Property Taxes under "Classification": Why do Firms pay more?

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ABSTRACT

This paper examines how communities will behave if they are given the option of taxing the property of commercial establishments (factories, shopping centers, office buildings, etc) at different rates from residential housing. In the last 2 decades many states have enacted legislation which allows communities to discriminate in this manner – called "classification". We build a simple model wherein firms provide tax revenue without using local services and also create a valuable local job base. Towns thus confront a well defined choice: raise commercial taxes and gain revenue but risk loosing jobs. Firms in turn need to choose a community to locate in but do so with a (finite) negative elasticity with respect to the town taxes. The model yields two schedules between commercial tax rates and firm concentration in a community. A "demand" schedule has greater firm concentration leading a town to select higher commercial taxes, while a "supply" schedule has higher taxes leading to less firm concentration. The model comparative statics suggest that smaller and wealthier communities will encourage firms by keeping taxes low and rely less on their tax subsidy. Empirically we create a panel of towns in Massachusetts that covers the years prior to and after the state allowed such tax discrimination. With this data we find that towns with more pre-existing commerce chose to discriminate most, that such higher taxes gradually do discourage firm location, and that smaller and wealthier towns tend not to engage in tax discrimination.

I. Introduction

In the 1970s, there was a period during which tax payers seemed to "revolt" against the payment of Property Taxes. Several states implemented property tax limits such as Proposition 13 in California and Proposition 21/2 in Massachusetts [Preston, 1991]. As an outgrowth of these movements local property tax revenue became constrained and a range of states began to offer localities the option of taxing different classes of property at different effective rates. This is called property tax "Classification". Implicit in this policy change was the view that taxes on business property represented a pure source of revenue with little incremental cost of local services and with little tax incidence on local residents.

This paper develops a simply model that illustrates the choice towns make as to whether to tax commercial property (higher). Doing so will generate revenue but eventually lower the job base in the town. The model makes several predictions about what types of towns will or will not opt to engage in tax "classification". The paper then collects a time series panel data base on all towns in Massachusetts both before and after the legislative change in 1979 that opened up this option. This data allows us to track which towns chose to use classification, what tax rates they set, and then whether these taxes hindered subsequent job growth. We find that town choices closely match up with the model's predictions and that those towns selecting classification (and hence setting higher tax rates for businesses) lost jobs or had slower job growth.

Empirically, our conclusions are derived using two approaches. The first is a simple differences-in-differences analysis of towns both before and after the date at which towns were allowed to classify. The second is to estimate a yearly panel model in which the extent of a town's job base (lagged) influences the setting of tax rates and then lagged tax rates impact the growth of the town's job base. Both the D-in-D approach and the full panel analysis yield comparable results.

The paper is organized as follows. The next section reviews the existing literature on property taxes, tax classification and the several approaches that exist to understanding property tax incidence. Section III reviews the history of Massachusetts property taxes, the implementation of tax classification, and some summary statistics from our panel data base. Sections IV and V develop a simply model of town choice over setting differential tax rates and derives some empirically testable propositions. Section VI undertakes our empirical tests and reports results. Section VII draws some conclusions about the implications of this research.

II. Property Taxes, Classification and Tax Incidence.

The objective of this study is to at least partially examine the incidence of local taxes on business and then to understand how and why towns might make different choices about whether to engage in the taxation of business property. Traditionally, a local property tax on businesses

has been viewed as a tax on capital. Mieszkowski (1972) argues that the common (across locations) component of the tax should have an incidence between labor, capital owners and consumers (buyers) just like a national capital tax. The local variations in rates however, should have an incidence on land values. In this view, a local decision to unilaterally raise taxes will simply go back land owners. What this view neglects is that land might be perfectly substitutable between residential and business uses and hence a fall in business uses (from taxation) need not reduce overall town land valuation.[1]

This revised view is best illustrated in the work of Fischel (1975). Fischel views local business taxes as having an incidence on labor or capital, but since local residents are generally neither workers, capital owners nor consumers of local production, the revenue raised is pretty much a net gain for the locality. This creates an incentive for localities to tax businesses – if so allowed by state authorization. In the Fischel view, business also can generate negative externalities on towns so localities trade off the tax subsidy against the valuation of the externality.

The view that *local* taxes on business property represent a transfer from the owners or users of capital to local residents received some initial empirical support by Fischel (1975). Studying the make up of local tax revenues in Bergen County, New Jersey, he suggested up to 70% of commercial tax revenue benefitted residents by either lowering household tax payments or by increasing local spending (Fischel (1975,p 155).]. Erickson and Wollover, (1987), further provided evidence that increasing the tax base with commercial property directly helps to reduce the tax burden of households. Oakland and Testa (1995) too find similar results in their study of Philadelphia. It is important to note that these studies do not address the impact of explicit difference in commercial tax rates, but rather how the make up of the tax base impacts spending - given a single rate system.

The explicit differential taxation of business by local governments was severely limited until quite recently. Most states required that localities use a single property tax rate based on "full and fair market value". The classification of real property (and the use of different rates for each) in the United States was first instituted in Minnesota in 1913. Then, after more than 50 years, the "tax revolt" of the 1970s led 25 other States and the District Columbia to enact property tax classification systems. Table 1 (from University of California at Davis' Institute of Governmental Affairs) categorizes property tax systems as of 2008. In some states classified property is assessed at a common fraction of market value and then taxed at explicitly different rates (different rates). In other states the rate is the same, and each class of property is assessed at a different fraction of supposed true market value (different ratios).

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[1] This view is distinct from a literature on the interregional effects of capital taxation, wherein land capitalization is generally not allowed. See Bucovetsky (1991) and Wilson (1986).

Table 1: States with Property tax classification systems

State	Number Classes	Different Ratios	Different Rates
Alabama	7	X	
Arizona	9	X	
Colorado	3	X	
D. C.	3		X
Georgia	2	X	
Hawaii	7		X
Illinois	2 (Cook County 6)	X	
Kansas	13	X	
Kentucky	14		X (state rates)
Louisiana	5	X	
Massachusetts	4		X
Minnesota	12	X	
Mississippi	5	X	
Missouri	8	X	
Montana	11	X	
Nebraska	2	X	
New Hampshire	2		X
New York	Local option		
North Dakota	2	X	
Oklahoma	4	X	
Rhode Island	Local option		
South Carolina	11	X	
South Dakota	3		X
Tennessee	4	X	
Utah	2	X	
West Virginia	4		X
Wyoming	3	X	

Source: http://www.orange-ct.gov/govser/PROPERTY%20TAX%20OLR.htm

Sonestelie (1979) was the first paper to directly address the long term tax incidence of an explicit property tax classification system. He adopts Mieszkowski's view (1972) that a property tax on firms is akin to capital tax, but in addition, postulates that firms provide local residents employment rather than generating negative externalities. In his model, there are no towns but rather rings of commercial and residential land use. Taxing the commercial use more and the residential use less will tend to shift the burden of property taxes from residents to the customers

of the commercial establishments and to landowners. DiMasi (1988), develops a Computational General Equilibrium model that similarly adopts a monocentric circular city where households travel to the CBD to work and consume products that are made there. For specific parameters, DiMasi measures the welfare effects of switching from a uniform tax rate to one that taxes CBD businesses more. Not surprisingly the answer depends highly on various elasticities of substitution.

Wheaton (1984) empirically shows that the differences in property tax rates among jurisdictions on office property do not show up in office rent. This implies that the owners rather than users of capital are absorbing local variation in business property taxes.

A very different strand in the literature examines incidence more implicitly by studying whether variation in local business taxes tends to drive business away. Four studies in the eighties found that tax rates have such an impact. Wasylenko (1980) finds a significant effect of property taxes on the choice of relocating firms in Milwaukee from 1964 to 1974. Fox (1981) studies the effect of taxes and spending on the amount of industrial land in municipalities in the Cleveland metropolitan area in 1970 and arrives at the same conclusion. Charney (1983) finds that local taxes have an effect on new firm locations in zip code areas of Detroit from 1970 to 1975. McGuire (1985) examines the effect of property taxes on the location of business building permits in the Minneapolis-St. Paul metropolitan area from 1976 to 1979, and also concludes that they deter new investment. Finally, Dye et al. (2001) examine the claim that classification used in Cook County but not surrounding counties is responsible in driving away business. They find evidence that property taxes deter firms cross-sectionally, but cannot find sufficient evidence that those rate differences due to classification are the cause.

III. Massachusetts Property Tax Classification

Since 1780, the Massachusetts Constitution has required uniform assessment of all real properties subject to taxation and a single property tax rate applied thereto. Historically, however, this provision has been rarely honored and different classes of property as well as individual properties within the same class have been subject to assessment "bias". These illegal disparities precipitated a landmark court case (Bettigole vs Assessors of Springfield) in 1961. The result of the case was a judicial mandate for statewide 100 percent assessment. Some years later, in response to growing pressure to enforce statewide 100 percent assessment, politicians began to lobby for property tax classification as a way to offset the impact. In 1968 and 1969, although the State legislature passed a classification provision, only 36% of the voters supported it and a classification constitutional amendment was not passed.

In 1974, a second case concerning 100 percent assessment (Town of Sudbury vs Commissioner of Corporations and Taxation) was brought before the Massachusetts Supreme Judicial Court. The outcome of the case generated further pressure to enforce 100% equal

assessment and again renewed interest in property classification. In 1975 and 1976, the State Legislature passed a new classification amendment and placed it on the ballot in 1978. This classification amendment was successful. In 1978, the citizens of the Commonwealth of Massachusetts adopted a constitutional amendment authorizing the General Court to classify real property into as many as four separate and distinct classes and thereafter to tax such classes differently. Bloom (1979) argued that local citizen support of property tax classification in Massachusetts was based on miss-understanding rather than informed self-interest.

The classification of property in Massachusetts does not raise additional dollars from the property tax, but rather serves to redistribute how much levy will be raised from each class. Preferential tax treatment for any class of property is not mandated, but the choice of distributing the levy burden among the various classes remains a local option – done in three phases: first, every city and town must value all taxable property at full and fair cash value; second, each city and town must classify every parcel of property according to use; third, each city and town which has revalued and classified may allocate its tax levy among the various classes of property. The first and second steps are mandatory. The third stage, determining whether to allocate the tax burden by class, is optional with each community.

Table 2: Massachusetts Average Property Tax Rates

	Commercial property tax rates		Residential property tax rates	
	Mean	Std deviation	Mean	Std deviation
1970	40.79	12.62	40.79	12.62
1971	44.52	14.62	44.52	14.62
1972	44.02	15.42	44.02	15.42
1973	48.96	15.97	48.96	15.97
1975	31.51	12.32	31.51	12.32
1976	34.17	12.55	34.17	12.55
1977	32.48	13.51	32.48	13.51
1978	34.56	13.67	34.56	13.67
1979	32.63	13.69	32.63	13.69
1980	32.15	13.02	32.15	13.02
1981	29.30	11.86	28.61	11.16
1982	23.60	8.60	22.46	7.63
1983	20.73	6.89	19.06	5.08
1984	20.78	6.76	18.73	4.73
1985	21.36	13.43	19.27	12.74
1986	18.30	6.39	16.16	4.40
1987	16.14	5.65	14.18	4.04

1988	15.15	5.42	13.10	3.71
1989	12.78	4.57	10.83	3.12
1990	12.07	4.28	10.07	2.53
1991	12.49	4.25	10.44	2.29
1992	13.75	4.95	11.45	2.47
1993	15.17	5.58	12.60	2.71
1994	16.06	5.96	13.30	2.86
1995	16.89	6.31	13.95	2.96
1996	17.35	6.58	14.32	3.02
1997	17.69	6.58	14.63	3.01
1998	18.04	6.65	14.91	3.06
1999	17.93	6.45	14.88	3.09
2000	17.66	6.28	14.74	3.21
2001	17.08	6.13	14.26	3.37
2002	16.57	6.08	13.79	3.55
2003	16.06	6.02	13.25	3.57
2004	15.22	6.04	12.37	3.57
2005	14.13	5.92	11.26	3.20
2006	13.50	5.79	10.66	3.00
2007	13.13	5.56	10.41	2.86

In Table 2, we depict the average official effective tax rates on commercial and residential property in Massachusetts across its 351 communities (unweighted). The rates are identical until after the year classification was implemented (1980). The table shows the gradual increase in the effective rates paid by commercial as opposed to residential property. In 1998, 102 communities used the classification law to shift property taxes from residential to business taxpayers. Although the classifying communities comprised less than a third of the Commonwealth's 351 cities and towns, they account for almost two thirds of the state's population and encompass most of the state's larger cities and more developed suburbs. In Boston, the largest classifying community, the business tax rate of $38.45 (1998) was more than three times the rate paid by residential taxpayers. In the 101 other classifying communities, the average tax rate for business of about $28 was almost double the rate for residences. By contrast, in the 239 communities that did not classify, the uniform tax rates averaged $14.60 per $1,000 of assessed value. It is also interesting to note that no community which switched to a multiple tax rate regime has ever switched back.

IV. A Model of Town Classification Choice

We begin with a municipally fragmented metropolitan area. In the aggregate there are Q municipalities, N residents and L firms (or jobs). The population of each town is n_i which sums to the metropolitan total N. Population is *exogenous*. We call the ratio of jobs per capita in each town establishment density l_i. The absolute number of firms in each jurisdiction is then $n_i l_i$ and the sum of these must equal L as firms spread themselves across jurisdictions.

If towns were equal in all other ways beside population, we would expect firms to spread themselves proportionately to population. In this way commuting would be averted. This is consistent with the growing literature on urban job dispersal and commuting (e.g. McMillen (2003), Wheaton (2004)). In the case at hand, however, towns may not be identical and firms are influenced negatively by town tax rates on establishments, t$_2$.

We can model firm location choice very simply with a variation of the logistic choice function in (1) below. Here if towns have identical tax rates, firms will spread themselves proportional to town population (to minimize commuting) and all towns will have identical firm concentration in turn equal to aggregate firm density L/N.

$$l_i = \frac{L}{n_i}\left[\frac{n_i e^{\beta t_{2i}}}{\sum_j n_j e^{\beta t_{2j}}}\right] \tag{1}$$

Since firms are adverse to tax rates we would require that $\beta < 0$. We will see below that we must further assume that β be small enough to insure that raising commercial taxes increases commercial tax revenue. Taking the first derivative of (1) with respect to the tax rate we have (2).

$$l'_i = \frac{\partial l_i}{\partial t_{2i}} = \beta l_i \left(1 - \frac{n_i l_i}{L}\right) \tag{2}$$

Faced with this environment, we consider the decision faced by town residents that can raise tax revenue to support public services S in one of two ways. First they can tax themselves at a head tax rate of t$_1$ or they can impose the aforementioned tax on firms of t$_2$ per job. The tax on firms is "free" revenue – not in any way directly impacting the cost of services or resident income. Without any "local" firms, however, the residents of this town are employed elsewhere and must commute. If firms decide to locate in the town, they will employ local residents and eliminate their commute. Hence having firms in a town both creates tax revenue and jobs (eliminates commuting). Of course the only way to attract firms is to lower the taxes that they

pay (and hence tax revenue). To incorporate this local decision, we create the resident utility function in (3). For ease, we drop the subscript (i) from the representative town in the equations that follow from here.

$$U = S^b X^{1-b} \qquad (3)$$

In (3) X is the amount of private goods consumed and S denotes the amount of public services demanded. The income constraint for the resident is equation (4) if we assume that the price of the private good is 1. Here we also have the important assumption that as local jobs are created, resident commuting decreases and hence "net" income increases. In (4) a represents the impact of firm density on the net income of residents. Y is income without any local firms which then rises at the rate a as firms become more prevalent and commuting time saved is saved.[2] We assume for simplicity that the allocation of time between work and leisure is fixed while commute time is implicitly minimized subject to the availability of local jobs.

$$X = Y(1 + al) - t_1 \qquad (4)$$

As for public services, the government budget constraint is

$$S = t_1 + t_2 l \qquad (5)$$

As was discussed above, firms will move with some elasticity in response to taxation and the town recognizes this. From (2) we defined $l' = \partial l / \partial t_2 < 0$ and it must be further assumed that as commercial taxes are increased, commercial tax revenue (per capita) from firms increases.

$$l + t_2 l' \geq 0 \qquad (6)$$

This assumption is required to ensure residents do not tax firms at an infinitely high or low rate. Without this assumption, the particular utility function here becomes a downward sloping schedule with respect to the commercial tax rate and hence will lead to a corner solution of a zero tax rate. The inequality in (6) will ensure the utility function forms a concave function with respect to t_2.

Combining the various constraints into the utility function, residents solve the following optimization problem:

$$\max(t_1, t_2): U = (t_1 + t_2 l)^b (Y(1 + al) - t_1)^{1-b} \qquad (7)$$

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[2] In the long run, *ex post*, it would be the case that town differences in firm density and local commuting might be fully capitalized into wages (e.g. Wheaton, (2004)). Note that this requires residents be fully mobile between towns, while here they are assumed fixed. *Ex ante*, however, even with mobile residents as a town unilaterally attracts new firms net wages would still rise.

First order condition with respect to t_1 is the following:

$$\frac{b}{t_1+t_2l} - \frac{1-b}{Y(1+al)-t_1} = 0 \qquad (8)$$

With respect to t_2 it is the following:

$$\frac{b(l+t_2l')}{t_1+t_2l} + \frac{(1-b)aYl'}{Y(1+al)-t_1} = 0 \qquad (9)$$

Without the condition (6), both terms in (9) are negative and there is no interior solution to the choice of commercial tax rates and utility is maximized with an infinitely low commercial tax rate that both will maximize revenue and create the most jobs.

If we incorporate (8) into (9) we can rearrange terms and derive (10) below in which the choice of t_2 is a very simple and explicit function of town income, the level of firm density and the derivative of firm density with respect to the tax rate.

$$t_2 = -\frac{l}{l'} - aY \qquad (10)$$

If we further incorporate the derivative as defined by the logistic choice function in (11) we have the following expression for the town's "desired" tax rate:

$$t_2 = -\frac{1}{\beta(1-\dfrac{n\,l}{L})} - aY \qquad (11)$$

The first term on the right side of (11) is positive (since $\beta < 0$) and the second is negative. As nl approaches L a town has virtually all the firms in the region, firm location is very insensitive to tax increases and so the chosen tax rate rises infinitely. As as nl approaches zero towns have no firms, which at this point becomes very sensitive to the tax rate, which is set at some very low but finite value. Note that as β becomes larger in absolute value (more elastic firm supply in general) it easily becomes the case – as discussed above - that the desired tax rate is negative. A sufficiently small value of β insures a positive solution.

The determination for each town of both l and t_2 involves the simultaneous solution to (11) and (1) for that town (i) holding other towns constant. A closed form solution to (11) and (1) is not obvious, but we can easily illustrate the solution numerically – *for one town*. We can consider a symmetric model where there are 10 equal sized towns. We set the following parameters:

Table 3: Model Parameter Values

Parameters	Base Values
B	0.2
a	0.2
β	-2.
Y	1
L	1
n_i/N	0.10
N	1
Q (total number of municipals)	10

Using the supply function shown in (1) and setting the commercial property tax rate in all other communities at a chosen value of 0.5, we plot out in Chart 1, the number of firms in municipal (i) as a function of its own tax rate t_{2i} - equation (1). Similarly, Chart 1 also plots out the town tax rate demand schedule (11) – as a function of l_i. In this case, the solution for the representative town is a tax rate of 0.4 which yields 1.6 firms per capita – again if all other towns were to set their tax rates at 0.5.

Chart 1: Representative Town solution
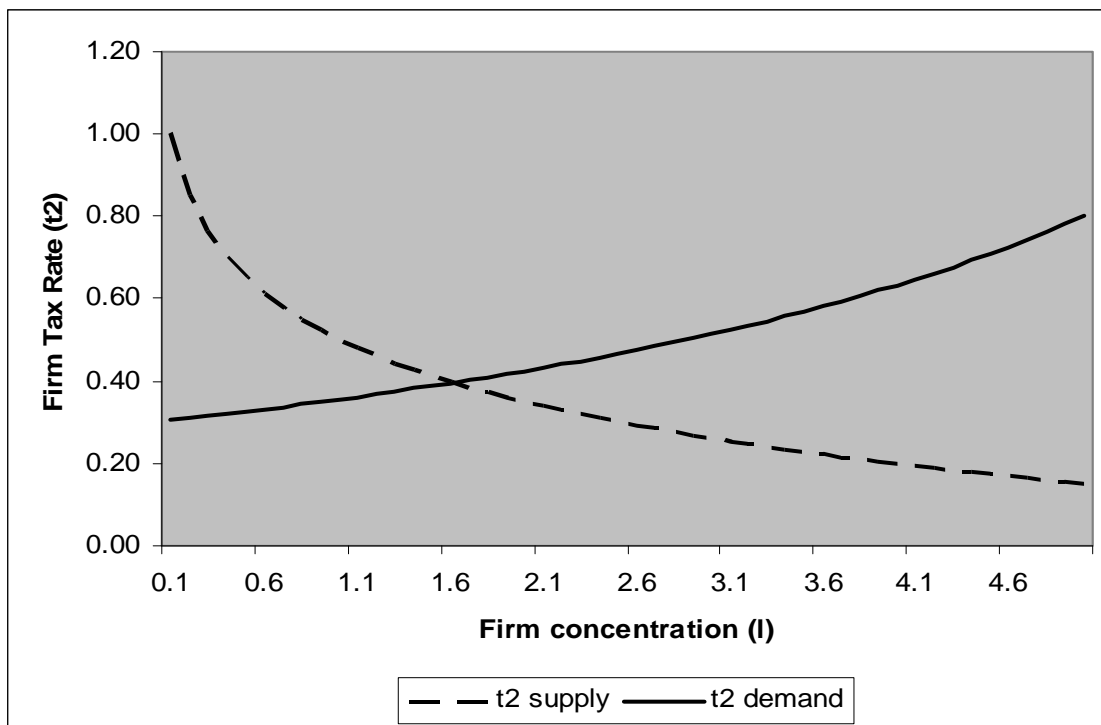
V. Symmetric Nash Equilibrium(s).

To be clear, Chart 1 is only the unilateral solution for a representative town – if all other towns were set their tax rates at 0.5. The purpose of the Chart is simply to show the shape of the two schedules that each town faces and provide an example of a solution to (1) and (11). Clearly the full Nash equilibrium (in the case of symmetry) would have the other towns lowering their rates below 0.5, which has the effect of shifting the supply schedule downward. The full solution, to an asymmetric NASH equilibrium, where towns are of different sizes and incomes, will generally be quite complicated, but if we assume that all towns are identical, the symmetric NASH solution becomes easy and almost trivial to compute.

The assumption of identical towns, and NASH symmetry, insures that every town has a concentration of firms equal to the aggregate level of concentration L/N (or 1.0 in the example above). With this even level of concentration $l_i' = -1.8$ and the full Nash equilibrium tax rate (everywhere uniform) becomes $t_{2i} = .345$.

It is easy to re-compute this symmetric NASH equilibrium with a less elastic firm supply schedule. If for example we change beta from -2.0 to -1.0 the full equilibrium tax rate rises from 0.345 to .91. The equilibrium allocation of firms to town is still a uniform density level of 1.0. In fact if we combine (11) with the condition of NASH symmetry, $l = L/N$, we can see more generally that as beta decreases (in absolute value), the tax rate rises.

Proposition 1: With lower firm location elasticity, town commercial tax rates rise.

Going back to the original firm supply elasticity of -2.0 we can also re-compute the symmetric NASH equilibrium solution with (uniformly) higher town income. If we double income from 1.0 to 2.0, the full equilibrium tax rate drops from .35 to .15. Again by inspection of equation (11) higher income reduces commercial tax rates as towns increasingly value the advantages of *not* commuting and hence try to attract more firms to achieve this.

Proposition 2: Greater town income yields lower commercial tax rates.

Finally, in (2) a system composed of many (smaller) towns each has greater sensitivity of town employment density with respect an individual town tax rate. If we combine (11) with the condition of NASH symmetry, $l = L/N$, and n/N decreases towns select lower commercial taxes. In theory with only a single town, there is no elasticity and that town can raise commercial taxes without any loss of jobs.

Proposition 3: Greater municipal fragmentation (smaller average town size) yields lower commercial tax rates.

13

VI. Empirical tests with Massachusetts Panel Data.

To see if the model fits the case of Massachusetts, we assembled panel data on town property tax rates and levies from the yearly publications of Massachusetts Taxpayers Association (MTA) and the state Department of Revenue. We use the effective tax rates- rates based on Equalized Valuations by the department. Note that the actual tax rates are usually higher than the effective tax rates before 1981 because the valuations were usually lower than Equalized Valuations. Given that the Department of Revenue only provides information from 1980 onwards, we were forced to depend on the publications by MTA. Some of the early publications like the tax rates on 1974 were missing in the library. In addition, for some small municipals, information is not available and they are omitted from study. The series provided by Department of Revenue also has missing information on the levies collected. We used the rates from MTA and the equalized valuations that stretched back to 1970 to derive the levies collected. Comparing the levies collected in the MTA and those so derived the differences are not large.

The income and employment data is obtained from the Department of Labor and Workforce of Massachusetts. It contains employment and wages in establishments in each of the 351 cities and towns in the Commonwealth. The wage data does not represent the income of residents however, but what is paid by firms in the municipals. The only information we could get on the income of town residents was median household income for the census years: 1979, 1989 and 1999 - that were contained within our sample period.

In addition to the employment and tax data there is also information on the number of establishments. This data, however, is subject to certain restrictions to protect the confidentiality of all data reported by individual employers. Summary level data is confidential if there are less than three reporting units in total, or if with three or more units, one unit accounts for 80% or more of the total. Using the published numbers for establishments is problematic and hence we use the employment base as a proxy for the number of firms.

We formed the combined data on population, employment, income and tax rates into a panel data base for 340 of the 351 communities in the state across 28 years.

Choice of Tax Classification

In our model, there is an upward sloping tax "demand" schedule wherein towns with higher pre-existing firm density will select higher tax rates on those firms. This schedule also shifts with town size and income. To examine the existence of this schedule we use two tests. The first is a simple Probit model of whether in 1990 (9 years after classification was allowed) a town chose a commercial rate that was higher than its residential rate. The determining variables

are those in our model – the number of pre-existing firms (or firm employment density), town income and population. These results are in Table 5.

Table 5: Probit : Choice of tax regime (1-dual tax regime, 0-uniform tax regime)

	Coefficient	Standard deviation	T stat	Pvalue	95% confidential level	
Median Household Income 1989	-0.000018	6.90e-06	-2.54	0.011	-.000031	-3.99e-06
Employment per capita 1980	3.002607	.5497244	5.46	0.000	1.925167	4.080047
Constant	-0.160275	.4128947	-0.39	0.698	-.9695344	.6489831

	Coefficient	Standard deviation	T stat	Pvalue	95% confidential level	
Median Household Income 1989	-3.82e-06	7.63e-06	-0.50	0.616	-0.0000188	0.0000111
Employment per capita 1990	2.502331	0.5817613	4.30	0.000	1.3621	3.642562
Population 1980	0.0000457	0.0000103	4.43	0.000	0.0000255	.000066
Constant	-1.811566	0.5379733	-3.37	0.001	-2.865975	-0.757158

The first frame of results in Table 5 clearly show that municipalities with high median household income are less likely to choose the dual tax regime and those with high pre-existing employment per capita also are more likely to choose the dual tax regime.[3] The results are consistent when we shift the cross-section to years other than 1990, although always after 1981. Thus the Probit test provides some simple support to our model of town tax rate choice. In the second frame, we add in town population in 1980. It has a very significant positive sign although the impact of town income is now considerably weakened (although still of the correct sign). Thus as to which towns chose to classify in reaction to the 1981 legislative "experiment", we have pretty good support for the propositions in the previous section.

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[3] The results are virtually identical if 1979 Median town income is used.

Our second approach is to expand our analysis to a panel model across the 28 years and 340 communities. In this model we regress the town tax rate differential in year t against the number of workers (per capita) in the previous year. We wanted to include town income in the prior year, but as discussed previously resident income is available only once every decade. In some specifications we also include the lagged tax rate differential because rates change so slowly between years and this generates a great deal of autocorrelation. The estimating equation in its fullest form is (12) below.

$$TC_{i,t} - TR_{i,t} = \alpha(TC_{i,t-1} - TR_{i,t-1}) + \beta E_{i,t-1} + \sum_i \delta_i + \sum_t \phi_t + \varepsilon_{i,t} \tag{12}$$

We run equation (12) in 5 different forms. In the first two columns of Table 6, we exclude the lagged dependent variable and experiment with just year and then both year and municipal fixed effects. Even with full fixed effects, the level of employment per capita in the previous period has significant impact each year in generating a higher tax rate differential. When we eliminate the cross section fixed effects this becomes truly dominant. In the 3rd and 4th columns we add the lagged value of the tax rate differential, again with just year and then full fixed effects. Exhibiting high auto correlation the coefficient on this variable is between .8 and .95 and shows that in response to a permanent increase in employment per capita – the tax rate differential should gradually adjust upwards. If we take the coefficient on employment per capital and divide it by 1-minus the coefficient on the lagged differential we get a permanent impact (from a change in employment per capita) that somewhat greater than the results in the first two columns.

In panel models with lagged dependent variables and individual heterogeneity, there exists a specification issue. With cross-section fixed effects the error term can be correlated with the lagged dependent variables [Nickell, (1981)]. OLS estimation can yield coefficients that are both biased and also that are not consistent in the number of cross-section observations. Thus estimates and any tests on the parameters of interest may not be reliable. To be on the safe side, however, we also estimate the equation following an estimation strategy by Holtz-Eakin et al (1988), which amounts to using 2-period lagged values of the dependent variable as an instrument with GLS estimation. These results are shown as the last column in Table 6 and the results are equally strong and significant.

In terms of point estimates, the sample of towns has a range of jobs-per-capita that varies from very close to zero to .91. If this ranges is applied to the average steady state coefficient from Table 6 (0.6/(1-.9)=6.0) the result is that a town would increase its tax discrimination by 5.4 basis points. With Holtz-Eakin estimation the impact is 14 basis points. By comparison, the difference in tax rates ranges in the sample from zero to 27 basis points.

Table 6: Difference in property tax rates

	Fixed Effects (year and municipal)	Fixed Effects (year only)	Fixed Effects (year and municipal)	Fixed Effects (year only)	H-E Est. (year and municipal)
	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Difference in Property tax rates (lag 1)	-	-	.8609834 (193.79)	0.9578126 (316.23)	0.802916 (70.36)
Employment per capita (Lag 1)	1.767892 (7.26)	6.724493 (43.26)	.5214304 (4.37)	0.6114604 (11.16)	2.834432 (3.16)
Constant	0.3034126 (0.65)	0.5003444 (2.29)	-.1247075 (-0.55)	-0.082823 (-1.15)	-0.14929 (-1.04)
R-square	0.6618	0.19	0.9196	0.9135	

The effect of Commercial tax rates on employment per capita

The second set of tests examines whether the firm location decisions are in fact influenced by the town commercial property tax rates that they face – as we assumed in the "supply" schedule of the model. Dye et al. (2001) argues that changes in the classification tax system have had insignificant effect on economic development. With a larger number of cross-section observations and longer time series, we can examine this more carefully – using similar tests to those employed in towns' choice of tax rates. The first test is to examine the change in employment (or employment growth) during long windows on either side of the 1981 legislative change. Here we use a difference-in-differences approach, examining how employment (per capita) changed during the 1982-91 period as opposed to 1970-79, in towns that classified and taxed firms more as opposed to those that did not. In the test we also try including town income as a controlling variable, both pre and post change.

Table 7: Change in Employment-per-capita, (1970-1978 versus 1982-1991)
(Treatment is adopting tax classification after 1980)

	Coefficients (t-Statistic)		
	No income	Income 1979	Income 1999
Post x Treatment	-.046132 (-2.96)	-.0399472 (-2.49)	-.0399327 (-2.49)
Treatment	.0353707 (3.21)	.0434844 (3.81)	.0445035 (3.88)
Post	.0104364 (1.23)	.0019797 (0.18)	.0019652 (0.17)
Income (1979)	NA	1.00e-06 (2.85)	NA
Income (1999)	NA	NA	5.84e-07 (2.71)
Constant	.0377864 (6.31)	-.0028802 (-0.16)	.0054767 (0.35)
R^2	0.0163	0.0698	0.0677

In Table 7, before the classification tax regime was allowed "treated" municipals- those that select classification after 1981- had a cumulative growth of per capita employment of .073 (the sample mean of employment per capita over all years is .303). "Untreated" municipals- municipals that did not opt for dual tax regimes after 1981- had a growth of .037. After 1981, those municipals that selected the multiple tax regimes had a growth of .038. Alternatively, municipals that continued the existing single-rate tax regime had a growth of .048. The results provide evidence that the increase in commercial tax rates resulting from the choice to classify reduced a town's growth of jobs per capita. Higher town income also led to faster employment growth as such towns further selected lower commercial tax rates.

As with the choice of tax rates, we also constructed a panel analysis of change in employment. Here again we experiment with 5 different specifications (Table 8). The estimating equation with all fixed effects and lagged change in employment is shown in (13) below.

$$E_{i,t} - E_{i,t-1} = \alpha(E_{i,t-1} - E_{i,t-2}) + \beta(TC_{i,t-1} - TR_{i,t-1}) + \sum_i \delta_i + \sum_t \phi_t + \varepsilon_{i,t} \qquad (13)$$

In the first two columns of Table 8 we use the specification without lagged employment growth. It is interesting that the inclusion of municipal as well time effects strengthens the results. In both cases, however the growth in jobs per capita is significantly adversely impacted by previous year tax differentials. Adding lagged employment growth suggests only slight

(negative) autocorrelation, and the coefficient of lagged tax differentials remains significant and strong. The Holtz-Eakin estimates are larger in magnitude but with higher standard errors are not as precisely estimated (only at 5%). There is strong consistency between the various estimates in Table 8.

In terms of point estimates, the difference in tax rates within the sample of towns in 1998 ranges from 0 to 27 (basis points). If we take the average of the coefficients in Table 8 (approximately -.007) and apply it to this range, it would reduce the annual growth in jobs-per-capita from the sample mean of .005 to -.013. Over a decade this shift would mean that instead of jobs per capita increasing from a sample mean of .30 to .35, it would decline to from .30 to .17. This would be quite a strong decline in a town's employment base.

Table 8: Change in employment per capita

	Fixed Effects (year)	Fixed Effects (year and municipal)	Fixed Effects (year)	Fixed Effects (year and municipal)	H-E Est. (Year and municipal)
	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (Z- stat)
Change in Employment per capita (lag 1)	-	-	-0.054094 -(5.78)	-0.078663 (-8.31)	-0.05713 (-5.61)
Difference in property tax rates (lag 1)	-0.000218 (-2.29)	-.0008525 (-5.56)	-0.000230 (-2.37)	-0.001067 (-6.52)	-0.00166 (-1.67)
Constant	0.0009808 (0.42)	-0.005895 (-0.77)	0.0048096 (2.00)	-0.003509 (-0.44)	0.008373 (8.73)
R-square	0.0709	0.0932	0.0744	0.1029	

VII. Conclusion

Property tax classification has increasingly been adopted by states as a locally-exercised option to assist municipal governments in raising revenue. The incidence of such taxes is much more complicated to asses that in traditional macroeconomic tax incidence theory. At the local level, some incidence could be born by land, but not all since land has alternative uses. In theory, some could be born by workers, but local labor is quite mobile between towns and the consumers of local production would seem to be broad based as well. This leaves the owners of capital, and the demonstrated slow (but significant) relocation of a town's employment base makes them the most likely bearer of the tax – at least in the near run.

In this paper we have adopted more modest goals rather than trying to exactly parse out tax incidence. We demonstrate that as towns adopt higher property taxes on businesses, business do in fact leave or at least their growth slows. This then creates a dilemma for local governments – raise revenue to support services and reduce residential taxes, but risk the prospect of fewer local jobs (forcing residents to commute further). Communities with higher resident income seem to prefer forgoing the tax subsidy from classification – opting instead to try and attract or retain a greater job base. Our theoretical model explains this as a natural byproduct of the higher income value of commuting time. We also find that smaller communities are less likely to tax businesses and our model explains this conclusion as a result of the higher elasticity smaller towns face between their business tax rate and the number of local jobs.

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