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Taxation and the International Mobility of Inventors

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In 1876, Alexander Graham Bell invented the telephone, and he created the Bell Telephone Company one year later. By 1886, more than 150,000 people in the United States owned telephones. In 1916, James L. Kraft patented a pasteurization technique for cheese and established his company, Kraft Foods Inc., which would grow into a conglomerate responsible for creating some of the United States's most popular food products and employ more than 100,000 people. In 1968, Ralph Baer created a TV game unit that allowed players to control onscreen action with paddle controls. Today, the video gaming industry is worth $66 billion. In the early 1970s, Michael Ter-Pogossian developed the positron emission tomography (PET) scanner, which is used today in countless medical examinations. In the mid-1970s, Samar Basu, through a series of patents, invented the technology that allowed the lithium ion batteries used in innumerable consumer products to be recharged multiple times. In 1981, Charles Simonyi started developing some of Microsoft Office's most profitable products. In addition to being prolific inventors, these innovators had something else in common: they were all immigrants.

According to World Intellectual Property Organization data, inventors are highly mobile geographically with a migration rate of around 8 percent. But what determines their patterns of migration, and, in particular, how does tax policy affect migration? The fear of a "brain drain" and the exodus of economically valuable agents in response to higher taxation has led to a vivid public debate regarding the taxation of high-income people. For instance, in response to the *New York Times'* article "The Myth of the Rich Who Flee from Taxes," following Gerard Depardieu's Russian exodus for tax purposes, *Forbes* published "Sorry *New York Times*, Tax Flight of the Rich Is not a Myth."

Our research studies the effects of top income tax rates on the international migration of inventors, who are key drivers of technological progress. While an important issue, the response of international migration to taxation has remained underexplored due to an absence of appropriate data. One exception is a study of the migration responses of football players, but these economic agents are very different from inventors.

We use a unique international data set on all inventors from the U.S. and European patent offices to track the international location of inventors since the 1970s. The benchmark data are from the disambiguated inventor data, based on inventors who patent with the United States Patent Office (USPTO). The focus is on the eight Organisation for Economic Co-operation and Development (OECD) countries that represent the bulk of USPTO

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patents for the period 1977–2000: Canada, France, Germany, Great Britain, Italy, Japan, Switzerland, and the United States. The U.S. and European patent offices together account for a large fraction of worldwide patents, so our sample contains most of the inventors who patent. We combine these inventor data with international top effective marginal tax rates data.

Particularly interesting are "superstar" inventors, those with the most abundant and most valuable innovations. The distribution of inventor quality, as captured by the citations that an inventor's patents receive, is highly skewed: while the median and mean inventors have, respectively, 11 and 42 lifetime citations, the average top 1 percent superstar inventor has 1019 citations.

Several major challenges arise when studying the migration responses to taxation. First, migration decisions should depend on the counterfactual income that an agent expects to receive in each potential location, which is not observed. Second, migration decisions should depend on the counterfactual average tax rate that the agent expects to pay in each potential location, which itself depends on the (unknown) counterfactual income earned. Finally, average tax rates may be endogenous to other factors in a given country and year.

To address these challenges, we construct proxies for inventors' counterfactual earnings in each potential destination country, including, in particular, measures of inventor quality. Indeed, the patent data allow us to measure inventor productivity and quality directly. Our benchmark measure of quality is citations-adjusted patents, but we also consider the number of patents, average citations per patent, and the maximum citations per patent, as well as measures of the breadth of patents and breadth of impact of an inventor. We focus on inventors who are employees of companies and, hence, not the owners of their patents.

The quality measures based on citations are important determinants of inventors' incomes. Directly, more citations mean a higher economic value of the patent, which companies typically reward through bonuses or "fair-share" agreements. Indirectly, employers presumably try to promote and retain their star employees, as characterized by high patent qualities.

Based on our benchmark quality measure, we construct a corresponding quality distribution, conditional on region of origin and year, and determine the rank of each inventor in this distribution. We define superstar inventors as those in the top 1 percent of the quality distribution, and similarly construct the top 1–5 percent, the top 5–10 percent, and subsequent quality brackets.

The evidence presented suggests that the top 1 percent superstar inventors are well into the top tax bracket. While the top 1–5 percent are still likely to be in the top tax bracket, the likelihood of being there declines sharply as we move down through the top 5–10 percent to the top 10–25 percent or below the top 25 percent inventors. Hence, the lower quality groups (top 5–10 percent, top 10–25 percent, and below top 25 percent) serve as control groups for the top 1 percent group. Moreover, top tax rates are a good approximation for the average tax rate (which is what drives migration) for top earners, who are deep into the top tax bracket, as is the case here.

We analyze the relation between top tax rates and superstar inventor location in several ways. We start by documenting a negative correlation between the top tax rate and the share of top quality foreign inventors who locate in a country, as well as the share of top quality domestic inventors who remain in their home country.

We then exploit the quasi-experimental variation provided by migration or tax reforms. First, we consider the special case of Russian inventors, a group whose migration opportunities were severely restricted before the collapse of the Soviet Union. We then exploit two large tax reforms, namely the U.S. Tax reform Act of 1986 and Denmark's "Researchers' Tax" reform of 1992. Finally, we exploit the country-by-year variation in top tax rates and, as our main estimation strategy, the differential effective impact of top tax rates on inventors of different qualities.

We find that the superstar top 1 percent inventors are significantly affected by top tax rates when choosing where to locate. At the lower end, using the top 5–10 percent as a control group yields a responsiveness (elasticity) of the number of domestic superstar top 1 percent inventors to the net-of-tax rate of 0.02. Using the top 10–25 percent or the below top 25 percent as control groups yields elasticities of, respectively, 0.02 and 0.03. On the other hand, the elasticity of the number of foreign top 1 percent superstar inventors to the net-of-tax rate is much larger, with corresponding values of 0.63, 0.85, and 1.04. The far greater elasticity for foreign relative to domestic inventors makes sense since, when a given country adjusts its top tax rate, it potentially affects inventor migration from all other countries.

These results suggest that, if the economic contribution of these key agents is important, their migratory responses to tax policy might represent a cost to tax progressivity. Our estimates could fruitfully be used to

calibrate models of optimal taxation in the presence of migration. An additional relevant consideration is that inventors may have strong spillover effects on their geographically close peers, making it even more important to attract and retain them domestically.

NOTE:

This research brief is based on Ufuk Akcigit, Salomé Baslandze, and Stefanie Stantcheva, "Taxation and the International Mobility of Inventors," *American Economic Review* 106, no. 10 (2016): 1–53.