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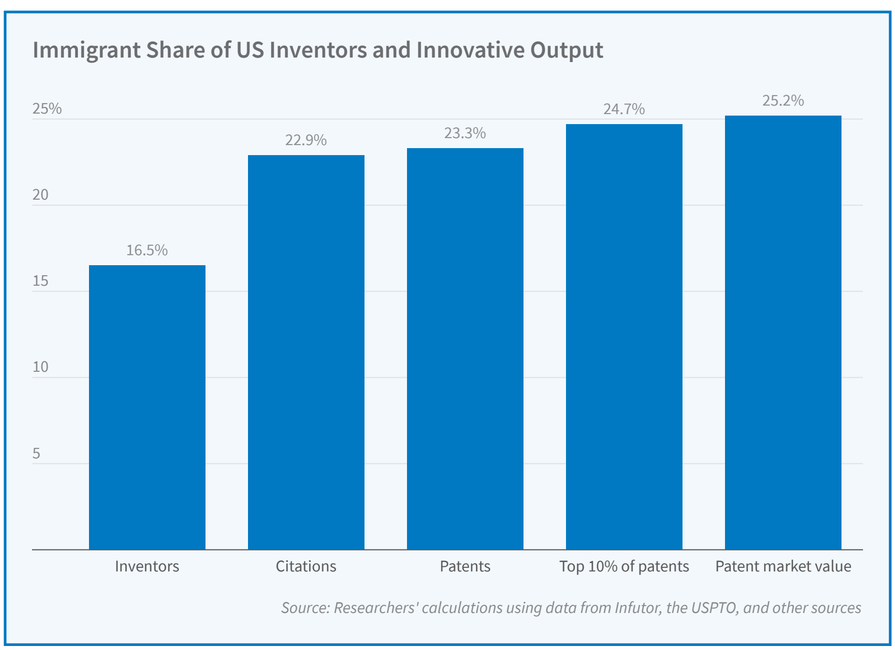
The Outsize Role of Immigrants in US Innovation

Immigrant inventors are key contributors to innovation in the United States, both through their direct productivity and through the spillover effects of their work with native-born collaborators. While accounting for just 16 percent of all US-based inventors, immigrant inventors produce nearly a quarter of total innovation output as gauged by the number of patents and patent citations and the economic value of the patents.

Those are among the findings Shai Bernstein, Rebecca Diamond, Abhisit Jiranaphawiboon, Timothy McQuade, and Beatriz Pousada report in **The Contribution of High-Skilled Immigrants to Innovation in the United States** (NBER Working Paper 30797). The researchers compare the impacts of immigrant inventors with those of their native-born peers between 1990 and 2016. Their study identifies immigrants as individuals who were assigned Social Security numbers at age 20 or older.

Immigrants produced 23 percent of all patents over the study period. If the patents are quality-weighted in proportion to the number of forward citations they receive, the immigrant contribution is 24 percent. It is even higher, 25 percent, when patents are weighted using the value of the stock market reaction to their being granted. Immigrants also collaborated with native-born inventors on 13 percent of all patent filings, so they were either directly or indirectly responsible for 36 percent of US patent output during the study period.

Immigrant inventors account for almost one-quarter of US innovation, but a substantially smaller share of the inventor population.



Source: Researchers' calculations using data from Infutor, the USPTO, and other sources

Two factors explain about 30 percent of the patenting gap between immigrants and natives. First, immigrants disproportionately live in innovation hubs, counties that have high rates of patent productivity. Second, immigrants tend to patent in sectors that are changing rapidly. They generate more than 25 percent of innovative output in the computer, communications, electronics, and medical fields, but just 15 percent in older technologies such as metalworking, transportation, and engines. The researchers suggest this indicates that immigrants are more prepared than natives to make sectoral choices that improve their innovative output.

To compare the benefits of working with foreign-born versus US-born innovators, the researchers examined the patenting activity of inventors following the premature death of collaborators, defined as death before age 60. Co-inventor productivity dropped 17 percent after the death of an immigrant, compared with 9 percent after the death of a native inventor.

Immigrant inventors play a disproportionate role in the international exchange of knowledge. Compared with native-born inventors, immigrants are 10 percent more likely to cite work in other countries in their patents and twice as likely to collaborate with foreign inventors. Foreign inventors are also 10 percent more likely to cite patents of US-based immigrants than of US natives.

Contrary to concerns that language and cultural barriers isolate immigrant inventors, immigrants have more collaborators on average than native inventors. Their initial patents are more likely to reflect joint work with other immigrants, but that pattern decays as they assimilate.

— Steve Maas

Recruitment and Compensation of Private Equity CEOs

Fewer than 30 percent of new CEOs at S&P 500 companies over the last few decades were hired externally and only 20 percent were complete outsiders. Some have concluded that this suggests a limited market for CEOs. Little research, however, has studied the market for CEOs of private equity funded companies. In **The Market for CEOs: Evidence from Private Equity** (NBER Working Paper 30899), Paul A. Gompers, Steven N. Kaplan, and Vladimir Mukharlyamov address this gap by studying the market for CEOs using a sample of 192 private equity funded buyouts in the US worth more than $1 billion between 2010 and 2016. They find very different results from those for public companies. More than 75 percent of new CEOs were external hires, and more than 65 percent were complete outsiders. The most recent experience of 67 percent of the outside CEOs was at a public company, including 32 percent at an S&P 500 company. Almost 50 percent of the external hires have some previous experience at an S&P 500 company. This suggests there is an active market for CEOs that crosses the boundaries between publicly traded and privately financed firms.

> More than 75 percent of new CEOs hired to run private-equity-funded companies are external hires, compared with only 28 percent of new CEOs at S&P 500 companies.

The researchers go on to estimate how the private-equity-funded CEOs are compensated compared to public company CEOs. They use two pieces of information to estimate compensation. First, they measure the performance of the buyouts in their sample. The median buyout earned 2.5 times its equity investment. Second, they assume the cash compensation and equity incentives for CEOs are similar to those of CEOs of the sample buyouts that returned to public ownership through initial public offerings. Combining that information, the researchers estimate that the private-equity-funded company CEOs earned significantly more total compensation, roughly twice as much as CEOs of similar-sized public companies.

Source: Researcher's calculations using data from Pitchbook, CapitalQ, LinkedIn, and other sources

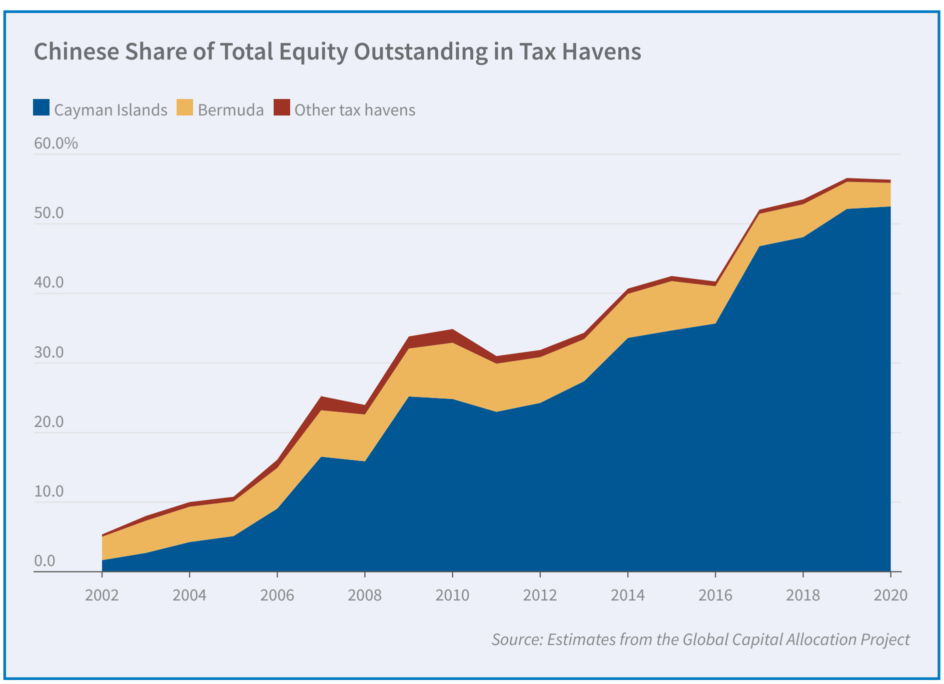
Overall, the results suggest that the broader market for CEOs is active and that, at least for private equity-funded portfolio companies, firm-specific human capital is relatively unimportant. The compensation results indicate that public company executives have viable outside options. Finally, the findings suggest that one cannot necessarily generalize the results for and inferences from publicly owned companies to all companies.

— Linda Gorman

Chinese Firms Access Foreign Capital through International Tax Havens

Tax havens are increasingly the avenue for emerging market countries, particularly China, to raise money from foreign investors. Many Chinese companies use financing subsidiaries and shell companies located in the tax havens, which makes them hard to trace. The firms involved range from Chinese tech giants to state-owned enterprises.

In **China in Tax Havens** (NBER Working Paper 30865), Christopher Clayton, Antonio Coppola, Amanda Dos Santos, Matteo Maggiori, and Jesse Schreger draw on subsidiary-parent information from several commercial datasets, along with data from the International Monetary Fund, to link securities offerings in tax havens with the ultimate country of origin for the issuer as well as the domicile of the holder.



In the past 20 years, Chinese companies have gone from negligible participation in securities issuance in tax havens to representing more than 60 percent of the equity outstanding by firms domiciled in these countries in 2020. Roughly 70 percent of foreign portfolio equity investment to China flowed through this channel, especially through the Cayman Islands. Chinese companies also account for about one-fifth of the corporate bonds issued in tax havens, and offshore entities also account for most foreign bond investment in China. Since 2016, however, foreign investment in Chinese government bonds onshore has also risen rapidly, diminishing the relative importance of offshore bond investments.

The use of tax havens for equity investments is more aimed at skirting Chinese law than tax considerations per se. Foreign investors are not permitted to own equity in Chinese firms in strategic industries, which include the technology industry. To abide by the letter of Chinese law and still attract foreign investment, some Chinese firms set up shell companies in tax havens and list them on global exchanges including the New York Stock Exchange.

In 2020, Chinese companies accounted for more than 60 percent of the outstanding value of equities issued by firms resident in tax havens.

The offshore shell companies create bilateral contracts with the Chinese operating companies and their owners. These are not formal equity contracts, but they are designed to give shell company shareholders control and a claim to the residual profits of the operating companies in China. International accounting standards regard these contracts as equivalent to equity. Meanwhile, the companies operating in China report to local regulators that they are fully owned by residents of China.

Giant tech-sector enterprises including Alibaba, Tencent, and Baidu get the vast majority of their portfolio equity investment from developed country investors through offshore shell companies. For bond issuance, large firms in other industries including state-owned enterprises, such as State Grid Corporation of China, China National Offshore Oil Corporation (CNOOC), and Sinopec, raise large amounts of offshore financing via the British Virgin Islands as well as the Caymans.

Offshore investments raise a number of uncertainties. The central question is whether stock holdings via tax-haven entities, known as variable interest entity (VIE) structures, are legal and enforceable. For corporate bonds, what happens if the Chinese company goes bankrupt? The US Senate and regulators have stepped up scrutiny of these entities if they are listed on a US stock exchange. China, too, has repeatedly warned it might increase and change its oversight of Chinese VIEs.

— Laurent Belsie

Policing Practices That Curb Domestic Violence

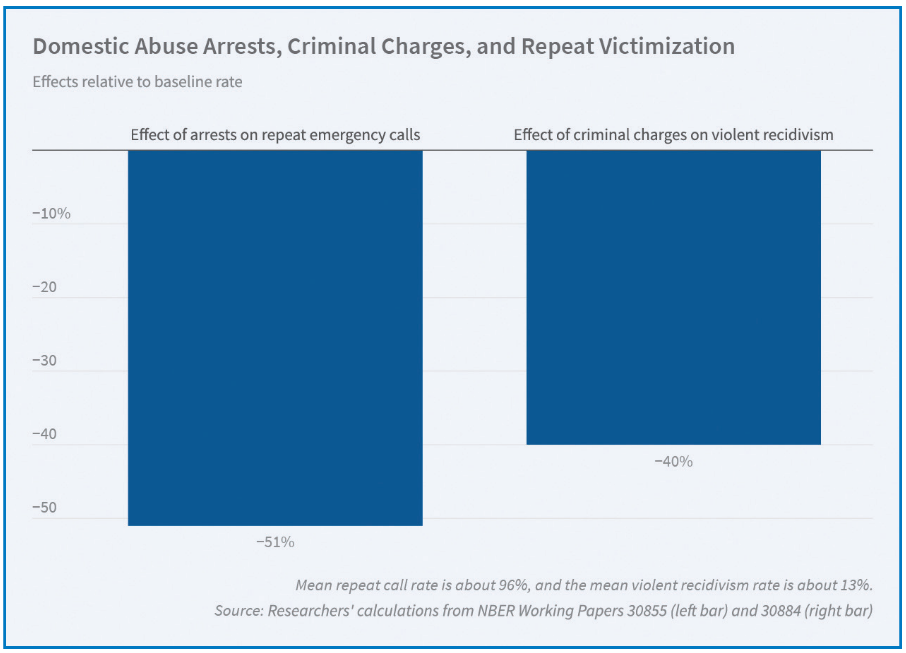
The lifetime incidence of intimate partner violence is 24 percent in the United Kingdom and slightly higher, 26 percent, in the United States. Two studies of policing in England conclude that taking legal action against the perpetrator reduces the likelihood of repeated abuse, refuting concerns that arrests and prosecutions boomerang by triggering retaliation and discouraging future calls for help.

> Arresting or pressing charges against those who abuse their intimate partners reduces the likelihood of repeat behavior.

In **Deterrence or Backlash? Arrests and the Dynamics of Domestic Violence** (NBER Working Paper 30855) Sofia Amaral, Gordon B. Dahl, Victoria Endl-Geyer, Timo Hener, and Helmut Rainer report that an arrest halves domestic violence calls about the arrested person in the ensuing year. Most domestic violence calls do not, however, lead to an arrest or prosecution.

In **Criminal Charges, Risk Assessment, and Violent Recidivism in Cases of Domestic Abuse** (NBER Working Paper 30884), Dan A. Black, Jeffrey Grogger, Tom Kirchmaier, and Koen Sanders find that pressing charges substantially reduces violent recidivism while providing risk-based protective services to victims does little to break the cycle of abuse.

The first study uses arrest data as the key variable and also uses the fact that police officers are quasi-randomly assigned to emergency calls, with these officers differing in their propensities to make arrests. The second study uses data on whether charges were pressed and controls for other possible explanatory factors such as the severity of an incident and the responding officers' propensity to make arrests or press for charges.



"**Deterrence or Backlash?**" focuses on the West Midlands, the second most populous county in England, and examines data from more than 124,000 domestic violence emergency calls made over the last decade. These calls include reports of threatening behavior, violence, or abuse.

In the absence of an arrest, abuse reoccurs in an estimated 23 percent of cases within 48 hours of the emergency call. Short-term revictimization is unlikely when there is an arrest, which allows for a cooling-off period during which the offender is no longer interacting with the victim. Additional reductions in revictimization occur over the following year, consistent with a longer-term deterrence effect. The initial arrest reduces the probability of another domestic violence call over the subsequent year by 51 percent. The deterrence effect is reinforced by the increased probability of prosecution: offenders who are arrested face a 12 percent chance of formal charges, compared with just 2 percent for those who are not arrested.

The researchers cite two indicators that suggest that the reduction in emergency calls reflects an actual decline in violence as opposed to a change in reporting behavior induced by fear of retaliation. First, post-arrest calls on average were for less-violent behavior, suggesting victims had a lower tolerance for abuse. Second, the composition of callers changed: repeat calls by third parties, such as neighbors, dropped by 57 percent, while those by victims fell 36 percent, the opposite of what one would expect if victims felt intimidated.

These findings are reinforced by those of "**Criminal Charges, Risk Assessment**." In this study, the researchers assess two approaches used by the Greater Manchester Police to reduce serious domestic violence recidivism. One entails pressing criminal charges, the other sparing the offender and instead providing protective services to the victim based on a risk assessment made at the scene of the incident. The sample consists of more than 154,000 incidents between 2013 and 2019.

The study finds that pressing charges reduces violent recidivism over the following year by about 5 percentage points, a nearly 40 percent reduction relative to the average recidivism rate. Providing victims with protective services does not reduce violent recidivism on average. As in the previous study, pressing charges resulted in a greater drop in repeat calls from third parties than from victims.

—Steve Maas

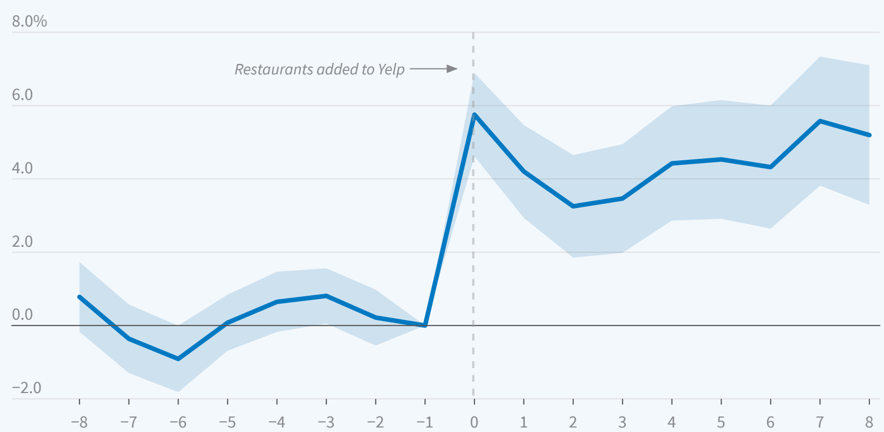
Gauging the Value of an Online Restaurant Listing

Some businesses maintain an online presence, and some do not. In **Getting on the Map: The Impact of Online Listings on Business Performance** (NBER Working Paper 30810), Michael Luca, Abhishek Nagaraj, and Gauri Subramani study a sample of restaurants in Texas to examine the revenue effects of establishing an online listing. They estimate that revenues increased by approximately 5 percent after a restaurant was listed on Yelp. Yet over 30 percent of the businesses in their sample were never listed, even though listings are free to create. Their results suggest that firms might at times be missing out on low-cost digital strategies.

A study of Texas restaurants finds that revenues rose roughly 5 percent after a free listing on Yelp, but many restaurants don't take advantage of the opportunity to list their businesses.

Effect of Online Listings on Restaurant Revenue

Difference in revenue between restaurants newly added to vs already on Yelp, relative to quarter before being added



Horizontal axis represents quarters since being added to Yelp; shaded area is 95% confidence interval

Source: Researchers' calculations using data from Texas Comptroller of Public Accounts' office and Yelp

The researchers created their sample of bars and restaurants using data on 34,270 name and address combinations from the Texas Comptroller of Public Accounts. The comptroller's records contain monthly tax receipts for every Texas business that had a liquor license and paid taxes on the sale of distilled spirits, beer, ale, and wine. The researchers used the recorded tax payments from 2007 to 2017 to estimate monthly revenues in dollars, using alcohol revenue as a proxy for total restaurant and bar revenue.

After cleaning the data to adjust for gaps in payment records and eliminate liquor license holders that might be stadiums, catering services, event management companies, and other entities that are not restaurants or bars, there were 14,381 unique tax location establishments. Using an algorithm that matches location information to listings in Yelp's internal database, they find that 9,571 of those establishments had a Yelp listing at some point in their lifetime.

Founded in 2004 in San Francisco, Yelp began expanding in Texas in April 2007. Although creating and managing listings is free, many existing Texas establishments created new Yelp listings between 2007 and 2010. The researchers believe that cost was unlikely to be the reason for not listing.

Once a business was listed, Yelp users could add reviews. Users could also add businesses that were not already listed to the platform. Of users actively adding sample businesses to Yelp, the 1 percent most active users — 56 "super-adders" — listed 747 of the businesses in the sample. On average, the businesses they listed were younger and more likely to be urban than were other sample listings.

In July 2010, Yelp boosted its Texas listings by buying data from a third party business data aggregator and doing a "bulk add," which resulted in 1,295 new Texas restaurant and bars from the researchers' sample to be listed. As a result, the proportion of sample establishments not on Yelp fell by half to slightly less than a third. Relative to the businesses from the data acquisition, the businesses listed on Yelp were more urban, had been in business longer, and had higher revenues than businesses never listed on Yelp. Average monthly revenues for businesses listed and never listed were $30,911 and $20,853 respectively.

The estimated revenue increase for the sample businesses listed on Yelp was about 5 percent. Sample businesses added to Yelp by the super-adders enjoyed revenue increases of about 8.9 percent. The businesses from the bulk add had a 10 percent revenue increase even though their user rankings were slightly lower than the sample average. The researchers conclude that "adding a new listing unlocks a new source of customers and revenue to the restaurant that stays persistent over time."

— Linda Gorman

Urbanizing the US: From Agriculture to Manufacturing to Services

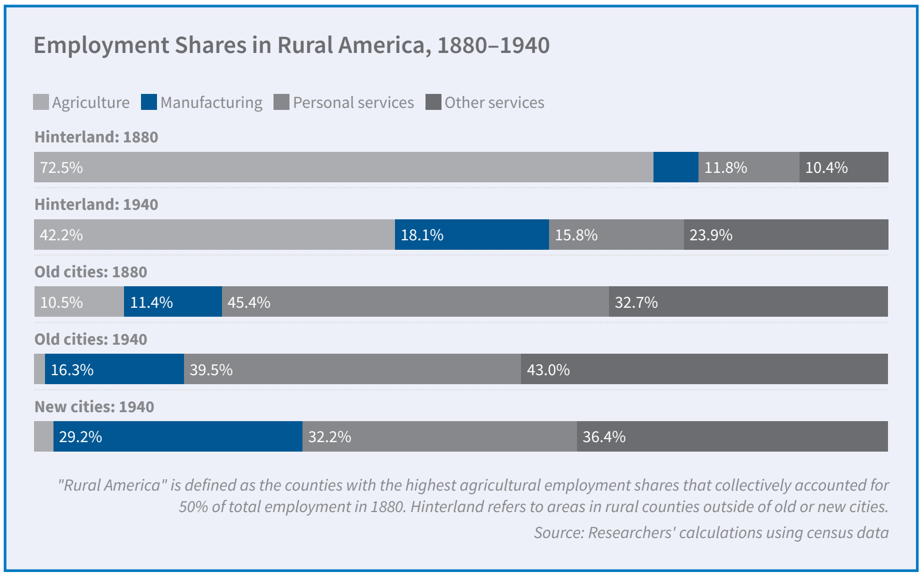
Between 1880 and 1940, the United States experienced two profound changes: a wave of industrialization that reallocated employment away from agriculture and toward manufacturing, and a wave of urbanization. These transformations were closely intertwined: because rural dwellers had high agricultural employment shares and urban dwellers had high manufacturing employment shares during this period, population flows from rural to urban areas accounted for much of the change in employment structure.

How were these changes connected? Were workers leaving rural counties and migrating long distances to superstar industrial cities like Chicago and New York, or were rural counties becoming more urbanized and industrialized internally? In **Sprouting Cities: How Rural America Industrialized** (NBER Working Paper 30874), Fabian Eckert, John Juneau, and Michael Peters analyze publicly available census files and find that the second narrative better fits the facts.

The researchers identify the counties with the highest agricultural employment shares in 1880 that collectively accounted for half the US population. Between 1880 and 1940, 240 new incorporated cities sprang up and the share of the sample counties' populations living in urban areas rose from 5 to 30 percent. Over the same period, their agricultural employment share fell from 72 to 36 percent. Population agglomeration in new cities, rather than population growth in existing cities, accounted for most of the urbanization the counties experienced. These new cities tended to be factory towns focused heavily on manufacturing, in contrast to existing cities in these counties focused on providing consumer services. The rise of new factory towns simultaneously explains most of the urbanization and industrialization of rural counties.

> In the late 19th and early 20th centuries, 240 new, manufacturing-focused cities sprang up in heavily agricultural US counties.

The changes in rural counties were quantitatively important at the national level. The researchers decompose the change in the national agricultural employment share, which fell from 47 percent in 1880 to 15 percent in 1940, into movement attributable to the migration of workers from rural to urban counties and movement attributable to the internal industrialization of rural counties. Internal industrialization accounted for 63 percent of the national decrease in agricultural employment.



"Rural America" is defined as the counties with the highest agricultural employment shares that collectively accounted for 50% of total employment in 1880. Hinterland refers to areas in rural counties outside of old or new cities.

Source: Researchers' calculations using census data

The researchers next turn to international data. They find that in developing countries local industrialization of rural areas has accounted for most of the decline in agricultural employment, as occurred previously in the United States.

— *Shakked Noy*