Innovation, Taxation and Migration: The Effect of State Taxes on Star Scientists

Enrico Moretti (Berkeley, NBER, CEPR, IZA)

Daniel Wilson (FRB San Francisco)

US states compete aggressively to attract high tech employers and skilled workers by offering increasingly generous tax incentives. For example, over the past two decades, general R&D tax credits offered by U.S. states have become increasingly important. In addition, personal and corporate taxes vary enormously from state to state, and these geographical differences are particularly large for high income taxpayers. For example, the individual income marginal tax rate (MTR) for someone with income at the 99th percentile is 9.5% in California and zero in Washington and Texas. Large differences are also observed in business taxes. Iowa and Pennsylvania, have corporate income taxes rates of 12% and 9.99%, respectively, while Washington, Nevada has no corporate tax at all.

These differences in taxes have the potential to affect the location decisions of geographical location of highly productive workers and innovative businesses. But despite all the attention from policy makers and voters, the effect of tax differences and tax credits remains poorly understood.

In this project we focus on the locational decisions of star scientists, defined as scientists – in the private sector as well as academia and government – with patent counts in the top 5% of the distribution. Using data on the universe of U.S. patents filed between 1976 and 2010, we will identify their state of residence in each year. We will compute bilateral migration flows for every pair of states (50x50) for every year. We will then relate bilateral out-migration to the differential between the destination and origin state in personal and business taxes in each year. To this end, we will compile a comprehensive data set on state personal income tax rates for taxpayers at the 99.9%, 99%, 95%, 50% of the income distribution, the state-level corporate income tax rate, R&D tax credit rate and investment tax credit rate. We will look at both personal and business taxes because personal taxes might shift the supply of workers to a state, while business taxes might shift the demand for skilled workers by businesses.

Star scientists are an important group of workers because of their local spillover effects. The location decisions of top scientists have potentially large consequences for local job creation. Their presence in a state is typically associated with research and production facilities and in some cases, with entire industries. The literature has highlighted the role that stars scientists have historically played in the birth and localization of new high-tech industries. For example, the location of a handful of star scientists in 1975 has determined to a large extent the localization of the four main biotech clusters within the US (Zucker, Darby and Brewer, 1998). Similar patterns have been documented for other high tech industries, from semiconductors and computer science to nano-tech and stem cell research. Star scientists have been shown to play the key role not only in the development of scientific discoveries and their successful commercialization, but also in the choice of location of high tech industries.

Taxes are not the only factor that determines the location of star scientists. Indeed, we find no cross-sectional relationship between state taxes and number of star scientists as the effect is swamped by all the other differences across states. California, for example, has relatively high taxes throughout our sample period, but it is also attractive to scientists because the historical presence of innovation clusters like Silicon Valley and the San Diego biotech cluster. Indeed, California is a net importer of stars from Texas, even though Texas has no personal income tax and a low business tax rate.

Our baseline model estimates the elasticity of migration to taxes using a specification where the number of scientists who move from one state to another is a function of the tax difference between the two states, conditional on state-pair ordered fixed effects. The inclusion of state-pair effects is important because it uses *changes* over time to identify the effect of taxes and therefore

it absorbs all time-invariant factors that can shift the demand of scientists and the supply of scientists across state pairs.

Our preliminary estimates point to large, stable, and precisely estimated effects of personal and corporate taxes on star scientists' migration patterns. The probability of moving from state *o* (origin) to state *d* (destination) increases when the tax rate differential between *o* and *d* increases. For the individual income MTR on income at the 99th percentile, we find an elasticity of about 1.7: a 1% decline in after-tax income in state *d* relative to state *o* driven by a change in the MTR for the top 1% of income earners is associated with about a 1.7 percent increase in the number of star scientists who leave state *o* and relocate in state *d*. We find a similar elasticity for state corporate income tax as well as the investment tax credit. Our estimated elasticities don't change when we include origin state*year effects. These models fully absorb differences in local business cycle across origin states, as well as other time varying differences such as state and industry specific shocks. Thus, it seems that both the supply of, and the demand for, star scientists is highly sensitive to state taxes. We are now collecting data to extend our models to R&D credit rate and investment tax credit rate.

Of course, it is in principle possible that changes over time in taxes reflect unobserved shocks to a state economy that might bias our estimates. We plan to deal with this issue in several ways.

First, we will provide a specification test based on differences in the degree of tax progressivity across states. The idea is simple. Star scientists are likely to be among the top earners in a state. If our identification assumption is valid, we should see that star scientists location decisions are sensitive to changes in tax rates that apply to top incomes but not to changes in tax rates that apply to average incomes. To implement this test, we will estimate models that include both changes in the MTR for the top 99% of income and changes in the MTR for median income. Identification comes from differential changes in the progressivity of personal income taxes. In other words, we will compare the flow of scientist from state *i* to state *j* to the flow of scientists from state *z* to state *j* where state *i* and *z* have the same rates for median income, but different rates on high incomes.

Second, we will provide a specification test based on the fact that corporate taxes should affect the demand for scientists on the part of private sector firms but not demand for scientists on the part of universities and government agencies, which are mostly non-profit and therefore unaffected by corporate income taxes. We should also see that individual inventors are not sensitive to corporate taxes but they are sensitive to R&D tax credits. While individual inventors are not subject to CIT, they can take advantage of R&D credits (against individual income taxes).

Third, we should see that corporate taxes matter only in states where labor (the wage bill) has a non-trivial weight in the state's formula for apportioning multi-state income. In origin or destination states that apportion a corporation's multi-state income based only or primarily on the state's share of the corporation's national sales, so that labor's location has little or no effect on the tax bill, corporate taxes have no effect on stars migration.

Fourth, we will focus on the timing of the change and test for pre-trends. Finding that migratory flows of scientists change before a tax change may cast doubt on the exogeneity of tax changes.

Finally, and most importantly, we will collect data on state elections (governor, house and senate) for all states for the last 30 years, and we will use a regression discontinuity approach based on closed elections. Specifically, we will focus on states where the party of the governor switches from Democrat to Republican (or vice versa) by a narrow margin (say, less than 0.5% of vote share). We will also focus on states where the party that controls the state legislature switches by a narrow margin. This approach will allow us to isolate large variation in tax rates that is triggered small –and arguably random—differences in party vote share.