

EVALUATION OF CONNECTICUT TAX
REFORM OF 1991

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Abstract

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The State of Connecticut tax reform in 1991 imposed a broad-based state income tax. Using methods similar to those applied by Harmon and Mallick (1993), and with the newly available data, this study estimates the pre- and post-reform characteristics of the Connecticut tax system. This study finds that the tax reform greatly improved the stability of the tax system; the measure of instability used decreased from 44.1 percent to 25.4 percent. The revenue elasticity of the tax system also decreased by 0.14. However, the growth of the tax system dropped by 4.97 percent. In addition, the study shows that the tax reform achieved a fairer tax structure; the measure of vertical equity used significantly improved by 0.65. Last, the tax reform achieved approximate uniformity of specific tax rates between Connecticut and its neighboring states.

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1. Introduction

The state of Connecticut undertook major tax reform in 1991, imposing a broad-based income tax. While Harmon and Mallick (1993) studied some of the economic characteristics of Connecticut's post-reform tax code, they used simulated data in their assessment. By using the available actual data, this study seeks to replicate their methodology, with some improvements on it, to determine what can be learned from Connecticut's tax experience, in particular with respect to the effects of tax reform on the tax system growth, stability, tax elasticity, fairness and competitiveness. The factors that prompted the tax reform are discussed in section two. Section three describes the key changes that the 1991 tax reform introduced. The paper's methodological approach is explained in section four. Section five provides the economic characteristics of major taxes in Connecticut. Section six contains the overall evaluation of the tax reform. In section seven, the study findings are compared with findings of other studies. The study's conclusions are in section eight.

2. Factors That Prompted The 1991 Tax Reform

2.1. Connecticut's Fiscal Crisis

In January of 1991, the Office of Fiscal Analysis released budget projections for the fiscal year 1992 that included an astounding \$2.7 billion shortfall in its \$7.5 billion budget. This was a shortfall of over 35 percent, by far the worst percentage shortfall of any state in the nation (Rapoport, 1993). Many factors were believed to contribute to the large revenue shortfall, one of which was that Connecticut's tax structure was especially sensitive to economic fluctuations. In the late 1980's and early 1990's, Connecticut experienced a decline in some of its major economic activities including real estate, construction, insurance and banking. This coincided with the defense cutback. The bottom of the trough in the decline in tax revenue was 5.7 percent in fiscal 1991. In 1990, the unemployment rate approached 4.5 percent, and Gross State Product declined by 3.7 percent (Rapoport, 1993). On the other hand, State expenditure increased continuously, resulting in an imbalance between the growth of state revenue and state expenditure. Figure 1 shows this imbalance (Office of Fiscal Analysis, 2000).

Figure 1: Actual Expenditure Vs. Actual Tax Revenue

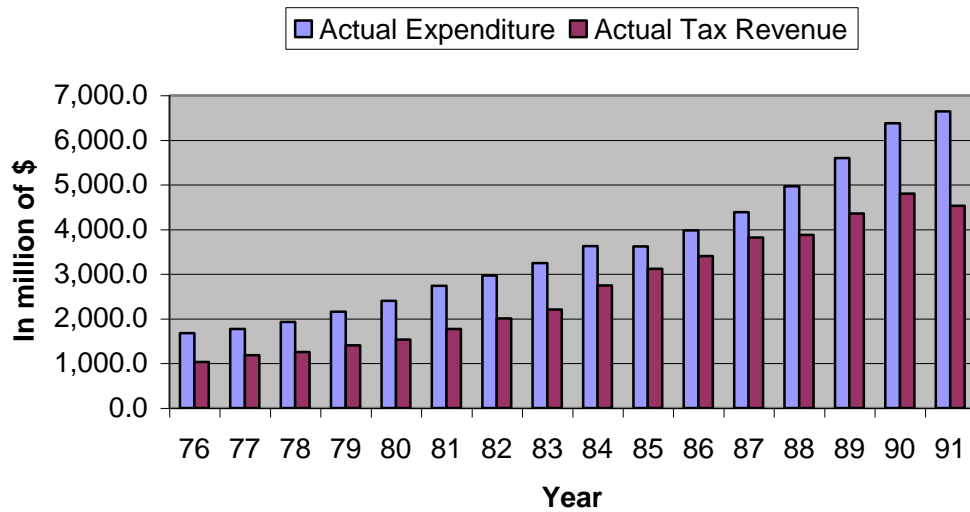
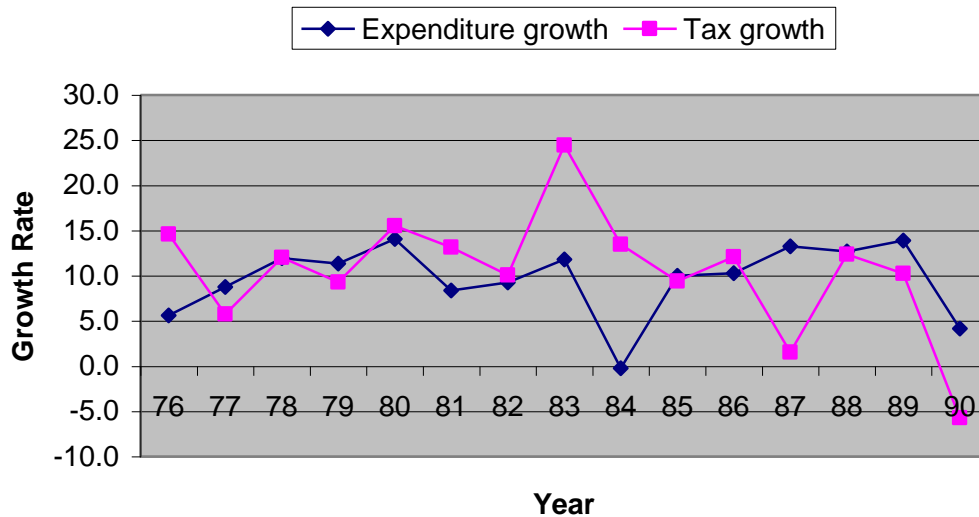


Figure 2 shows the volatility over the period 1976 to 1991 of the growth of actual tax revenue compared to the growth of state expenditure. The variance of the growth of actual tax revenue was almost triple the variance of the growth of state expenditure (42% and 15.7%, respectively).

Figure 2: Actual Expenditure Growth Vs. Actual Tax Revenue Growth



To deal with this problem, the Connecticut General Assembly passed an act in 1989 to set up a task force on state tax revenue. The task force compared Connecticut's existing tax system with three neighboring states, New York, New Jersey and Rhode Island. They found that Connecticut's overreliance on the corporate income tax and sales tax caused the volatility of the tax system. Sales and corporate income taxes were found to be relatively unstable and to play a major role in the instability of the tax system (Task Force, 2002).

2.2. Connecticut's Antibusiness Climate

Without a broad-based personal income tax, the sales tax and corporate income tax rates were increased several times to offset the state's revenue shortfall. For instance, in 1989, the Office of Fiscal Analysis predicted a major revenue shortfall. To cope with this anticipated shortfall, a major tax increase was enacted, raising the sales tax from 6 percent to 8 percent and imposing a 20 percent surcharge on business taxes (Rapoport, 1993). In a study conducted using a 22 state sample, Tannenwald (1996) found that according to an analysis of the year 1991, the State of Connecticut was ranked among the three states with the least attractive business tax climate. Its rates on sales and corporate taxes were the highest in the nation. Table 1 compares tax rates between Connecticut and its neighboring states in 1991.

Table 1: Sales & Corporate Income Tax Rates in Some States, 1991.

<i>State</i>	<i>Sales Tax</i>	<i>Corporate Income Tax</i>
Connecticut	8	13.8
Massachusetts	5	Not Comparable
New Jersey	6	9.84
New York	7 – 8.2	10.35
Rhode Island	7	9

- Source: Harmon & Mallick, 1993, taken from ACIR (annually)
Note: Corporate income tax is calculated as the sum of the marginal tax rate and the product of the marginal tax rate and the temporary surcharge rate.

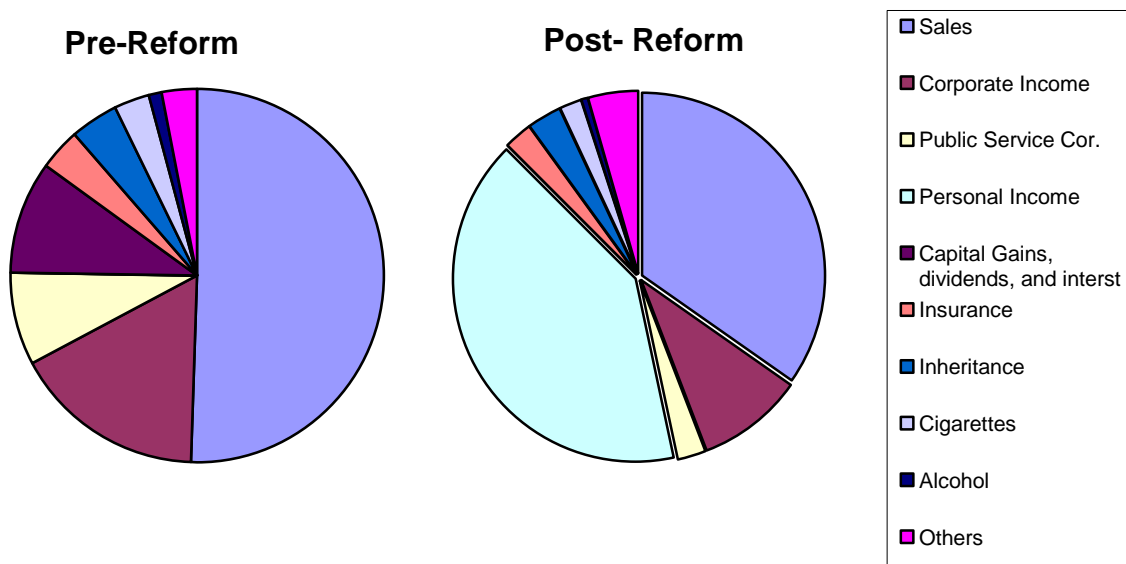
2.3. Distributional Factor

A key factor that shapes the debate over any tax reform is improvement of the fairness of the tax system. The comparison between Connecticut's pre-reform tax system and those of its neighboring states (NY, NJ and RI) by the task force shed light on the fact that Connecticut's tax system was more regressive than the three other states' (Task Force 2002). A major source of regressivity was the over-reliance on the sales tax, which is widely believed to be the central regressive element of the tax system (Ettliger, 1996).

3. Key Changes Due to the 1991 Tax Reform

The main change introduced by the 1991 tax reform was the introduction of the broad-based personal income tax. As a result, the relative importance of other individual taxes changed. Figure 3 shows each of the individual taxes as a percentage of the total tax revenue for the pre- and post-reform tax system.

Figure 3: Decomposition of Total Tax Revenue into the Various Individual Taxes



It is clear from Figure 3 that while the pre-reform tax structure did not include a broad-based income tax and mainly relied on the sales tax, the post-reform tax system's main source of revenue is the income tax. This resulted in equivalent decreases in the weights of the other individual taxes (see Table 3, p. 19).

The tax reform also changed some of the structures and rates of some individual taxes.

The following are the main changes:

3.1. Income Tax

In 1991, the Connecticut Legislature enacted a state personal income tax as part of the broad-based tax reform bill. The budget bill initially imposed a flat tax rate of 1.5 percent during the first year, after which the rate increased to 4.5 percent on taxable income. To achieve progressivity, generous exemptions and credits that decline as income rises were included in the system. The imposed income tax base is similar to the base for the federal income tax (Harmon & Mallick, 1993). Earned and unearned incomes are not taxed differently (note that capital gains, dividends, and interest previously were taxed at 14 percent). In recent years, the income tax rate has been reduced and personal exemptions have been increased (Task Force, 2002).

3.2. Sales Tax

Under the new tax structure, the sales tax was reduced from 8 percent to 6 percent. Along with this reduction, a base-broadening measure was implemented that made the sales tax applicable to various services and some other items that had been exempted previously.

3.3. Corporate Income Tax

The tax reform reduced the surcharge on corporate income tax from 20 percent to 10 percent for the first year, then totally eliminated it by January 1993.

4. Methodological Approach

This paper replicates, with some modifications, the methodology used by Harmon and Mallick (1993). They used adjusted tax revenue data for the period 1972 to 1990, then used simulated data to assess the post-reform period. This study uses actual tax revenue data compiled by the Office of Fiscal Analysis for 1976 to 2000¹. This data is divided into two sets. The first set covers the period between 1980 and 1991 to study the characteristic of the pre-reform tax structure. The second set covers the post-reform period of 1992 to 2000. By comparing the economic characteristics of these two data sets, a conclusion on the significance of the tax reform can be drawn. The study uses five measures in the evaluation:

4.1. Growth of the Tax System

The growth of individual taxes is based on the average annual growth rate of actual tax revenue, expressed as:

$$r_{i,t} = \frac{y_{i,t} - y_{i,t-1}}{y_{i,t-1}}, \quad (1)$$

where r_i is the growth rate of the individual tax i in year t ; y_t is tax revenue i in fiscal year t ; and $y_{i,t-1}$ is tax revenue i in the previous fiscal year.

¹ The real estate conveyance tax, oil company tax, fees, admissions, cabaret tax and the miscellaneous category have been excluded from the analysis either because their historical series is relatively short or because of the insignificance of these taxes relative to the total tax revenue (Harmon & Mallick, 1993). Further, to make data comparable, the transportation fund is also excluded from this analysis both in calculating the total tax revenue and budget shares because over the period 1975 to 1984 it was included by the Office of Fiscal Analysis in the total tax revenue fund, then removed from it (OFA, 2000).

The growth of the tax system is calculated as the sum of the individual growth rates weighted by the corresponding budget shares (Harmon & Mallick, 1993):

$$R = \sum_{i=1}^9 b_i \times \bar{r}_i, \quad (2)$$

where R is the growth of the tax system; b_i is the average budget share of tax i ; and \bar{r}_i is the average growth rate of tax i .

4.2. Instability of the Tax System

The variance of the annual growth rate of the actual individual taxes is the measure of instability, expressed by:

$$Var(r_{i,t}) = \frac{\sum (r_{i,t} - \bar{r}_i)^2}{n}, \quad (3)$$

where $Var(r_{i,t})$ is the variance of the tax i ; and n is the number of fiscal years included in the analysis.

The instability of the tax system is calculated as a function of the variances and covariances of the individual taxes weighted by their corresponding budget share (Harmon & Mallick, 1993):

$$Var(R) = \sum_{i=1}^9 Var(x_{i,t}) + \sum_{i \neq j} Cov(x_{t,i}, x_{j,t}), \quad (4)$$

where $Var(R)$ is the overall variance of the tax system; $Cov(x_{t,i}, x_{j,t})$ is the covariance between $x_{i,t}$ and $x_{j,t}$ for $i \neq j$ two individual taxes; and $x_{i,t} = b_i \times r_{i,t}$.

4.3. Fairness: Vertical Equity

The measure of vertical equity is the ratio of the effective tax rate for the bottom 20 percent of the income distribution to that for the top 20 percent (Harmon & Mallick (1993) used 50 percent rather than 20 percent). The vertical equity index is expressed by:

$$VEM_i = \frac{ET_L}{ET_U} , \quad (5)$$

where VEM_i is the vertical equity index for tax i ; ET_L is the effective tax rate for the lower 20 % of income distribution; and ET_U is the effective tax rate for the top 20 % of income distribution. The tax is proportional if the index equals 1. An index of less than 1 implies that the tax is progressive. An index greater than 1 implies that the tax is regressive.

The index of vertical equity of the tax system is calculated as the sum of the individual vertical equity indices weighted by the corresponding budget share (Harmon & Mallick, 1993).

$$VEM = \sum_{i=1}^9 b_i \times VEM_i , \quad (6)$$

where VEM is the overall vertical equity measure for the tax system.

4.4. Revenue Elasticity of the Tax System

The revenue elasticity of individual taxes is the percentage change in individual tax revenue divided by the percentage change in state personal income (SPI), expressed as:

$$\eta_{i,t} = \frac{\% \Delta y_i}{\% \Delta SPI} , \quad (7)$$

where $\eta_{i,t}$ is the tax elasticity for individual tax i in year t ; $\% \Delta y_i$ is the percentage change in tax i ; $\% \Delta SPI$ is the percentage change in SPI. Alternatively, it can be simplified as:

$$\eta_{i,t} = \frac{y_{i,t} - y_{i,t-1}}{SPI_t - SPI_{t-1}} \times \frac{SPI_{t-1}}{y_{t-1}} . \quad (8)$$

The elasticity of the tax system is the measure of the responsiveness of the tax revenues to changes in the SPI. It is calculated as the sum of the individual tax elasticities weighted by their corresponding budget shares, expressed by:

$$H = \sum_{i=1}^9 \bar{\eta}_i \times b_i , \quad (9)$$

where H is the elasticity of the tax system; and $\bar{\eta}_i$ is the average tax elasticity of tax i .

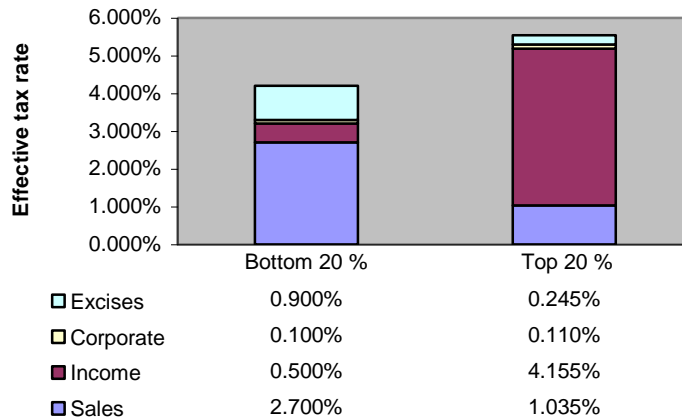
4.5. Competitiveness

Our measure of competitiveness is based on the assumption that interstate tax differences influence business location. Data on tax rates in neighboring states are compared with Connecticut's rates (see Tables 1 and 4, pages 9 and 5).

5. Characteristics of Major Connecticut Taxes (1980 - 2000)

This section sheds light on the economic characteristics of the major taxes in Connecticut’s tax system during the period of 1980 to 2000. These taxes are: sales, personal income, corporate income and other excises. Figure 2 shows the effective tax rates² for family income of non-elderly married couples from the bottom 20 percent and the top 20 percent in the year 1995 “expressed as a percentage of income” (Ettliger, 1996). These data are used to calculate the measure of vertical equity as explained earlier.

Figure 4: Effective Tax Rates for Top and Bottom 20 % of Income Distribution



² Effective tax rates are computed as the ratio of taxes paid on family incomes for non-elderly couples from the top and bottom 20% of the income distribution to their corresponding incomes. The lowest 20% income group is for family incomes less than \$41,000 per year; the top 20% income group is for those with incomes exceeding \$99,000 per year.

5.1. Sales Tax

The analysis finds that the sales tax is regressive; the vertical equity measure is 2.61. The sales tax's growth rate is 7.3% annually on average. Its variance is 52.2%, implying a moderate stability measure. The sales tax is found to be moderately elastic (1.13).

5.2. Personal Income Tax

As expected, our analysis finds that the income tax is highly progressive with a vertical equity measure of 0.12. Since it was enacted, the income tax grew at a relatively high rate of 11.5% annually on average. The income tax is found to be moderately stable with variance equal to 71.8% of its growth. The income tax is highly elastic (2.6).

5.3. Corporate Income Tax

The vertical equity measure for corporate income tax is 0.91, implying some degree of progressivity. The corporate income tax grew at 7.3% annually on average during the period of the analysis. It is also found to be highly unstable; the variance of its growth was 187.3%. The corporate income tax is inelastic (0.77).

5.4. Other Excises

Taxes on cigarettes and alcohol have similar characteristics. These two taxes are highly regressive with a vertical equity measure of 2.33. They grew at 2.5% and 2.7%, respectively. Both taxes were found to be moderately stable; their variances are 56.3%

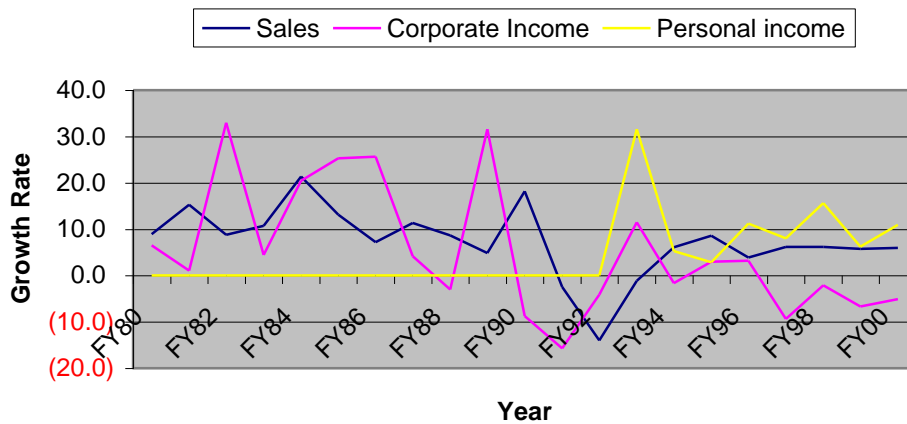
and 80.3%, respectively. Taxes on cigarettes and alcohol are inelastic (0.51 and 0.54, respectively).

Table 2: Economic Characteristics of Major Connecticut Taxes (1980-2000).

	<i>Sales</i>	<i>Income</i>	<i>Corporate</i>	<i>Cigarettes & Alcohol</i>
Vertical Equity	2.61	0.12	0.91	3.67
Tax Growth	7.3 %	11.5 %	7.3 %	2.5, 2.7 %
Tax Instability	52.2 %	71.8 %	187.3 %	56.3, 80.3 %
Revenue Elasticity	1.13	2.6	0.77	0.51, 0.54

In Figure 5, the growths of the three major taxes (sales, personal income and corporate) are compared. The figure shows that the corporate income tax was very volatile.

Figure 5: Growth of Connecticut Major Taxes



6. Overall Evaluation of The Tax Reform

As explained earlier, the measures used to evaluate the overall tax system depend on the weights (budget shares) given to each individual tax. Thus, it is worth highlighting the changes in budget shares pre- and post-reform to better understand and explain the moves in the measures used. Table 3 shows the shifts of weights between various individual taxes due to the introduction of the broad-based income tax in 1991. Since its enactment, income tax has been the largest component of the tax system, resulting in equivalent losses of budget shares of other taxes.

Table 3. Change in Budget Shares

<i>Individual Tax</i>	<i>Pre-Reform</i> <i>(1980-1991)</i>	<i>Post-Reform</i> <i>(1992-2000)</i>	<i>Change</i>
Sales	50.6 %	34.6 %	- 16 %
Corporate Income	16.6 %	9.6 %	- 7 %
Public Service Corp.	8.1 %	2.5 %	- 5.6 %
Personal Income	0 %	40.7 %	40.7 %
Capital Gains & Dividends*	9.7 %	0 %	- 9.7 %
Insurance	3.6 %	2.5 %	- 1.1 %
Inheritance	4.2 %	3.2 %	- 1 %
Cigarettes	3.1 %	1.8 %	- 1.3 %
Alcohol	1.1 %	0.6 %	- 0.5 %

- *Note: Capital gains, dividends, and interest were included in personal income post-reform.

In Table 4, the measures used in the analysis are compared between pre- and post-reform tax system.

Table 4: Overall Economic Characteristics of the Pre-and Post-Reform Tax System

	<i>Pre-reform</i>	<i>Post-reform</i>
Growth	10.77 %	5.8 %
Instability	44.1 %	25.4 %
Vertical Equity	1.94	1.29
Elasticity	1.5	1.36

Growth of the Tax System

The tax reform has decreased the overall growth of the tax system by 4.97%, from 10.77% for the pre-reform period to 5.8 % for the post-reform period.

Instability of the Tax system

The variance of the tax system (the measure of instability) was lowered significantly by 18.7%. The instability measure decreased from 44.1% for the pre-reform period to only 25.4% post-reform.

Fairness of the Tax System

The vertical equity measure significantly decreased from 1.94 for the pre-reform period to 1.29 for the post reform period, implying a fairer tax structure and less tax burden placed on the poor.

Revenue Elasticity of The Tax System

The overall revenue elasticity decreased by 0.14, from 1.5 pre-reform to 1.36 post-reform, implying a less responsiveness of tax revenues to changes in the SPI.

Competitiveness

In the late 1980s and early 1990s, Connecticut was especially concerned about the attractiveness of its business climate. Indeed, it was one of the factors that prompted the tax reform of 1991. The measure of the competitiveness used in this study is the assumption that interstate tax differences influence business location. In Table 5, the major three taxes in Connecticut and its neighboring states are compared just after the Connecticut tax reform of 1991.

Table 5: Tax Rates of Connecticut and its Neighboring States, 1992.

<i>State</i>	<i>Sales Tax</i>	<i>Personal Income Tax</i>	<i>Corporate Income Tax</i>
Connecticut	6	4.5	12.65
Massachusetts	5	6.25	Not Comparable
New Jersey	6	2 – 7	9.84
New York	7 – 8.2	4 – 7.8	10.35
Rhode Island	7	4.1 – 8.5	12.21

Source: Harmon & Mallick (1993), taken from ACIR (annually).

As described earlier (see p.7), the pre-reform Connecticut taxes on sales and corporate income were the highest in the nation. Comparison of Table 5 with Table 1 demonstrates that tax reform generated greater similarity of tax rates between Connecticut and its neighboring states. This sheds light on issues other than taxes in Connecticut's efforts to create a healthy business climate, for instance, skilled labor. State and local taxes were traditionally viewed as the major challenge facing Connecticut's businesses. However, a survey conducted in 1999, compiled by the Connecticut Business and Industry Association and the accounting firm Arthur Anderson, found that labor costs and a lack of qualified workers are now the two biggest problems facing Connecticut's businesses, pushing corporate taxes to the third place (Keating, 1999 b).

7. Results Comparison

In this section, the Findings of this study are compared with those by Harmon and Mallick (1993). Both Studies agree that the tax reform of 1991 stabilize the growth of the tax system and improve the measure of vertical equity. However, the growth of the tax system in Harmon and Mallick was found to be increased moderately for the post-reform period contrary to the findings of this study that the growth was decreased (see Table 4, p. 21). An explanation to this is firstly due to the fact that Harmon and Mallick (1993) used simulated data to assess the post-reform period, while this study used the available actual data from 1992 to 2000 post-reform. Secondly, even for the pre-reform period, there still some differences in the findings. This is because Harmon and Mallick used the adjusted tax revenue to calculate the growth and variance of the various taxes. This study does not see any reason to use the adjusted tax revenue; in stead it uses the actual tax revenue.

Conclusion

There is a misconception that reduction of the regressivity of the tax system would be at the expense of the tax system's attractiveness: if wealthy people pay lower effective tax rates than lower-income people, they may be induced to increase the level of their investment (Ettliger, 1996). However, Connecticut's experience does not support this claim. This study found that Connecticut's tax reform in 1991 significantly improved the overall fairness of the tax system on the one hand, on the other hand generating a similarity of tax rates between Connecticut and its neighboring states that led to a more attractive business climate. This study also found that the diversification in sources of tax revenues brought about by the tax reform helped smooth the growth of the tax system. Though the growth of the tax system decreased, its stability was greatly improved, providing a tax structure more immune to fluctuations in economic conditions. The study gives grounds for confidence that the 1991 tax reform achieved the objectives that shaped the debate over its enactment.

References

- Ettliger, M. P. et al. "Who Pays? A distributional Analysis of the Tax System in All 50 States." Washington, D.C.: Citizens for Tax Justice & The Institute on Taxation and Economic Policy, 1996.
- Harmon, O. R., and R. Mallick. "An economic assessment of Connecticut's recent tax reform." *State Tax Notes* (August, 1993) 256-260.
- Keating, Christopher. "Rich Pay Whopping Share of Income Tax Tab Raging Economy, State Efforts Ease Burden on Poor." *The Hartford Courant*, May 25, 1999.
- "State's Attractiveness Improves in Survey" *The Hartford Courant*, September 17, 1999.
- Rapoport, Miles S. "Winning With Tax reform." *The American Prospect* vol. 4 no. 12, January 1, 1993.
- State of Connecticut, Office of Fiscal Analysis. Connecticut Revenue, Budget and Economic Data: Fiscal Years 1972-2000 (Connecticut General Assembly, Hartford, Conn.).
- Saez, Emmanuel, "The Effect of Marginal Tax Rates on Income: A Panel Study of 'Bracket Creep.'" *Journal of Public Economics* 1 (2001).
- Sillamaa, M. A., and M. R Veall. "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1998 Tax Flattening in Canada." *Journal of Public Economics* 80 (2001) 341-356.

- Tannenwald, Robert, "State Business Tax Climate: How Should It be Measured and How Important is It?" *New England Economic Review*, (January 1996).

- Connecticut General Assembly, Task Force on State Tax Revenue, Summary: Tax Reform in Other States, (Hartford, Conn.), 2002.

APPENDIECES

Appendix 1

Growth and variance of Pre-and post-reform individual taxes

	Sales				Corporate Income			
	y1	r1	e1	b1	y2	r2	e2	b2
Year								
FY72	358.40			42.57	122.70			14.57
FY73	465.90	29.99		46.93	138.60	12.96		13.96
FY74	451.40	-3.11		47.95	140.20	1.15		14.89
FY75	425.50	-5.74		50.24	140.00	-0.14		16.53
FY76	542.90	27.59		52.54	143.20	2.29		13.86
FY77	583.70	7.52		49.29	201.70	40.85		17.03
FY78	654.20	12.08		52.23	199.60	-1.04		15.94
FY79	742.80	13.54		52.95	231.10	15.78		16.47
FY80	808.90	8.90	0.64	52.76	246.10	6.49	0.47	16.05
FY81	932.70	15.30	1.27	52.66	248.70	1.06	0.09	14.04
FY82	1014.60	8.78	1.12	50.63	330.70	32.97	4.20	16.50
FY83	1123.10	10.69	1.57	50.92	345.50	4.48	0.66	15.66
FY84	1362.90	21.35	1.80	49.65	416.10	20.43	1.72	15.16
FY85	1542.00	13.14	1.77	49.51	521.30	25.28	3.40	16.74
FY86	1652.60	7.17	0.95	48.51	654.80	25.61	3.39	19.22
FY87	1840.60	11.38	1.13	48.20	681.90	4.14	0.41	17.86
FY88	2000.30	8.68	0.83	51.59	661.30	-3.02	-0.29	17.06
FY89	2097.60	4.86	0.62	48.15	870.00	31.56	4.03	19.97
FY90	2479.00	18.18	4.76	51.61	794.10	-8.72	-2.29	16.53
FY91	2417.80	-2.47	-5.31	53.40	669.00	-15.75	-33.88	14.78
Average		10.50	1.50	50.63		10.38	1.44	16.63
Variance		35.63				243.12		
FY92	2080.20	-13.96	-2.27	37.43	641.40	-4.13	-0.67	11.54
FY93	2056.20	-1.15	-0.35	33.85	715.20	11.51	3.49	11.77
FY94	2181.50	6.09	2.02	34.24	703.50	-1.64	-0.54	11.04
FY95	2368.10	8.55	1.89	34.72	724.70	3.01	0.66	10.63
FY96	2460.10	3.88	0.80	33.85	748.10	3.23	0.67	10.29
FY97	2611.50	6.15	0.95	34.54	677.90	-9.38	-1.45	8.97
FY98	2772.10	6.15	0.85	33.81	663.70	-2.09	-0.29	8.10
FY99	2932.20	5.78	1.36	34.48	619.50	-6.66	-1.57	7.29
FY00	3106.80	5.95	0.90	34.35	587.80	-5.12	-0.77	6.50
Average		3.05	0.68	34.58		-1.25	-0.05	9.57
Variance		42.50				35.61		

only during 1980-1991

During 1992-2002

Note: y1= sales tax, y2 corporate income tax, y3 public service corporation, y4 personal income tax y5 capital gains, interest and dividends, y6 insurance, y7 inheritance tax, y8 cigarettes tax and y9 alcohol tax.

r, e, and b are the corresponding growth rate, tax elasticity and budget share for the individual tax *i*, respectively.

	Public Service Corporation				Personal Income			
	y3	r3	e3	B3	y4	r4	e4	b4
Year					0.00			
FY72	52.90			6.28	0.00			0.00
FY73	61.70	16.64		6.22	0.00	0.00		0.00
FY74	68.70	11.35		7.30	0.00	0.00		0.00
FY75	82.80	20.52		9.78	0.00	0.00		0.00
FY76	92.70	11.96		8.97	0.00	0.00		0.00
FY77	131.20	41.53		11.08	0.00	0.00		0.00
FY78	108.30	-17.45		8.65	0.00	0.00		0.00
FY79	122.60	13.20		8.74	0.00	0.00		0.00
FY80	146.30	19.33	1.39	9.54	0.00	0.00		0.00
FY81	175.30	19.82	1.65	9.90	0.00	0.00		0.00
FY82	218.20	24.47	3.12	10.89	0.00	0.00		0.00
FY83	233.90	7.20	1.06	10.60	0.00	0.00		0.00
FY84	259.80	11.07	0.93	9.46	0.00	0.00		0.00
FY85	290.70	11.89	1.60	9.33	0.00	0.00		0.00
FY86	269.40	-7.33	-0.97	7.91	0.00	0.00		0.00
FY87	253.20	-6.01	-0.60	6.63	0.00	0.00		0.00
FY88	254.80	0.63	0.06	6.57	0.00	0.00		0.00
FY89	263.00	3.22	0.41	6.04	0.00	0.00		0.00
FY90	278.40	5.86	1.53	5.80	0.00	0.00		0.00
FY91	182.10	-34.59	-74.38	4.02	0.00	0.00		0.00
Average		4.63	0.93	8.06	0.00	0.00		0.00
Variance		229.62						
FY92	180.90	-0.66	-0.11	3.25	1817.60			32.70
FY93	185.00	2.27	0.69	3.05	2392.00	31.60	9.60	39.37
FY94	187.60	1.41	0.47	2.94	2517.70	5.26	1.74	39.52
FY95	185.50	-1.12	-0.25	2.72	2589.90	2.87	0.63	37.97
FY96	192.00	3.50	0.73	2.64	2879.40	11.18	2.31	39.62
FY97	179.40	-6.56	-1.02	2.37	3110.90	8.04	1.24	41.14
FY98	170.40	-5.02	-0.69	2.08	3596.20	15.60	2.15	43.87
FY99	167.70	-1.58	-0.37	1.97	3820.80	6.25	1.47	44.93
FY00	166.30	-0.83	-0.13	1.84	4238.20	10.92	1.65	46.85
Average		-0.96	-0.08	2.54		11.46	2.60	40.66
Variance		9.37				71.80		

	C. G., Dividends, and Interest				Insurance			
	y5	r5	e5	b5	y6	r6	e6	b6
Year								
FY72	60.90			7.23	51.80			6.15
FY73	50.80	-16.58		5.12	56.70	9.46		5.71
FY74	18.70	-63.19		1.99	44.10	-22.22		4.68
FY75	13.60	-27.27		1.61	34.00	-22.90		4.01
FY76	50.40	270.59		4.88	44.20	30.00		4.28
FY77	59.30	17.66		5.01	49.00	10.86		4.14
FY78	75.60	27.49		6.04	51.70	5.51		4.13
FY79	83.50	10.45		5.95	56.30	8.90		4.01
FY80	101.00	20.96	1.51	6.59	62.00	10.12	0.73	4.04
FY81	117.80	16.63	1.38	6.65	67.00	8.06	0.67	3.78
FY82	137.70	16.89	2.15	6.87	72.40	8.06	1.03	3.61
FY83	183.70	33.41	4.91	8.33	77.80	7.46	1.10	3.53
FY84	289.50	57.59	4.84	10.55	82.30	5.78	0.49	3.00
FY85	302.40	4.46	0.60	9.71	92.80	12.76	1.72	2.98
FY86	317.30	4.93	0.65	9.31	115.40	24.35	3.23	3.39
FY87	467.80	47.43	4.71	12.25	140.30	21.58	2.14	3.67
FY88	386.30	-17.42	-1.66	9.96	151.10	7.70	0.73	3.90
FY89	508.60	31.66	4.04	11.67	176.00	16.48	2.10	4.04
FY90	624.70	22.83	5.98	13.01	170.50	-3.13	-0.82	3.55
FY91	520.50	-16.68	-35.87	11.50	174.30	2.23	4.79	3.85
Average		18.56	2.65	9.70		10.12	1.19	3.61
Variance		475.08				54.93		
FY92	159.00	-69.45	-11.29	2.86	166.20	-4.65	-0.76	2.99
FY93		-100.00		0.00	157.90	-4.99	-1.52	2.60
FY94				0.00	170.90	8.23	2.73	2.68
FY95				0.00	176.80	3.45	0.76	2.59
FY96				0.00	167.90	-5.03	-1.04	2.31
FY97				0.00	193.10	15.01	2.32	2.55
FY98				0.00	192.80	-0.16	-0.02	2.35
FY99				0.00	196.20	1.76	0.42	2.31
FY00				0.00	201.20	2.55	0.38	2.22
Average		-18.83		0.32		1.80	0.36	2.51
Variance						39.71		

	Inheritance				Cigarettes			
	y7	r7	e7	b7	y8	r8	e8	b8
Year								
FY72	49.70			5.90	68.22			8.10
FY73	64.20	29.18		6.47	69.94	2.52		7.05
FY74	53.90	-16.04		5.73	72.40	3.52		7.69
FY75	46.00	-14.66		5.43	70.22	-3.01		8.29
FY76	45.20	-1.74		4.37	77.36	10.18		7.49
FY77	48.70	7.74		4.11	74.82	-3.29		6.32
FY78	48.90	0.41		3.90	76.18	1.81		6.08
FY79	53.00	8.38		3.78	76.35	0.22		5.44
FY80	54.80	3.40	0.24	3.57	75.79	-0.73	-0.05	4.94
FY81	67.40	22.99	1.91	3.81	74.32	-1.94	-0.16	4.20
FY82	79.20	17.51	2.23	3.95	74.30	-0.03	0.00	3.71
FY83	77.50	-2.15	-0.32	3.51	73.75	-0.73	-0.11	3.34
FY84	111.20	43.48	3.66	4.05	89.83	21.80	1.83	3.27
FY85	125.30	12.68	1.71	4.02	89.33	-0.55	-0.07	2.87
FY86	153.30	22.35	2.96	4.50	87.72	-1.81	-0.24	2.57
FY87	177.30	15.66	1.56	4.64	88.74	1.17	0.12	2.32
FY88	181.20	2.20	0.21	4.67	87.46	-1.44	-0.14	2.26
FY89	194.00	7.06	0.90	4.45	98.14	12.21	1.56	2.25
FY90	164.00	-15.46	-4.05	3.41	120.90	23.19	6.08	2.52
FY91	274.30	67.26	144.63	6.06	115.70	-4.30	-9.25	2.56
Average		16.41	1.00	4.22		3.90	0.80	3.07
Variance		435.96				84.13		
FY92	198.30	-27.71	-4.50	3.57	121.30	4.84	0.79	2.18
FY93	230.20	16.09	4.89	3.79	118.10	-2.64	-0.80	1.94
FY94	207.70	-9.77	-3.24	3.26	124.80	5.67	1.88	1.96
FY95	200.50	-3.47	-0.76	2.94	131.80	5.61	1.24	1.93
FY96	247.40	23.39	4.84	3.40	126.40	-4.10	-0.85	1.74
FY97	228.00	-7.84	-1.21	3.02	126.60	0.16	0.02	1.67
FY98	279.20	22.46	3.09	3.41	127.20	0.47	0.07	1.55
FY99	237.60	-14.90	-3.51	2.79	123.30	-3.07	-0.72	1.45
FY00	228.10	-4.00	-0.60	2.52	122.00	-1.05	-0.16	1.35
Average		-0.64	-0.11	3.19		0.66	0.16	1.75
Variance		275.69				13.08		

				(w/o m fuels)	Income	
Year						
FY72	24.10			2.86	842.00	
FY73	24.20	0.41		2.44	992.70	
FY74	24.70	2.07		2.62	941.40	
FY75	24.20	-2.02		2.86	846.90	
FY76	26.50	9.50		2.56	1033.30	
FY77	24.30	-8.30		2.05	1184.30	
FY78	25.20	3.70		2.01	1252.50	
FY79	25.30	0.40		1.80	1402.90	
FY80	25.60	1.19	0.09	1.67	1533.10	38725.931
FY81	25.40	-0.78	-0.07	1.43	1771.12	43379.827
FY82	26.00	2.36	0.30	1.30	2003.90	46781.651
FY83	27.10	4.23	0.62	1.23	2205.75	49962.914
FY84	31.50	16.24	1.36	1.15	2744.89	55905.976
FY85	33.00	4.76	0.64	1.06	3114.26	60063.37
FY86	31.80	-3.64	-0.48	0.93	3406.82	64597.83
FY87	33.50	5.35	0.53	0.88	3818.58	71098.739
FY88	30.90	-7.76	-0.74	0.80	3877.32	78551.081
FY89	35.50	14.89	1.90	0.81	4356.70	84702.665
FY90	47.40	33.52	8.78	0.99	4802.90	87935.181
FY91	45.00	-5.06	-10.89	0.99	4527.60	88344.099
Average		5.44	1.18	1.10		
Variance		119.13				
FY92	43.10	-4.22	-0.69	0.78	5558.20	93778.706
FY93	43.50	0.93	0.28	0.72	6075.30	96866.466
FY94	41.70	-4.14	-1.37	0.65	6371.00	99787.807
FY95	40.50	-2.88	-0.63	0.59	6820.60	104315.124
FY96	40.40	-0.25	-0.05	0.56	7268.10	109353.546
FY97	39.70	-1.73	-0.27	0.53	7561.10	116420.559
FY98	39.80	0.25	0.03	0.49	8198.30	124880.308
FY99	40.30	1.26	0.30	0.47	8503.20	130174.951
FY00	41.00	1.74	0.26	0.45	9045.40	138795.955
Average		-1.00	-0.24	0.58		
Variance		4.75				

Appendix 2: Growth Rate of Various Individual Taxes

	r1	r2	r3	r4	r5	r6	r7	r8	r9
Pre-Reform									
FY 80	8.898761	6.490697	19.33116	0	20.99808	10.12433	3.396226	-0.72563	1.185771
FY 81	15.30473	1.056481	19.82228	0	16.63366	8.064516	22.9927	-1.94477	-0.78125
FY 82	8.780959	32.97145	24.47233	0	16.89304	8.059701	17.50742	-0.03229	2.362205
FY 83	10.69387	4.475355	7.195234	0	33.40595	7.458564	-2.14646	-0.72952	4.230769
FY 84	21.35162	20.43415	11.07311	0	57.5639	5.784062	43.48387	21.79979	16.23616
FY 85	13.1411	25.28238	11.89376	0	4.455959	12.7562	12.67986	-0.55326	4.761905
FY 86	7.172503	25.60905	-7.32714	0	4.927249	24.35345	22.34637	-1.8123	-3.63636
FY 87	11.37601	4.138668	-6.01336	0	47.43145	21.57712	15.65558	1.166277	5.345912
FY 88	8.676519	-3.02097	0.631912	0	-17.422	7.69779	2.199662	-1.43569	-7.76119
FY 89	4.86427	31.55905	3.21821	0	31.69333	16.47915	7.064018	12.20959	14.88673
FY 90	18.18268	-8.72414	5.855513	0	22.82737	-3.125	-15.4639	23.18759	33.52113
FY 91	-2.46874	-15.7537	-34.5905	0	-16.68	2.228739	67.2561	-4.30108	-5.06329

Post-Reform

	r1	r2	r3	r4	r5	r6	r7	r8	r9
FY92	-13.9631	-4.12556	-0.65898	0	-69.4524	-4.64716	-27.7069	4.840104	-4.22222
FY93	-1.15374	11.50608	2.266446	31.80211	-100	-4.99398	16.08674	-2.63809	0.928074
FY94	6.093785	-1.63591	1.405405	5.256017	0	8.233059	-9.77411	5.673158	-4.13793
FY95	8.553747	3.013504	-1.1194	2.867697	0	3.452311	-3.46654	5.608974	-2.8777
FY96	3.884971	3.228922	3.504043	11.17804	0	-5.03394	23.39152	-4.09712	-0.24691
FY97	6.154221	-9.38377	-6.5625	8.039869	0	15.00893	-7.84155	0.158228	-1.73267
FY98	6.149722	-2.0947	-5.01672	15.59999	0	-0.15536	22.45614	0.473934	0.251889
FY99	5.775405	-6.65964	-1.58451	6.245481	0	1.763486	-14.8997	-3.06604	1.256281
FY00	5.954573	-5.11703	-0.83482	10.92441	0	2.54842	-3.99832	-1.05434	1.738973

Appendix 3: Growth Rate of the Individual Taxes Weighted by their Corresponding Budget Shares

Pre-Reform									
	x1	x2	x3	x4	x5	x6	x7	x8	x9
FY 80	4.502773	1.077456	1.565824	0	2.032934	0.364476	0.142642	-0.02249	0.013043
FY 81	7.744196	0.175376	1.605605	0	1.613465	0.290323	0.965693	-0.06029	-0.00859
FY 82	4.443165	5.473261	1.982259	0	1.638625	0.290149	0.735312	-0.001	0.025984
FY 83	5.411098	0.742909	0.582814	0	3.240378	0.268508	-0.09015	-0.02262	0.046538
FY 84	10.80392	3.392069	0.896922	0	5.586609	0.208226	1.826323	0.675794	0.178598
FY 85	6.649395	4.196876	0.963395	0	0.432228	0.459295	0.532554	-0.01715	0.052381
FY 86	3.629287	4.251103	-0.5935	0	0.477943	0.876724	0.938547	-0.05618	-0.04
FY 87	5.756263	0.687019	-0.48708	0	4.600851	0.776776	0.657534	0.036155	0.058805
FY 88	4.390318	-0.50148	0.051185	0	-1.68893	0.27712	0.092386	-0.04451	-0.08537
FY 89	2.461321	5.238802	0.260675	0	3.070955	0.59325	0.296689	0.378497	0.163754
FY 90	9.200439	-1.44821	0.474297	0	2.214255	-0.1125	-0.64948	0.718815	0.368732
FY 91	-1.24918	-2.61511	-2.80183	0	-1.61796	0.080235	2.824756	-0.13333	-0.0557
Post-Reform									
	x1	x2	x3	x4	x5	x6	x7	x8	x9
FY92	-4.83124	-0.39605	-0.01647	0	-0.20836	-0.11618	-0.88662	0.087122	-0.02533
FY93	-0.39919	1.104584	0.056661	12.86206	-0.3	-0.12485	0.514776	-0.04749	0.005568
FY94	2.108443	-0.15705	0.035135	2.138792	0	0.205826	-0.31277	0.102117	-0.02483
FY95	2.959597	0.289296	-0.02799	1.167153	0	0.086308	-0.11093	0.100962	-0.01727
FY96	1.3442	0.309977	0.087601	4.549461	0	-0.12585	0.748529	-0.07375	-0.00148
FY97	2.129361	-0.90084	-0.16406	3.272227	0	0.375223	-0.25093	0.002848	-0.0104
FY98	2.127804	-0.20109	-0.12542	6.349195	0	-0.00388	0.718596	0.008531	0.001511
FY99	1.99829	-0.63932	-0.03961	2.541911	0	0.044087	-0.47679	-0.05519	0.007538
FY00	2.060282	-0.49123	-0.02087	4.446236	0	0.06371	-0.12795	-0.01898	0.010422

Note: $x_i = n^i \cdot b_i$

Appendix 4: Var-Cov Matrix

Pre-Reform		x1	x2	x3	x4	x5	x6	x7	x8	x9
x1	9.12156									
x2	0.776944	6.699355								
x3	2.283983	1.475586	1.506562607							
x4	0	0	0	0						
x5	3.808866	1.713286	1.000781013	0	4.470050003					
x6	-0.17473	0.376336	-0.020850761	0	0.084448499	0.071191				
x7	-0.9124	-0.16968	-0.565868395	0	-0.289747047	-0.00276	0.769032			
x8	0.52511	0.063467	0.060383507	0	0.3434493	-0.02739	-0.05001	0.08085		
x9	0.208839	0.013386	0.032576108	0	0.144905687	-0.01167	-0.04063	0.031224	0.014414	

Variance (X) **44.08868**

Post-Reform

	x1	x2	x3	x4	x5	x6	x7	x8	x9
x1	5.08765								
x2	-0.12	0.328155							
x3	-0.03839	0.029489	0.005854119						
x4	0.474639	1.34132	0.059440995	12.72278					
x5	0.18476	-0.03444	-0.0002856814	-0.19447	0.011633184				
x6	0.190523	-0.05404	-0.00731728	-0.19068	0.0093889276	0.02482			
x7	0.45211	0.177323	0.007740406	1.328013	0.002211468	-0.02747	0.282311		
x8	-0.02491	-0.00484	-0.000693549	-0.13462	0.000232289	0.003049	-0.01819	0.004238	
x9	0.009956	0.000803	-9.17539E-06	0.028641	6.03024E-05	-0.00052	0.003506	-0.00074	0.000171

Variance (X) **25.36567**