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# A Reply to "A Replication of "Millionaire Migration and State Taxation of Top Incomes: Evidence from a Natural Experiment" (*National Tax Journal* 2011)"

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**Abstract**

This response discusses the findings and criticisms in Cohen, Lai, and Steindel (CLS). Despite the skeptical tone of their article, the CLS analysis confirms our core conclusion of a small (or very small) migration effect of the millionaire tax. The range of estimates reported by CLS, including the wrong-signed estimates they find, scarcely reaches beyond the 95 percent confidence interval originally reported by Young and Varner. The critical

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modeling choice made by CLS is to exclude the observed in-migration of millionaires in the years following the tax increase. Even this leaves small migration effects, with an implied revenue cost that is a small fraction of the additional revenues generated by the millionaire tax.

**Keywords**
millionaire, migration, state income tax, natural experiment

In replicating our original study, "Millionaire Migration and the State Taxation of Top Incomes" (Young and Varner 2011; hereafter YV), Cohen, Lai, and Steindel (2015; hereafter CLS) have done a substantial service by carefully reproducing the YV results and probing for models that may yield different estimates. Drawing on a census of millionaires in New Jersey, what happened to migration after the passage of the new millionaire tax? Despite the skeptical tone of their essay, the CLS analysis confirms our core conclusion of a small (or very small) migration effect of the millionaire tax.

## A Validating Replication

We are heartened to see that the basic YV results could be closely replicated based only on our published description of methodology. Studies of the data archives of journals such as the *American Economic Review* have found that this is all too often *not* the case (Glandon 2010; McCullough 2007). As noted in the "call" for this section, there are concerns that "replicable economic research is the exception and not the rule" (Anderson et al. 2005, 4; Burman, Reed, and Alm 2010). Thus, it is an important finding that CLS were able to very closely replicate our core findings.

CLS find some estimates that are smaller than our core result (including wrong-signed estimates, showing a positive effect of the tax), as well as estimates that are larger. Their findings are mostly contained within the original confidence interval reported in YV.

## Significance Standards for Replication

There are two standards for the significance of a replication. First is the statistical significance of the difference between the new and the original estimates. The second is the substantive or economic significance of the

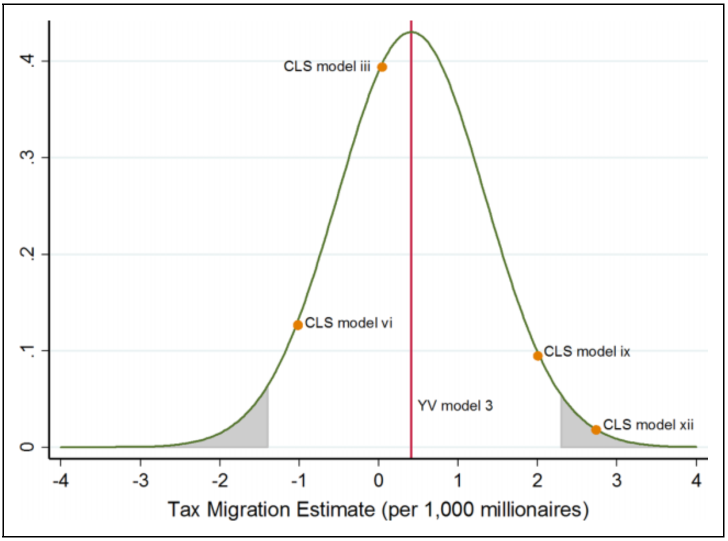


**Figure 1.** Young–Varner baseline estimate, confidence interval, and CLS estimates.

difference in estimates. These are two ways of addressing the question, "Are these findings new?"

First, statistical significance of a replication is somewhat different than in a conventional, original study. The null hypothesis in an original study is often concerned about whether an effect can be statistically distinguished from zero. In a replication study, however, concern is about whether the "new" findings can be distinguished from the "old" findings. Rather than a null of $\beta_{replication} = 0$, the replication null is $\beta_{replication} = \beta_{original}$. This replication null shows the distinction between a validating replication and a disconfirming replication.

This is important because, as statisticians have noted, "the difference between 'significant' and 'not significant' is not itself statistically significant" (Gelman and Stern 2006; McCloskey and Ziliak 1995). Often, small changes in a coefficient can shift an effect from 'significant' to 'not significant.' Replications that play at the margin of statistical significance, without showing much difference in substantive or economic significance, should be understood as validating replications—confirming the original results.

In figure 1, we plot the baseline YV estimate, along with its 95 percent confidence interval (represented as a normal distribution with shading at the

**Table 1.** Tax Migration Effects Using Constant Dollars.

| | | DiD | *SE* | Net DiD | Semi-elasticity |
|---|---|---|---|---|---|
| Linear probability model | Out-migration | 1.616* | 0.588 | | |
| | In-migration | 1.202 | 0.865 | 0.413 | 0.04 |

*Note:* DiD estimates are (period 2 × millionaire) interaction terms, capturing the extra migration of millionaires in the four-year period after the tax was passed. See model 3, table 2 in YV, and table 2 model ix in CLS.
$*p < .05$.

upper and lower bounds of the interval). On this, we also plot the new CLS estimates. Only one estimate falls outside our 95 percent confidence interval and that estimate just barely extends past the upper bound of our interval. In short, CLS present a validating replication: it primarily demonstrates the robustness of the YV results under stress testing by critics.

Despite the similarity of estimates, CLS lodge two main objections to the baseline YV model. First, they argue that millionaires moving *into* New Jersey should be excluded from the analysis, so their preferred model only considers out-migration. Second, they argue that incomes should not have been adjusted for inflation. These model changes allow both larger and smaller estimates, which we replicate subsequently. The key modeling change of CLS is to "drop New Jersey in-migrants" (9), which is critical to obtaining their larger migration effects.

## In-migration and Out-migration

CLS show, and we agree, that *out*-migration increased after the tax came into effect. However, millionaire *in*-migration also rose after the tax increase, by almost an equal amount. In the wake of a millionaire tax in New Jersey, there was both rising out-migration and rising in-migration of millionaires. Net-migration models show that these two forces mostly cancelled each other out, leaving population largely unchanged. CLS acknowledge this in a footnote.

In table 1, we estimate the CLS out-migration model ix, as well as the corresponding in-migration model. There is a significant out-migration effect of 1.6 millionaires per 1,000 population, and a nonsignificant in-migration effect of 1.2. The net-migration effect is the simple difference in coefficients, out-migration less in-migration, which is 0.4—or roughly one millionaire migrant for every 2,000 millionaire population.[1]

By comparison, CLS report a significant out-migration effect of 2.007, but a nearly zero *net* effect of 0.076 (CLS table 2, models ix and iii). CLS

**Table 2.** Tax Migration Effects Using Current Dollars.

| | | DiD | *SE* | Net DiD | Semi-elasticity |
|---|---|---|---|---|---|
| Linear probability model | Out-migration | 2.179* | 0.921 | | |
| | In-migration | 3.655* | 0.595 | −1.477 | −0.15 |
| Probit model | Out-migration | 2.050* | 0.860 | | |
| | In-migration | 2.593* | 0.540 | −0.542 | −0.06 |

*Note:* The probit model DiD estimates are reported as marginal effects at the mean, not as probit coefficients. This facilitates both clear interpretation and comparison with estimates from the linear probability model.
*$p$ < .05.

do not report their comparable in-migration model, but arithmetically, the estimate must be 1.931. They acknowledge the "increase in millionaire in-migration" (8) and in a footnote they comment that the result "may be seen as a rejection of the tax flight hypothesis" (18fn5). This is why their larger out-migration effect leaves a nearly zero net-migration effect: the loss from out-migration is almost completely compensated by the gain from in-migration. "Churn" in the millionaire population increased after the tax, but there was little net outflow.

## Should In-migration Be Ignored?

The YV design is based on the concept of a natural experiment: high-quality data on *one state*, which increased taxes on some people but not others (see also Varner and Young 2012). CLS emphasize that the study does not control for factors outside New Jersey that influence migration. The YV identifying assumption is that the millionaire tax was not triggered by events in other states that influence the migration of the elite. CLS do not provide any specific evidence that the YV identifying assumption fails to hold—they simply say that it might not. In essence, they argue that in-migration, but not out-migration, might have been caused by "something else" outside the state. This is a weak foundation for discarding the observed in-migration of millionaires.

## Adjusting for Inflation

How does using nominal, rather than inflation-adjusted, incomes, affect the results?[2] Table 2 shows that for the linear model, both the out-migration and in-migration effects are stronger when using incomes that are not adjusted for inflation. The net in-migration effect is −1.477, a wrong-signed effect, suggesting that the tax attracted a net *in-flow* of millionaires of about 1.5 per 1,000 New Jersey millionaire population.[3] Table 2 also shows the probit estimates using current dollars (not adjusted for inflation), which gives very similar results, and a wrong-signed net migration effect of −0.542. When simply using current rather than constant dollars as CLS advocate, the baseline model produces results that are opposite to the CLS-preferred results. We find this a bit surprising, but it emphasizes that CLS's conclusions depend entirely on excluding millionaire in-migrants.

## Projecting the Tax Effect Outside the Data

In their conclusion, CLS write "our results suggest that by 2012, more than 700 millionaires . . . had left the state." This is misleading, as CLS do not use data beyond the year 2007. Instead, they doubled their observed estimate from the years 2004 through 2007 to somehow "project" additional effects for the years 2008 through 2012.[4] This is in spite of the fact that CLS have access to the most recent years of data, but chose not to extend the empirical analysis to include these additional years.

Does the migration response to top taxes extend into perpetuity in a linear fashion? More likely, there is an initial reaction to a tax increase that fades over time.

Reexamining the New Jersey data with this in mind, we reran our baseline model, allowing the migration effect to vary by year following the tax increase. We find a relatively clear pattern in which the effect is strongest in the first year, and declining thereafter. This pattern of declining effects holds for both out-migration and in-migration, using both constant dollars and current dollars (table 3). There does not seem to be an empirical basis for forecasting a tax migration effect much beyond 2007, even if only looking at out-migration.

## The Cost of Tax Flight—Small or Very Small?

Focusing on the years for which there is reported evidence, how large of a cost do these migration estimates imply? YV estimated the total revenue cost from tax-induced out-migration to be US$16.4 million for the total period (2004–2007), based on an estimate of seventy out-migrants.[5] The CLS preferred estimate (model ix, ignoring in-migration) implies a revenue cost of roughly US$75 million. Meanwhile, the millionaire tax generates gross new revenues of roughly US$1 billion per year. The migration effects

**Table 3.** Annual Estimates of Migration Effects.

| | Constant dollar income | | Current dollar income | |
|---|---|---|---|---|
| | Out-migration DiD | In-migration DiD | Out-migration DiD | In-migration DiD |
| Period | | | | |
| 2004–2007 | 1.616* (0.588) | 1.202 (0.865) | 2.689* (1.076) | 3.086* (1.103) |
| By year | | | | |
| 2004 | 2.323* (0.841) | 1.732 (0.863) | 2.600** (0.737) | 2.649** (0.772) |
| 2005 | 1.850 (1.062) | 1.309 (0.853) | 0.622 (1.024) | 1.745 (0.912) |
| 2006 | 0.531 (1.204) | 0.523 (0.951) | −0.427 (1.369) | 1.993 (1.131) |
| 2007 | 0.966 (1.233) | 0.360 (1.393) | 0.296 (1.653) | 1.681 (0.939) |

*Note:* DiD estimates are (time period × millionaire) interaction terms, capturing the extra migration of millionaires in each period/year after the tax was passed. For the baseline, see model 3, table 2 in YV, and table 2 model ix and model xi in CLS.
$^{*}p < .05$, $^{**}p < .01$.

found in YV and CLS imply either a small offset cost (US$75 million: CLS) or a very small offset cost (US$16.4 million: YV) of raising these revenues.

## Conclusion

We believe in replication as a fundamental principle of science (Young 2009). The original YV data are confidential tax records not publically available. CLS have used their office's access to the data to carefully replicate the baseline results of YV and to subject the findings to critical scrutiny. The range of estimates reported by CLS scarcely reaches beyond the statistical margin of error originally reported by YV. The difference between YV and CLS is largely one of literary tone; in terms of statistical significance or economic importance, the estimates are very similar. This replication has helped advance evidence-based public policy, by showing the range of empirical disagreement among different teams of researchers using the same data.

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## Notes

1. This is the same as reported in Varner and Young (2011; YV), table 2, model 3. The net effect is the same whether it is estimated in a net-migration model, or calculated from separate in- and out-migration models, as in table 1.
2. We want to correct Cohen, Lai, and Steindel (CLS) on one claim. CLS write, "YV informed us that they were unable to tell us which [inflation] index they used" (p. 6). This is incorrect. They asked us which index we used, and we replied that we would have to look it up. Being busy scholars, we never followed up, they never followed up, and we never heard from them again. For the record, we used the Consumer Price Index for All Urban Consumers (CPI-U) for urban consumers, under the assumption that millionaires tend to live in urban areas.
3. The CLS estimate for this model is −1.014 (CLS table 2, model vi).
4. CLS are on better ground when they say that their preferred estimate indicates a loss of about 80 millionaires per year in the posttax period (10), which is about 320 for the period of study, 2004 through 2007.
5. This is based on an average income of US$2.8 million, and an effective tax rate of 8.4 percent. See YV for more details.

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