Appendix for "Relocation of the Rich: Migration in Response to Top Tax Rate Changes from Spanish Reforms"

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A Appendix

A.1 Correlation of State Characteristics and Tax Changes

In this section, we show that the size of the state tax changes following the reform are not statistically associated with characteristics of the top 1% in the pre-reform period. In particular, the pre-reform in-migration rate, the stock of individuals in the top 1%, and the number of top 1% movers to not appear to predict the size of the tax change. Given that this analysis is limited to a cross-section of regions, this analysis is simply meant to be descriptive. Nonetheless, these types of variables also have small coefficients. The variables with large coefficients are the presence of a right wing government, debt per capita, and incomes in the region. Although not statistically significant, the large coefficients suggest these may be more important factors. This helps to allay concerns that governments changed their tax rates because they had expectations about how the migration rates of the top 1% or the stock of the top 1% in their region would respond. The results are shown in table A.1 where the dependent variable is the size of the tax change and in table A.2 where the dependent variable is a dummy that equals one if the region became high-tax.

A.2 Transition Matrix

Tables A.3 and A.4 show the transition matrix between regions for individuals in the top 1% of the income distribution. The first table shows the transition matrix for the post-reform era and the second table shows the transition matrix for the pre-reform era. These numbers represent the total number of migrants observed in our 4% random sample of the population. To obtain full population numbers multiply by 25.

A.3 Tax Calculator

This section introduces our tax calculator which computes marginal and average tax rates for all individuals in fifteen regions of Spain from 2005-2014. The Spanish income tax is a dual tax which applies progressive taxes on labor income (which can be changed by region) and taxes capital income separately (cannot be changed by regions). The capital tax base does not have an influence on the progressivity of the labor tax base. This tax calculator only computes the average and marginal tax rates for the labor tax base and takes into account the basic deductions and tax credits for ascendents and descendents as described below. Given this, the tax calculator is written to be accurate for top income taxpayers and should not be used to study low-income households where credits and deductions are much more important.

The tax calculator takes into account regional variation in marginal tax rates, tax bracket thresholds and the basic deductions given by the variables in the input data table. However, other specific tax credits and deductions are ignored, as they fade out with income and do in general not affect substantially the higher part of the income distribution.[1] Thus, to reiterate, our tax calculator should only be used for studying high-income taxpayers where the role of these deductions are small. Information about marginal tax rates, deductions and tax brackets are taken from the annual **Manual Práctico** published by the Spanish ministry of finance.

Structure of input data

The tax calculator consists of a STATA *.do* file which runs over a data-set with the variables given in table A.5. These input variables allow us to construct an average and marginal tax rate for each person for all years and states in the data set. Tax rates and bracket thresholds are not inputs in the data set because they are coded directly into the *.do* file which feeds in income and characteristics for each individual.

Output data

The output are given by the variables in table A.6 for each person identifier (id) for all states and years in our data. As an example, we present in table A.7, tax rates for a hypothetical tax payer, born 1970 with an income of 300,000 Euro and no children and all other inputs set to zero.

[1]Durán and Esteller (2006) show that tax credits predominantly lower the effective tax burden for the poor. A prominent example are tax credits given to young individuals renting a flat in various regions. However, only young and low income individuals are eligible (for example below 35 years of age and 19,000 Euros in Extremadura, and 32 years and 20,000 in Cataluña). Madrid allows for a small deduction of school books for families with a tax base below 30,000 Euros, to give a further example of these types of deductions. Omissions from the tax calculator are common to all calculators. Even NBER's TAXSIM does not present a complete set of tax rules for all states and years.

A.4 Summary Stats

Table A.8 shows summary stats for the top 1% (and as a comparison for the next percentile). The summary statistics are for movers only. As is clear, only 1 out of 100 individuals in the top one percent migrate in the post-reform period. We present statistics for income following their move, such that the income statistics presented here are in the new place of residence. Income among movers was declining over this time period. It was also very noticeable that average income for the top 1% and 2% are very different; the dramatic fall in income after the top percentile justifies our focus on this elite group. We also present the tax rates for the group. Focusing on the marginal rates, all individuals in the top 1% were in the 45% central government tax bracket prior to 2007. In the post-reform period, these tax rates increases on average and began to diverge.

A.5 Justification of Stock Model of Migration

Moretti and Wilson (2017) estimate a flow model of migration. Let o index the origin and d index the destination in year t. The reduced form is given by:

$$ln(P_{odt}/P_{oot}) = \beta[ln(1 - atr_{dt}) - ln(1 - atr_{ot})] + \zeta_o + \zeta_d + \zeta_t + \nu_{odt}. \quad (A.1)$$

The left hand side variable $ln(P_{odt}/P_{oot})$ is the log odds ratio where P_{odt} is the share of the population that moves from state o to state d in year t and P_{oot} is the fraction of the population that stays in state o in the same year. On the right hand side of the estimating equation are fixed effects given by ζ including: origin fixed effects, destination fixed effects, state pair (or origin by destination fixed effects) and time fixed effects. The net-of-tax rate with respect to the average rate is given by $1 - atr_{dt}$ $[1 - atr_{ot}]$ in the destination [origin].

Unlike Moretti and Wilson (2017), we prefer using a stock rather than flow model of migration in our aggregate analysis. In particular, notice that the log odds ratio will be missing whenever there is no migration between regions. Given we only have a 4% sample of the full population, this means we have a large number of missing observations for which migration may actually exist, which raises selection concerns. Second, our panel is much shorter than that of Moretti and Wilson (2017) which prevents us from being able to do important robustness checks as in their paper. Finally, we are missing two regions in Spain and thus "out-of-data" migration may be important.

In addition, the identification strategy in Moretti and Wilson (2017) fundamentally relies on a diff-in-diff approach, but where the outcome is migration flows across regions rather than stocks of top earners across regions. Compared to a standard random utility model where individuals decide every period where to locate, irrespective of where

they are, these flow specifications rely on a model where utility of being in any location is always conditional on where individuals are located to start with in period t (the origin region). Identification relies on the assumption that moving costs are asymmetric across regions. This assumption has an important consequence: it generates some non-random permanent migration flows across regions that do not come from changes over time in amenities / characteristics across regions. In terms of identification, this means that the strategy is a little bit different from what is usually done in location choice models. Traditionally, the identification relies on the assumption that, absent tax changes, differences in stocks of individuals across regions are fixed over time. In the flow model, the assumption is that region-pair migration flows are fixed over time. For this reason, and given the large number of pairs with no observed migration flows and the length of our sample, we prefer the stock analysis.

A.6 Aggregate Analysis

Table A.9 shows the event study as a standard difference-in-difference, including a specification where we control for trends from the time of the treatment. We use a binary treatment that equals one if a region increased its net-of-tax rate relative to the other region pair. We verify an elasticity of taxable income that is less than 0.30 and is statistically insignificant in figure A.1.

A.7 Individual Analysis

Figure A.2 shows the within individual variation in tax rates across the regions. As is clear, this variation jumps up almost immediately following the reform and is a much larger increase for the top 1%, which justifies our focus on this group.

Table A.10 shows a test of means for the characteristics of movers versus stayers. The goal of this table is to see if our sample is different from the full population. For this reason, we use pre-migration income as it is the relevant income to verify if a selection problem existed. No difference in pre-reform income exists between movers and stayers, however, people do eventually move to higher wage regions, which justifies our IV strategy. Movers are different on some demographics: they are younger and higher educated.

Table A.11 estimates the model using the full sample of movers and stayers. The effect of taxes on the full sample including stayers is small and insignificant. This is consistent with the discussion in Schmidheiny (2006) where the inclusion of stayers results in using many individuals that are in a per se sub-optimal location because of migration frictions. The table also shows results in column (2) using within region movers and across-region movers and in column (3) using only within state movers. As is evident, the effects are smaller than those presented in the text and are marginally insignificant

at the 10% level. This sample of moves, however, omits any within state moves for which we do not have precise local residence locations in the data. For this reason, columns (2) and (3) should be interpreted with caution.

Table A.12 shows various treatments of the standard errors. As is evident, the standard errors are similar.

Table A.13 is analogous to table 2 except instead of using the average tax rate, it uses the marginal tax rate (person-specific). Results are smaller in absolute value because the marginal tax rate increases the average tax rate by less than one-for-one.

Table A.14 shows a robustness check that removes individuals near the bracket thresholds of any state. The justification that the marginal tax rate is independent of counterfactual earnings requires individuals do not change tax brackets across the various alternative regions. This could happen if an individual is close to any tax bracket across all of the j alternatives. Thus, to verify the instrument is robust to this possibility, we exclude individuals that could possibly change brackets because they are near any state level threshold. The results are very similar to our baseline IV estimates.

Table A.15 shows the effects by individual characteristics. Overall, we conclude that differences exist, but they are not statistically different in our sample.

Table A.16 shows the effects by job characteristics. Overall, our conclusion is that taxes have a significant effect on location choices and that this result is highly stable across various specifications, sample restrictions and robustness checks. Table (A.20) and (A.21) show the point estimates and standard errors for the figures presented in the text relating to occupation and industry.

A.8 Individual Analysis: Non-linear Models

As an alternative to the linear model we estimate, (6) could be estimated by a multinomial logit model. This, however, results in convergence problems for many specifications or necessary adjustment of the convergence threshold given the large number of binary regressors included. To convince the reader that our OLS model is valid, Table A.17 presents the final specification from 3 in the text, but estimates the coefficient by a conditional logit model. This implies a large flow elasticity consistent with our OLS approach.

A.9 Occupation and Industry

Tables A.18 and A.19 show the occupation and industry of the most common categories of migrants from the top 1% in the post-reform period. Most industries and occupations are high-skill and previously studied subgroups such as athletes feature prominently in the distribution. Nonetheless, access to nationally representative Social Security data

allows us to study a much broader set of occupations and industries than many studies in the prior literature. It also paints a picture of what the top 1% of the income distribution looks like in Spain. As noted in the text, we can classify the main contract of an individual as self-employed, however, we only observe income if the individual has a contract with a reporting firm. To verify we are classifying the self-employed correctly, in figure A.3 we show all the sources of income for each income category. The key to this figure is that individuals we classify as self-employed have the majority of their income from the "economic activities" category, which includes self-employment income.

Table A.20 shows the results by occupation. We present two set of results. In the first column for each occupation category listed, we show the effect on the probability of moving to a region relative to all other occupation categories. In the second column, we show the results in a particular occupation relative to all other occupations listed in only the lower panels in the table. In column (5), we present results from a single estimating equation where taxes are interacted with each of the occupation category dummy variables.

Several OECD countries have preferential tax schemes.[2] In table A.21 we focus on the results by industry.[3] We present two sets of results. In the upper panel, using a model that interacts the taxes with a particular dummy variable for industry k, we present the results in a particular industry relative to all other industries in the data. The second row showing the effects in all industries other than k has the flavor of a leave-one-out procedure that allows us to test the sensitivity of the estimates if we remove one industry. The results indicate that the coefficients generally remain stable. This is reassuring because it informs us that our results are not driven by a single industry. However, the first row, which represents the effect in industry k shows substantial heterogeneity. This is confirmed in the second panel of table A.21 where we estimate a single estimating

[2]For example, Denmark has income tax exceptions for foreign scientists, Korea has exceptions for high-tech fields, Poland has exceptions for workers engaged in artistic, scientific, sport or expert activities, and Switzerland has exceptions for managers and specialists. In the United States, many states have aggressively passed "jock taxes" that target professional athletes, which enforce tax collections based on the number of duty days worked in a state.

[3]Detailed industry categories we use are (1) Agriculture, forestry, and fishing, (2) Manufacturing, (3) Electricity, gas, steam, and air conditioning supply, (4) Construction, (5) Wholesale and retail trade, repair of motor vehicles and motorcycles; accommodation and food service activities, (6) Transportation and storage, (7) Accommodation and food service activities (8) Information and communication, (9) Financial and insurance activities (10) Real estate activities, (11) Professional, scientific, and technical activities, (12) Administrative and support service activities, (13) Education, (14), Human health and social work activities, (15) Arts, entertainment, and recreation, (16) Activities of extraterritorial organizations and bodies, and (17) Other, which includes all other industry codes that have only a small number of observations including water supply, sewage, waste management and remediation activities; and public administration and defense; compulsory social security.

equation where taxes are interacted with dummy variables for each particular industry. We confirm substantial heterogeneity by industry the second panel of table A.21 where we estimate a single estimating equation where taxes are interacted with dummy variables for each particular industry.

A.10 Empirical Estimation of Revenue Response

To empirically estimate the revenue response we follow the following steps. This procedure accounts for the fact that the actual tax system contains many brackets above $\overline{y}$.

1. We pick a value of $\overline{y}$ that we wish to focus on. We consider 90,000 Euro which corresponds to the top 1% threshold.

2. We construct a dataset of individuals with incomes above this value of $\overline{y}$ and we calculate what their average tax rate would be in year t if they earned $\overline{y}$ using our tax calculator $(T(\overline{y})/\overline{y})$. Given we know what their average tax rate on their true income from our prior simulation of their tax rates, we use these two pieces of information to calculate what their marginal tax rate is on income above $\overline{y}$. In particular, solving $T(y) = T(\overline{y}) + \overline{\tau}(y - \overline{y})$, we calculate the marginal tax rate for each individual on income *above* the threshold as $\overline{\tau} = \frac{T(y)-T(\overline{y})}{y-\overline{y}}$ where y is true income, T is the taxes paid as a function of income. We then appropriately partition $\overline{\tau}$ to its regional and central component.

3. Using the dataset we also calculate the total stock of individuals with income above the threshold in each region (and in all of Spain).

4. We fit the Pareto distribution separately for each region on the individuals with income above $\overline{y}$ and calculate the Pareto parameter and its corresponding standard error.

5. We then calculate the mean income and mean tax rates in each region of Spain, which is equivalent to collapsing our data at the region by year level.

6. We apply our theoretical model using:

   (a) $\overline{y}$ is approximately 90,000 Euro (the threshold for the top 1%)

   (b) y is the average income of individuals above $\overline{y}$ in each state. We calculate this as the average income in the post-reform years in each region to minimize the threat of year specific shocks to income. The results are robust to using pre-reform numbers.

(c) $d\overline{\tau}$ is the regional tax rate minus the central government tax rate. To account for the fact that some small differences existed prior to the reform, we subtract off the regional tax rate net of the central government tax rate in 2010 for the few regions that had some differences prior to the reform.

(d) $T(y)$ is the tax payment the individual would have faced on income of y.

(e) N is the total stock of people above $\overline{y}$. We calculate this as the average number of individuals in the state with income above $\overline{y}$ in the post reform years. The results are robust to using pre-reform numbers.

(f) a and its standard error are estimated by fitting the Pareto distribution to the top 1% in each region.

(g) the stock elasticity η and its standard errors comes from our estimates of β.

(h) ϵ is set as 0.15 in our baseline simulation, but we show the results are robust for a range of values.

7. Given these values, we can simply apply the formulas in the text and use the parametric bootstrap to construct confidence bands. Given we assume no fiscal externalities, we assume the central government tax rate is zero, which is appropriate under separate partitioning of the regional and central government income tax bases.

The numerical results and standard errors, resulting from the parametric bootstrap, are presented in table A.22

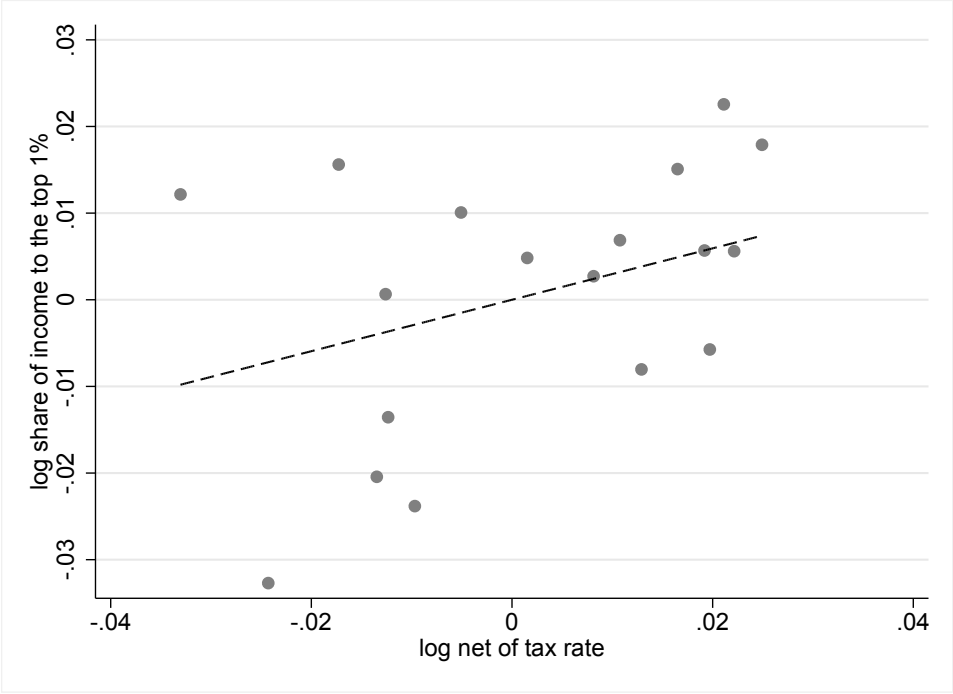
References

Durán, José Maria and Alejandro Esteller. 2006. "Exploring Personal Income Tax Diversity Among Spanish Regions." *Tax Notes International* .

Moretti, Enrico and Daniel Wilson. 2017. "The Effect of State Taxes on the Geographical Location of Top Earners: Evidence from Star Scientists." *American Economic Review* 107(7):1859–1903.

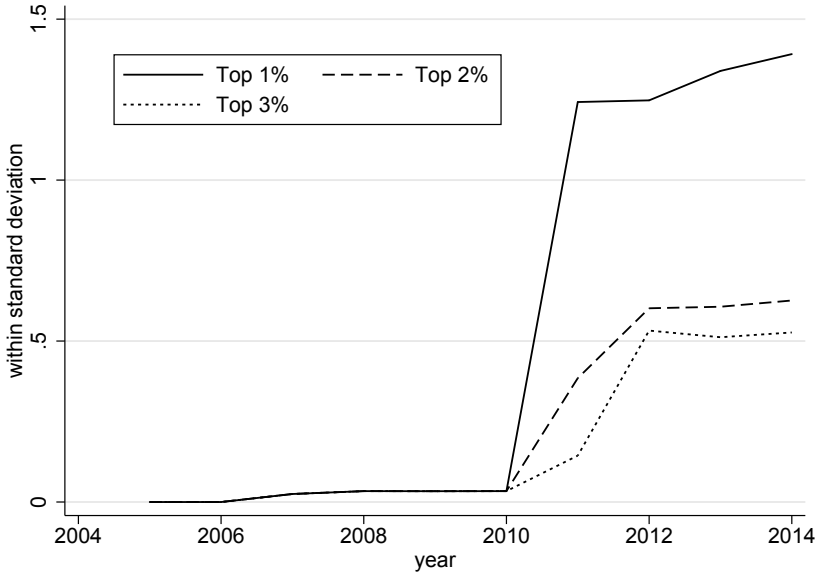
Schmidheiny, Kurt. 2006. "Income Segregation and Local Progressive Taxation: Empirical Evidence from Switzerland." *Journal of Public Economics* 90:429–458.

Figure A.1: Taxable Income Response



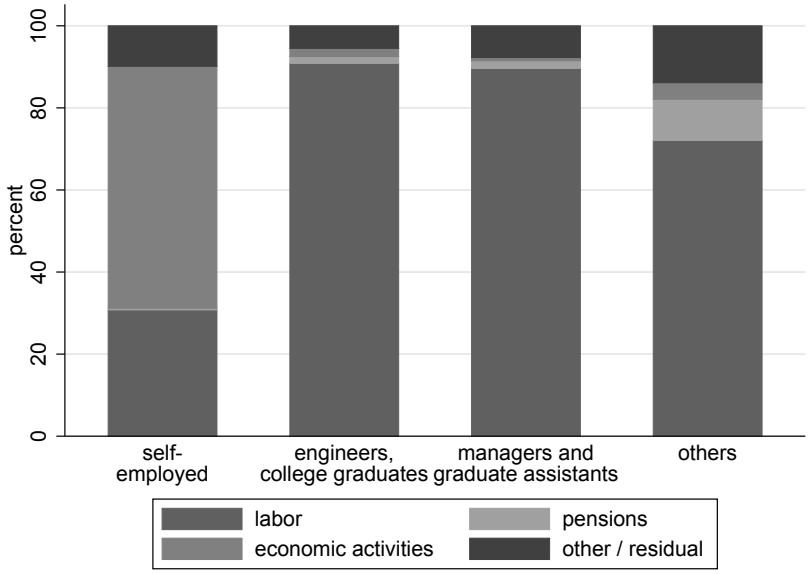
This figure shows results of a panel data regression of the form $ln(share_{r,t}) = \zeta_t + \zeta_r + \kappa ln(1 - mtr_{r,t}) + \nu_{r,t}$ where $share_{r,t}$ is the amount of income earned by the top 1% in region r in year t divided by the total income earned in the region. Thus, this variable is the share of income earned by the top 1%. When calculating income, we use income of the working age population. The explanatory variables include $1 - mtr_{r,t}$, the net-of-tax rate for the top tax bracket, region fixed effects and year fixed effects. We use data from 2005 to 2014. The parameter κ captures the elasticity of taxable income and is shown in the graph above. To construct the figure, we regress the log of the share on fixed effects. The same is done for the tax variable. We predict the residuals and bin the residuals to visualize the results. The ETI is insignificant.

Figure A.2: Tax Rate Variation Over Time



The graph shows the standard deviation within individual moves of marginal tax rates across alternative regions from 2005 to 2014 for different percentiles of the income distribution. Increasing variation indicates increasing dispersion of marginal tax rates across regions for a taxpayer.

Figure A.3: Income Breakdown by Occupation Classification



This figure shows the sources of income by occupation category: labor income, pension income, economic activity (self-employment) income, and other income. Our classification of self-employed individuals shows that they have the majority of their income from economic activities.

Table A.1: Correlation of Tax Changes and Pre-reform State Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
in-migration in the top 1%	-0.116									1.061
	(0.105)									(0.603)
in-migration in the top 3%		-0.177								-1.548
		(0.119)								(0.920)
in-migration in the top 10%			-0.165							0.769
			(0.120)							(0.666)
top 1% observations				0.067						4.999
				(0.388)						(3.342)
top 1% movers					-0.213					-5.365
					(0.450)					(3.499)
right wing government						-1.030				-1.289
						(0.809)				(0.937)
debt per capita							-3.005			1.171
							(7.524)			(9.243)
log of income in top 1%								-9.284*		-7.352
								(5.118)		(5.979)
log of income tax revenues									-0.303	0.377
									(1.678)	(1.513)
Constant	4.125***	4.430***	4.281***	2.844	3.912**	3.785***	3.637***	114.494*	4.338	75.693
	(0.899)	(0.900)	(0.858)	(2.321)	(1.493)	(0.591)	(1.093)	(61.328)	(6.128)	(72.238)
Observations	15	15	15	15	15	15	15	15	15	15
R-squared	0.087	0.144	0.127	0.002	0.017	0.111	0.012	0.202	0.002	0.763

This table shows the correlation between the size of the top marginal tax rate change at the state level between 2010 and 2011 and share of in-migration in the top 1% (column 1), 3% (column 2), and top 10% (column 3); the total number of observations (column 4) and movers (column 5); a dummy for right wing regional governments (PP, CC, and CiU; column 6); regional debt per capita (column 7), average income in the top percentile (column 8); and log income tax revenues (column 9). Column 10 uses all variables. All values are for the year prior to the reform: 2010. *** p<0.01, ** p<0.05, * p<0.1

Table A.2: Correlation of High-Tax Dummy and Pre-reform State Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
in-migration in the top 1%	-0.036									0.338
	(0.033)									(0.211)
in-migration in the top 3%		-0.054								-0.524
		(0.038)								(0.322)
in-migration in the top 10%			-0.048							0.270
			(0.038)							(0.233)
top 1% observations				-0.012						1.514
				(0.123)						(1.171)
top 1% movers					-0.103					-1.657
					(0.141)					(1.226)
right wing government						-0.321				-0.410
						(0.257)				(0.328)
debt per capita							-2.173			-0.935
							(2.327)			(3.237)
log of income in top 1%								-2.721		-1.333
								(1.655)		(2.094)
log of income tax revenues									-0.318	-0.059
									(0.526)	(0.530)
Constant	0.672**	0.765**	0.707**	0.472	0.727	0.571***	0.691*	33.013	1.557	12.561
	(0.286)	(0.287)	(0.275)	(0.737)	(0.469)	(0.188)	(0.338)	(19.831)	(1.921)	(25.302)
Observations	15	15	15	15	15	15	15	15	15	15
R-squared	0.081	0.133	0.109	0.001	0.039	0.107	0.063	0.172	0.027	0.712

This table shows the correlation between a dummy for high tax regions (defined as 1 if tax change is larger than 2 percentage points) and share of in-migration in the top 1% (column 1), 3% (column 2), and top 10% (column 3); the total number of observations (column 4) and movers (column 5); a dummy for right wing regional governments (PP, CC, and CiU; column 6); regional debt per capita (column 7), average income in the top percentile (column 8); and log income tax revenues (column 9). Column 10 uses all variables. All values are for the year prior to the reform: 2010. *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Migration Flows of Top 1% – Post-Reform

Destination (To) \ Origin (From)	Andalucía	Aragón	Asturias	Balears	Canarias	Cantabria	Castilla y León	Castilla	Cataluña	Valenciana	Extremadura	Galicia	Madrid	Murcia	Rioja	Other	TOTAL
Andalucía	0	0	0	4	7	0	1	1	7	3	0	0	14	0	1	1	39
Aragón	1	0	0	1	0	0	0	1	2	1	0	0	0	0	0	0	6
Asturias, Principado de	1	0	0	0	1	0	2	0	0	0	0	0	3	0	0	0	7
Balears, Illes	1	0	0	0	1	0	0	0	3	1	0	0	9	0	0	0	15
Canarias	2	0	1	0	0	0	1	0	3	1	0	1	5	0	0	0	14
Cantabria	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4
Castilla y León	0	0	0	0	1	1	0	0	3	0	1	4	6	1	0	0	17
Castilla - La Mancha	1	0	0	0	1	0	0	0	0	1	0	0	12	1	0	0	16
Cataluña	4	3	2	7	0	0	1	0	0	8	0	2	11	0	0	4	42
Comunitat Valenciana	2	3	0	2	2	0	1	4	6	0	0	1	4	1	0	0	26
Extremadura	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
Galicia	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	0	6
Madrid	25	2	5	6	5	2	15	18	16	11	3	11	0	1	2	8	130
Murcia, Región de	0	0	0	0	0	0	0	1	0	3	0	0	2	0	0	1	7
Rioja, La	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	39	9	8	20	19	3	21	25	44	29	4	19	69	4	3	15	331

This table shows the pairwise number of migrants by state pairs for moves in the top 1% of the income distribution in the post-reform era. Multiply by 25 to obtain population level estimates. Individuals moving *from* Navarre and the Basque Country are included in the analysis in the "other" column, but individuals moving *to* these regions are not included because they operate independent fiscal systems.

Table A.4: Migration Flows of Top 1% – Pre-Reform

Destination (To)	Origin (From)																
	Andalucía	Aragón	Asturias	Balears	Canarias	Cantabria	Castilla y León	Castilla	Cataluña	Valenciana	Extremadura	Galicia	Madrid	Murcia	Rioja	Other	TOTAL
Andalucía	0	1	0	1	2	1	1	0	8	8	1	0	17	1	0	4	45
Aragón	0	0	0	1	0	0	3	1	5	4	0	0	5	0	0	1	20
Asturias, Principado de	1	0	0	1	1	0	3	0	1	1	1	2	4	0	0	0	15
Balears, Illes	0	1	0	0	1	0	0	1	10	5	0	1	10	1	0	0	30
Canarias	3	0	1	2	0	0	0	1	4	1	0	1	6	1	0	1	21
Cantabria	1	0	0	0	0	0	2	0	0	1	0	1	2	0	1	1	9
Castilla y León	4	0	0	0	0	0	0	0	0	1	2	1	15	0	0	1	24
Castilla - La Mancha	4	1	0	1	1	1	3	0	1	1	0	0	50	0	0	1	64
Cataluña	6	6	3	10	4	1	1	0	0	8	0	2	12	2	0	2	57
Comunitat Valenciana	5	1	1	2	3	1	1	2	8	0	0	2	20	6	0	0	52
Extremadura	2	1	1	0	0	0	2	0	2	0	0	0	3	0	0	0	11
Galicia	1	0	1	0	2	0	3	2	0	2	0	0	6	2	0	1	20
Madrid	20	9	6	6	12	2	13	36	25	14	7	8	0	5	0	15	178
Murcia, Región de	1	0	0	0	0	0	0	1	0	5	0	1	5	0	0	0	13
Rioja, La	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	3
TOTAL	48	20	13	24	26	7	32	44	65	51	11	19	155	18	1	28	562

This table shows the pairwise number of migrants by state pairs for moves in the top 1% of the income distribution in the pre-reform era. Multiply by 25 to obtain population level estimates. Individuals moving from Navarre and the Basque Country are included in the analysis in the "other" column, but individuals moving to these regions are not included because they operate independent fiscal systems.

Table A.5: Variables for Tax Calculator

variable name	explanation
id	unique id variable
year	year identifier
income	sum of total income of labor tax base
ym_birth	year and month of birth [YYYYMM]
pers_kids_total	total kids in household
pers_kids_0to3	# kids below age 3
pers_elderly_total	total elderly people in household
pers_elderly_75	# of elderly people over age 75
pers_handicap	handicapped household members
pers_elderly_handicap_33to65	# elderly people with handicap of degree 33-65
pers_elderly_handicap_33to65_2	# elderly people with handicap of degree 33-65 and reduced mobility
pers_elderly_handicap_65	# elderly people with handicap of degree 66 and higher
pers_kids_handicap_33to65	# kids with handicap of degree 33-65
pers_kids_handicap_33to65_2	# kids with handicap of degree 33-65 and reduced mobility
pers_kids_handicap_65	# kids with handicap of degree 66 and higher

Table A.6: Output from Tax Calculator

variable name	explanation
atr_state1	average tax rate of individual in Andalucía
mtr_state1	marginal tax rate of individual in Andalucía
atr_state2	average tax rate of individual in Aragón
mtr_state2	marginal tax rate of individual in Aragón
atr_state3	average tax rate of individual in Asturias
mtr_state3	marginal tax rate of individual in Asturias
atr_state4	average tax rate of individual in Illes Balears
mtr_state4	marginal tax rate of individual in Illes Balears
atr_state5	average tax rate of individual in Canarias
mtr_state5	marginal tax rate of individual in Canarias
atr_state6	average tax rate of individual in Cantabria
mtr_state6	marginal tax rate of individual in Cantabria
atr_state7	average tax rate of individual in Castilla y León
mtr_state7	marginal tax rate of individual in Castilla y León
atr_state8	average tax rate of individual in Castilla - La Mancha
mtr_state8	marginal tax rate of individual in Castilla - La Mancha
atr_state9	average tax rate of individual in Cataluña
mtr_state9	marginal tax rate of individual in Cataluña
atr_state10	average tax rate of individual in Valencia
mtr_state10	marginal tax rate of individual in Valencia
atr_state11	average tax rate of individual in Extremadura
mtr_state11	marginal tax rate of individual in Extremadura
atr_state12	average tax rate of individual in Galicia
mtr_state12	marginal tax rate of individual in Galicia
atr_state13	average tax rate of individual in Madrid
mtr_state13	marginal tax rate of individual in Madrid
atr_state14	average tax rate of individual in Murcia
mtr_state14	marginal tax rate of individual in Murcia
atr_state17	average tax rate of individual in La Rioja
mtr_state17	marginal tax rate of individual in La Rioja
atr_state99	average tax rate for individual if region mimicked central government tax
mtr_state99	marginal tax rate for individual if region mimicked central government tax

Table A.7: Tax Rates for a Taxpayer with Income of 300,000 Euro and No Children

	Average Tax Rates															
year	atr_state1	atr_state2	atr_state3	atr_state4	atr_state5	atr_state6	atr_state7	atr_state8	atr_state9	atr_state10	atr_state11	atr_state12	atr_state13	atr_state14	atr_state17	atr_state99
2005	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17	42.17
2006	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12	42.12
2007	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.35	40.22	40.35	40.35	40.35
2008	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.27	40.29	40.29	40.17	40.29	40.17	40.29
2009	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.25	40.29	40.29	40.17	40.27	40.17	40.29
2010	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.29	40.27	40.29	40.29	40.17	40.29	40.17	40.29
2011	43.31	41.31	43.48	41.31	41.31	43.33	41.31	41.31	43.34	41.28	43.34	41.31	41.18	42.33	41.18	42.33
2012	48.75	45.95	48.12	45.95	46.84	47.97	45.95	45.95	47.99	46.97	47.99	45.95	45.82	46.97	45.82	46.97
2013	48.75	45.95	48.68	45.95	46.84	47.97	45.95	45.95	47.99	46.97	48.00	45.95	45.82	47.57	45.82	46.97
2014	48.75	45.95	48.68	45.95	46.84	48.27	45.95	45.91	47.99	46.94	48.00	45.95	45.43	47.57	45.82	46.97
	Marginal Tax Rates															
	mtr_state1	mtr_state2	mtr_state3	mtr_state4	mtr_state5	mtr_state6	mtr_state7	mtr_state8	mtr_state9	mtr_state10	mtr_state11	mtr_state12	mtr_state13	mtr_state14	mtr_state17	mtr_state99
2005	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2006	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2007	43	43	43	43	43	43	43	43	43	43	43	43	42.9	43	43	43
2008	43	43	43	43	43	43	43	43	43	42.98	43	43	42.9	43	42.9	43
2009	43	43	43	43	43	43	43	43	43	42.98	43	43	42.9	42.98	42.9	43
2010	43	43	43	43	43	43	43	43	43	42.98	43	43	42.9	43	42.9	43
2011	48	45	48.5	45	45	48	45	45	49	44.98	48	45	44.9	47	44.9	47
2012	55	51	54.5	51	52.08	54	51	51	55	53	54	51	50.9	53	50.9	53
2013	55	51	55	51	52.08	54	51	51	55	53	54	51	50.9	54	50.9	53
2014	55	51	55	51	52.08	54.5	51	51	55	52.98	54	51	50.5	54	50.9	53

Table A.8: Summary Statistics

variable	income group	pre-reform (<2007)	pre-reform (<2011)	post-reform (>2010)
P(move)	Top 1%	0.012	0.012	0.009
		(0.110)	(0.109)	(0.093)
P(move)	Top 2%	0.010	0.011	0.009
		(0.101)	(0.102)	(0.096)
income	Top 1%	207,202	202,216	176,370
		(364,750)	(270,380)	(226,949)
income	Top 2%	71,123	79,657	79,169
		(5487)	(7915)	(6749)
ATR	Top 1%	37.767	37.166	39.546
		(3.110)	(2.429)	(3.855)
ATR	Top 2%	31.941	32.379	33.944
		(1.404)	(1.263)	(1.639)
MTR	Top 1%	45.000	43.372	48.150
		(0.000)	(0.814)	(3.108)
MTR	Top 2%	45.000	43.358	46.137
		(0.000)	(0.798)	(1.833)

This table shows summary means by income group in the pre- and post-reform period. Standard deviations are in ( ).

Table A.9: Aggregate Analysis of Stock: Formal Dif-in-Dif

	(1)	(2)
	Binary Treatment	
Net-of-tax treatment	0.0162*	0.0122*
	(0.009)	(0.007)
Control for Trends?	N	Y
Number of Observations	1050	1050

The dependent variable is the log ratio of the populations in the top 1% in region d relative to the population in region o. Columns (1) and (2) define a binary treatment that equals one if region d increased its net-of-tax rate relative to region o. Column (2) controls for the time since treatment. *** p<0.01, ** p<0.05, * p<0.1

Table A.10: Differences Between Movers and Stayers in Post-Reform Period

variable	Movers	Stayers	Difference	P-value of Mean Difference
pre-move income	137,011	144,253	7241	0.302
	(126,609)	(172,741)		
age	49.028	44.653	-4.375	0.000
	(8.980)	(9.673)		
edu	0.399	0.674	0.275	0.000
	(0.489)	(0.469)		
gender	0.832	0.8212	-0.010	0.622
	(0.373)	(0.383)		
kids	0.670	0.695	0.025	0.653
	(1.021)	(1.090)		
atr	39.577	39.546	-0.031	0.874
	(3.613)	(3.854)		

This table shows summary means by movers and stayers and conducts a test of differences in means. The table shows means with standard deviations in ().

Table A.11: Baseline Individual Analysis for Full Sample

	(1)	(2)	(3)
$ln(1 - atr_{i,t,j})$	0.076	0.682	0.501
	(0.079)	(0.429)	(0.685)
individual fixed dummies	Y	Y	Y
j by year dummies	Y	Y	Y
j by education	Y	Y	Y
j by age	Y	Y	Y
j by age squared	Y	Y	Y
j by male	Y	Y	Y
controls	Y	Y	Y
observations	1,439,130	22,815	9,420
number people	95,942	1,521	628

The dependent variable equals one if the region is selected. The independent variable of interest is the log of the net-of-tax rate where the *person-specific* average tax rate is used and instrumented for using the person-specific marginal tax rate. Column (1) uses all movers and stayers in the top 1%. Column (2) focuses on only movers but includes both movers across regional lines and movers within regions. Column (3) studies movers within a region. We are unable to determine moves within the same municipality or when municipality code information is not available. We omit the region of origin dummy and distance from the controls because it almost perfectly explains location choices when including stayers. All standard errors are clustered two-ways: region-year clusters and move (i, t) clusters. *** p<0.01, ** p<0.05, * p<0.1

Table A.12: Treatment of Standard Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$ln(1 - atr_{i,t,j})$	1.731**	1.731**	1.731**	1.731*	1.731*	1.731**	1.731**	1.731**	1.731**
	(0.713)	(0.816)	(0.809)	(0.952)	(0.952)	(0.797)	(0.835)	(0.835)	(0.880)
SE's	no cluster	individual	move	destination region	destination & move	destination by year	province	province & move	bootstrap
observations	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395
number of moves	893	893	893	893	893	893	893	893	893

This table shows various forms of clustering for the baseline specification given in column 7 of table 3. Column (1) does not cluster. Column 2 clusters over the individual (if an individual moves twice, both moves are in the same cluster). Column (3) clusters over the move (if an individual moves twice, each move in different clusters). Column (4) clusters over destination. Column (5) clusters over the move and destination. Column (6) clusters over destination by year. Column (7) clusters over the province. Column (8) clusters over the province and move. Column (9) bootstraps the standard errors. *** p<0.01, ** p<0.05, * p<0.1

Table A.13: Individual Analysis: Marginal Tax Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$ln(1-mtr_{i,t,j})$	0.569	0.604**	0.670**	0.592*	0.631**	0.602**	0.677**
	(0.367)	(0.305)	(0.305)	(0.305)	(0.306)	(0.304)	(0.308)
place of origin		-0.797***	-0.765***	-0.797***	-0.796***	-0.797***	-0.766***
		(0.061)	(0.060)	(0.061)	(0.061)	(0.061)	(0.060)
place of birth		0.207***	0.206***	0.207***	0.207***	0.207***	0.206***
		(0.022)	(0.021)	(0.022)	(0.022)	(0.022)	(0.021)
place of first work		0.186***	0.177***	0.186***	0.186***	0.185***	0.177***
		(0.020)	(0.020)	(0.020)	(0.020)	(0.019)	(0.020)
work place		0.288***	0.260***	0.288***	0.286***	0.287***	0.261***
		(0.018)	(0.021)	(0.018)	(0.018)	(0.018)	(0.021)
ln(distance)		-0.075***	-0.072***	-0.075***	-0.075***	-0.075***	-0.072***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
move dummies	Y	Y	Y	Y	Y	Y	Y
j by year dummies	Y	Y	Y	Y	Y	Y	Y
j by education	N	N	Y	N	N	N	Y
j by age	N	N	N	Y	Y	N	Y
j by age squared	N	N	N	N	Y	N	Y
j by male	N	N	N	N	N	Y	Y
controls	N	Y	Y	Y	Y	Y	Y
observations	13,395	13,395	13,395	13,395	13,395	13,395	13,395
number moves	893	893	893	893	893	893	893
R^2	0.123	0.278	0.302	0.279	0.280	0.279	0.305

In all specifications the estimating sample uses pre- and post-reform moves in the top 1% of the income distribution. Each move has fifteen observations: one for each possible alternative region. The dependent variable equals one if the region is selected. The independent variable of interest is the log of the net-of-tax rate where the *person specific* marginal tax rate is used. All standard errors are clustered two-ways: region-year clusters and individual move (i,t) clusters. *** p<0.01, ** p<0.05, * p<0.1

Table A.14: IV Robustness Checks: Fixed Brackets

	(1)	(2)	(3)
$ln(1-atr_{i,t,j})$	1.782**	1.864**	3.734***
	(0.896)	(0.871)	(1.277)
move dummies	Y	Y	Y
j by year dummies	Y	Y	Y
$\zeta_j \mathbf{x}_{i,t}$	Y	Y	Y
controls: $\mathbf{z}_{i,t,j}$	Y	Y	Y
observations	12,255	10,620	8,040
number of moves	817	708	536
F-statistic	781.3	628	235.2

This table shows the results restricting the sample of moves that are more than 1% away from the nearest bracket threshold (column 1), 2.5% away from the nearest bracket threshold (column 2) and 5% away from the nearest bracket threshold (column 3). All standard errors are clustered two-ways: region-year clusters and move (i,t) clusters. We present the F-statistic as a test of instrument strength. *** p<0.01, ** p<0.05, * p<0.1

Table A.15: Heterogeneity of Effects by Personal Characteristics

$ln(1 - atr_{i,t,j})$	(1)	(2)	(3)	(4)
Younger than 40	1.680*			
	(0.862)			
Older than 40	1.759**			
	(0.846)			
Kids		1.767*		
		(1.031)		
No Kids		1.709**		
		(0.769)		
Men			1.483*	
			(0.864)	
Women			3.012**	
			(1.221)	
University Degree				2.185***
				(0.842)
No University Degree				1.008
				(1.045)
move dummies, j by year dummies, $\zeta_j \mathbf{x}_{i,t}$, and controls: $\mathbf{z}_{i,t,j}$	Y	Y	Y	Y
observations	13,395	13,395	13,395	13,395
number of moves	893	893	893	893
F Statistic	295.7	226.1	367	581.9

The net-of-tax rate is interacted with an indicator variable for the group category. This table presents results for the average tax rate. We instrument for the net of average tax rate using the net of marginal tax rate for the individual. The interaction term is instrumented for using the instrument interacted with the indicator variable for the group. All standard errors are clustered two-ways: region-year clusters and individual move (i, t) clusters. We present the F-statistic as a test of instrument strength. *** p<0.01, ** p<0.05, * p<0.1

Table A.16: Heterogeneity of Effects by Job Characteristics

$ln(1 - atr_{i,t,j})$	(1)	(1')	(2)	(3)
Not Fired	2.052***	2.015***		
	(0.789)	(0.778)		
Fired	-0.258	0.847		
	(1.077)	(1.061)		
No Firm Location Change			1.732**	
			(0.796)	
Firm Location Change			1.716	
			(1.491)	
No Contract Change				1.660**
				(0.797)
Contract Change				2.429**
				(1.015)
move dummies, j by year dummies, $\zeta_j \mathbf{x}_{i,t}$, and controls: $\mathbf{z}_{i,t,j}$	Y	Y	Y	Y
observations	13,395	13,395	13,395	13,395
number of moves	893	893	893	893
F-statistic	611.8	496.3	656.8	575.9

The tax rate is interacted with an indicator variable for the group category. This table presents results for the average tax rate. We instrument for the net of average tax rate using the net of marginal tax rate for the individual. The interaction term is instrumented for using the instrument interacted with the indicator variable for the group. Fired / not fired means that the variable is equal to 1 if the individual had a "non-voluntary stop of contract" on the main contract. Column (1) is fired in the year prior to moving and column (1') is fired in the year of moving. Firm location change / no location change is equal to 1 if the headquarter of the firm of the main contract changes but the individual does not change firms in the year of moving. Contract change / no change is equal to 1 if the individual changes the firm of their main contract in the year of move. All standard errors are clustered two-ways: region-year clusters and move (i, t) clusters. We present the F-statistic as a test of instrument strength. *** p<0.01, ** p<0.05, * p<0.1

Table A.17: Individual Analysis: Nonlinear Model

	(1)	(2)
$ln(1-\tau_{i,t,j})$	20.795**	16.579***
	(8.889)	(5.676)
place of origin	-31.259***	-30.354***
	(0.915)	(0.913)
place of birth	2.010***	2.008***
	(0.160)	(0.159)
place of first work	1.748***	1.763***
	(0.155)	(0.154)
work place	2.461***	2.452***
	(0.191)	(0.191)
ln(distance)	-1.343***	-1.342***
	(0.131)	(0.131)
move dummies	Y	Y
j by year dummies	Y	Y
j by education	Y	Y
j by age	Y	Y
j by age squared	Y	Y
j by male	Y	Y
controls	Y	Y
observations	13,395	13,395
number of moves	893	893

We estimate this model using an alternative-specific conditional logit. In all specifications the estimating sample is restricted to moves in the top 1% of the income distribution. Each move has fifteen observations: one for each possible alternative region. The dependent variable equals one if the region is selected. This table uses the person's average net-of-tax rate in each region as the independent variable in column (1) and the person's marginal net-of-tax rate in each region in column (2). All standard errors are clustered at the region-year level. This table presents results using a nonlinear model. *** p<0.01, ** p<0.05, * p<0.1

Table A.18: Occupation Composition of Movers

Occupation	Movers	Percent of Movers	Total in Top 1%	Percent of Total That Move
Engineers, college graduates	160	48.34	15,1023	1.06
Managers and graduate assistants	83	25.08	5,338	1.55
Self-employed	55	16.62	14,249	0.39
Others	33	9.97	3,854	0.86

This table gives the occupation breakdown of movers in the top 1%. This table gives the occupation breakdown of movers in the top 1%. Engineers, college graduates includes the highest occupation category in the dataset (ingenieros, licenciados y alta dirrección), managers and graduate assistants include the next two categories (ingenieros técnicos, peritos, y ayudantes) and other includes all lower categories.

Table A.19: Industry Composition of Movers

Industry	Movers	Percent of Movers	Total in Top 1%	Percent of Total That Move
Monetary intermediation	37	11.18	2964	1.25
Freight transport by road and removal services	20	6.04	3546	0.56
Support activities for transportation	19	5.74	749	2.54
Sports activities	17	5.14	199	8.54
N/A	12	3.63	1725	0.70
Hospital activities	12	3.63	2264	0.53
Passenger transport by air	10	3.02	517	1.93
Medical and dental practice activities	10	3.02	608	1.64
Electric power generation, transmission and distribution	9	2.72	537	1.68
Accounting, book-keeping and auditing activities; tax consultancy	9	2.72	904	1.00
Wholesale of household goods	7	2.11	1065	0.66
Legal activities	7	2.11	656	1.07
Construction of residential and non-residential buildings	6	1.81	556	1.08
Computer programming, consultancy and related activities	6	1.81	824	0.73
Advertising	6	1.81	364	1.65
Manufacture of pharmaceutical specialties	5	1.51	373	1.34
Wholesale of other machinery, equipment and supplies	5	1.51	337	1.48
Hotels and similar accommodation	5	1.51	108	4.63
Activities auxiliary to financial services, except insurance and pension funding	5	1.51	172	2.91
Architectural and engineering activities and related technical consultancy	5	1.51	563	0.89
Publishing of books, periodicals and other publishing activities	4	1.21	223	1.79
Cable telecommunications	4	1.21	380	1.05
All other 3-digit industries	111	33.38	11,771	0.94

This table gives the industry breakdown of movers in the top 1%. The table omits industries that had less than 4 movers in our sample and lumps them into the other category. Regressions using industry utilize a higher level of industry code aggregation than this table.

Table A.20: Heterogeneity of Effects by Occupation

$ln(1 - atr_{i,t,j})$	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(5)
Self-Employed	2.953***	2.953***						2.913***
	(1.021)	(1.021)						(1.024)
Not Self-Employed	1.379*	1.379*						
	(0.836)	(0.836)						
Engineers, college graduates and senior managers			1.645**	1.916**				1.557**
			(0.780)	(0.837)				(0.792)
Not...			1.838*	1.651				
			(0.941)	(1.275)				
Technical engineers and managers, graduate assistants, administrative managers					1.048	0.820		0.995
					(1.281)	(2.627)		(1.277)
Not...					1.883**	0.171		
					(0.794)	(2.869)		
Other							0.924	0.883
							(1.643)	(1.630)
Not Other							1.765**	
							(0.789)	
individual dummies, j by year dummies, $\zeta_j \mathbf{x}_{i,t}$, and controls: $\mathbf{z}_{i,t,j}$	Y	Y	Y	Y	Y	Y	Y	
observations	13,395	13,395	13,395	10,725	13,395	4,020	13,395	13,395
number of moves	893	893	893	715	893	268	893	893
F Statistic	152.3	152.3	368.9	341.4	151.4	140.7	144.5	90.93

The net-of-tax rate is interacted with an indicator variable for the occupation category. In columns (1)-(4) without a prime, we show the effects for the category listed in a row relative to all other observations. In columns with a prime, we show the effect for the category listed relative to all other occupations not given in the rows above. For example, in column (2) we focus on engineers, college grads and senior managers relative to all other occupations including the self-employed. But, in column (2') all other occupations excludes the self-employed. This table presents results for the average tax rate. We instrument for the net of average tax rate using the net of marginal tax rate for the individual. The interaction term is instrumented for using the instrument interacted with the indicator variable for the group. The "other" category includes all occupations not in the previous three groups. Given this is the residual category, we do not have a column (4'). Column (5) includes all occupation interactions in a single regression. All standard errors are clustered two-ways: region-year clusters and individual clusters. We present the F-statistic as a test of instrument strength. *** p<0.01, ** p<0.05, * p<0.1

Table A.21: Heterogeneity of Effects by Industry

$ln(1-atr_{i,t,j})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	Industry k versus All Other Industries																
Industry k	1.200	1.390	-2.850	2.571	1.677	1.418	-2.311	3.605**	1.928**	5.140**	1.747*	1.204	2.115	6.433***	1.411	1.576	5.558*
	(1.752)	(1.364)	(3.390)	(1.899)	(1.270)	(0.960)	(3.735)	(1.749)	(0.864)	(2.359)	(1.053)	(1.724)	(4.503)	(2.280)	(1.107)	(3.330)	(2.864)
Not Industry k	1.761**	1.764**	1.773**	1.711**	1.735**	1.808**	1.756**	1.640**	1.682**	1.724**	1.729**	1.750**	1.731**	1.752**	1.787**	1.733**	1.727**
	(0.799)	(0.793)	(0.798)	(0.791)	(0.802)	(0.822)	(0.794)	(0.793)	(0.811)	(0.797)	(0.837)	(0.810)	(0.799)	(0.806)	(0.855)	(0.794)	(0.796)
	Coefficients from a Single Regression With Taxes Interacted With a Dummies for Each Industry																
Single Regression	1.284	1.542	-2.581	2.748	1.819	1.507	-2.118	3.774**	2.087**	5.487**	1.938*	1.359	2.357	6.445***	1.454	1.669	5.941**
	(1.762)	(1.413)	(3.500)	(1.862)	(1.350)	(1.029)	(3.818)	(1.802)	(0.932)	(2.389)	(1.131)	(1.740)	(4.803)	(2.357)	(1.121)	(3.365)	(2.786)
Short Industry Description	Agriculture	Manufacturing	Electricity	Construction	Wholesale/Retail	Transportation	Tourism	Information	Financial	Real Estate	Professional/Scientific	Administrative	Education	Health	Arts/Entertainment	Extraterrioterial Activities	Other
individual dummies, j by year dummies, $\mathbf{x}_{i,t} \times \iota_j$, and controls: $\mathbf{z}_{i,t,j}$	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
observations	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395	13,395
number of moves	893	893	893	893	893	893	893	893	893	893	893	893	893	893	893	893	893

The net-of-tax rate is interacted with an indicator variable for the industry category. In the upper panel, we show the effects for the category listed in a row relative to all other industries. In the second panel, we show a single model estimating all the effects for each industry; thus the row in the second panel represents a single regression. This table presents results for the average tax rate. We instrument for the net of average tax rate using the net of marginal tax rate for the individual. The interaction term is instrumented for using the instrument interacted with the indicator variable for the group. Detail industry categories are (1) Agriculture, forestry, and fishing, (2) Manufacturing, (3) Electricity, gas, steam, and air conditioning supply, (4) Construction, (5) Wholesale and retail trade, repair of motor vehicles and motorcycles; accommodation and food service activities, (6) Transportation and storage, (7) Accommodation and food service activities (8) Information and communication, (9) Financial and insurance activities (10) Real estate activities, (11) Professional, scientific, and technical activities, (12) Administrative and support service activities, (13) Education, (14), Human health and social work activities, (15) Arts, entertainment, and recreation, (16) Activities of extraterritorial organizations and bodies, and (17) Other, which includes all other industry codes that have only a small number of observations including water supply, sewage, waste management and remediation activities; and public administration and defense; compulsory social security. All standard errors are clustered two-ways: region-year clusters and individual clusters. *** p < 0.01, ** p < 0.05, * p < 0.1

Table A.22: Revenue Changes in Thousands of Euros Relative to Mimicking Central Government, Income Above 90,000 Euros

Revenue Change	(1) Mechanical	(2) Income	(3) Mobility	(4) Total	(5) percent
Andalucía	48466	-4418	-9462	34585	.817
		[-4642,-4194]	[-20001,1138]	[24048,45191]	[.568,1.068]
Aragón	-2119	201	415	-1503	-.133
		[176,226]	[-46,874]	[-1964,-1044]	[-.173,-.092]
Asturias, Principado de	8361	-872	-1620	5870	.66
		[-1027,-716]	[-3423,188]	[4057,7682]	[.456,.864]
Balears, Illes	-1216	139	238	-840	-.102
		[119,159]	[-27,505]	[-1105,-571]	[-.135,-.07]
Canarias	2455	-242	-477	1737	.155
		[-276,-208]	[-1009,56]	[1203,2271]	[.107,.203]
Cantabria	1777	-211	-343	1224	.265
		[-263,-158]	[-724,39]	[838,1609]	[.181,.348]
Castilla y León	-2814	300	549	-1965	-.11
		[276,324]	[-66,1161]	[-2582,-1352]	[-.144,-.075]
Castilla - La Mancha	-2598	234	507	-1858	-.167
		[211,257]	[-59,1070]	[-2425,-1293]	[-.218,-.116]
Cataluña	11685	-1219	-2275	8191	.109
		[-1270,-1168]	[-4807,268]	[5658,10734]	[.076,.143]
Comunitat Valenciana	0	0	0	0	0
Extremadura	3916	-414	-756	2746	.551
		[-468,-361]	[-1599,90]	[1901,3592]	[.381,.72]
Galicia	-3126	288	610	-2229	-.123
		[262,313]	[-71,1288]	[-2909,-1550]	[-.161,-.086]
Madrid, Comunidad de	-49012	4224	9478	-35309	-.422
		[4063,4387]	[-1113,19990]	[-45905,-24810]	[-.548,-.296]
Murcia, Región de	1366	-125	-269	972	.127
		[-143,-108]	[-570,32]	[670,1273]	[.087,.166]
Rioja, La	-335	34	64	-236	-.097
		[26,43]	[-7,136]	[-309,-164]	[-.127,-.067]

This table calculates the changes in revenue – in thousands of Euros – realized by the region not mimicking the central government "top" tax rate and assuming the central government tax rate did not change. We define the top tax rate as the effective marginal rate on income above 90,000 Euro (the top 1% threshold, approximately). Column (1) shows the mechanical effect; there are no confidence bands because no parameters are estimated to derive it. Column (2) shows the taxable income response. Column (3) shows the mobility response. Column (4) shows the total change in revenue given by (7). Column (5) shows the total change in revenue as a percent of regional revenue raised from the personal income tax (across all taxpayers). In all columns, we estimate the Pareto parameter for each region using the top 1% of the income distribution in Spain. We use our estimated mobility elasticity and standard error and assume the elasticity of taxable income is 0.15. We present the change in revenue along with a 95% confidence interval, which is obtained using the parametric bootstrap.