Regional Theatre: Statistical Reflections on the Bottom Line

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ABSTRACT

The purpose of this paper is to paint a statistical portrait of the current economic state of regional theatre in the United States. How have regional theatre companies fared during the 1980’s and into the 90’s? As a result of rising production costs, increased competition for audience, and widely acknowledged diminishing federal support, are these theatres now subject to the same financial strains as Broadway theatre? This study uses the SAS System to reveal trends in the bottom line of the state of representative regional theatre. In particular, PROC PLOT, PROC CORR, PROC MEANS and PROC REG are used to identify and test for the significance of trends in regional theatre in the 1980’s and 1990’s. The author concludes with comments on the ease of learning and using the SAS System.

HISTORICAL PERSPECTIVE ON REGIONAL THEATRE

Following the Louisiana Purchase in 1803, territorial limits of the United States had begun to greatly expand. Florida, Texas, the southwest and California were added by the 1840’s. As settlers began to move into these new territories, theatre, too, expanded beyond the regions of the east coast. By the 1850’s approximately thirty-five regional, resident acting companies were in existence. However, by the late 19th century these companies were undermined by touring shows featuring well-known international ‘stars’ as well as increasing production costs (resulting from the demand for scenic splendor, realistic detail and spectacular special effects). The result was the long-run policy (allowing a show to run long enough to return a profit to the company manager and any investors), as opposed to the repertory system, the reduction in the number of productions and hence the number of company members. All these factors contributed to a decline in regional theatre and the establishment of New York as the only major center of production in the U.S. This dominant hold would last through the first half of the 20th century.

Broadway, however, began to experience serious threats to its monopoly on the recreational dollar as the century progressed. Motion pictures, sporting events, and television, as well as steadily escalating ticket prices drew potential patrons away from the theatre. Consequently the number of productions on "The Great White Way" steadily declined. Hence, the move to diversity theatre in the U.S. was renewed. Off-Broadway and off-Off-Broadway was the result of producers' desire to both maintain greater freedom and daring in the selection of potential material for production as well as an attempt to cut production costs substantially. The reemergence of regional theatres was also a result of this general sensibility to diversity. In 1947, Margo Jones established an arena theatre in Dallas. Nina Vance founded the Alley Theatre in Houston, Zelda Fichandler was instrumental in starting the Arena Stage in Washington, D.C., and Jules Irving and Herbert Blau began the San Francisco Actors’ Workshop in 1952. The 1960’s saw the greatest expansion of theatre outside New York City since the 19th century. Impetus came from the Ford Foundation, which, in 1959, began giving substantial grants to small companies across the country deemed to be doing exciting work of high artistic merit. The National Endowment of the Arts (NEA) was established in 1965 to also lend financial assistance to artistic pursuit. Other important regional, not-for-profit (not solely dependent upon ticket sales for survival, but rather federal, state and municipal grants, corporate sponsorship, private donors etc.) include the Guthrie Theatre and the Yale Repertory Company, The American Repertory Theatre at Harvard University, the Actors Theatre of Louisville, The Long Warf Theatre in New Haven, the Mark Tapor Theatre in Los Angeles and the Missouri.

ANALYSIS OF REGIONAL DATA USING PROC PLOT: GUTHRIE THEATRE, MINNEAPOLIS MINNESOTA

The initial data used for this paper is operational revenue and expenses for the Arena Stage Theatre in Washington, D.C. and the Guthrie Theatre Foundation in Minneapolis. [additional data will be used for the final paper]. The following plots present a time series of relevant revenue and expense variables used for the analysis.

The revenue variables used to analyze the Guthrie Theatre are mainstage revenue, grants/gifts revenue, endowment revenue and total revenue. The expenditure variables used are physical production expense and total expense.

Following is a plot of total revenue and total expenditure using PROC PLOT. This graph shows the total revenue and total expenditure of the Guthrie Theatre from 1986 to 1995. [For the final paper, PROC GPLOT will be used and the number of plots will be more succinctly summarized ]

Plot of TR*YEAR. Symbol used is ‘r’.
Plot of TE*YEAR. Symbol used is ‘e’.
R | 13000000 | 12000000 | 11000000 | 10000000 | 9000000 | 8000000 | 86 87 88 89 90 91 92 93 94 95 Year
| e | e | e | r | r | e | e | e | r | r | e

Plot of MARK*YEAR. Symbol used is ‘m’.
Plot of ENDON*YEAR. Symbol used is ‘n’.
MAIN
14000000 | 12000000 | 10000000 | 8000000 | e | e | e | e | e | e | e

Plot of MARK*YEAR. Symbol used is ‘m’.
Plot of ENDON*YEAR. Symbol used is ‘n’.
MAIN
14000000 | 12000000 | 10000000 | 8000000 | e | e | e | e | e | e | e

Plot of MARK*YEAR. Symbol used is ‘m’.
Plot of ENDON*YEAR. Symbol used is ‘n’.
The following regression model was estimated for the Guthrie variables.

Another important source of revenue is the amount of grants and gifts given to the theatre. Following is a graph of the amount of grant money over time.

Theabove graph overlays the relationship between mainstage revenue, total revenue and endowment income.

Following is a plot of mainstage revenue per total revenue and endowment revenue per total revenue. This graph illustrates the trend of proportional revenue coming to the Guthrie Theatre due to mainstage performances and from endowments.

Theoretical Model:

The primary concern of this paper is to determine whether or not there are significant trends in relevant revenue and expenditure variables for representative regional theatres. The SAS procedure PROC REG was used to estimate and forecast the trend of these variables.

The following regression model was estimated for the Guthrie Theatre data:
$Y_i = \beta_0 + \beta_1 X_i + \mu$

where: $Y_i$ is total revenue, endowment revenue, mainstage revenue, mainstage revenue divided by total revenue, and endowment revenue divided by total revenue

$X_i$ is Year

$\mu_i$ is Random error term with usual properties

An analysis of these regression results will allow us to determine whether or not there has been a statistically significant trend in these important financial variables over the time period of analysis.

**ANALYSIS OF EMPIRICAL RESULTS**

### Model: Mainstage Revenue

**Dependent Variable: Main**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Prob&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
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<td>885427760485</td>
<td>885427760485</td>
<td>2.378</td>
<td>0.1616</td>
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<tr>
<td>Error</td>
<td>8</td>
<td>3.8634756E12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C Total</td>
<td>9</td>
<td>3.8634756E12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | -5328081 | 6082484.8866| -0.876                | 0.4066 |  |
| YEAR    | 1  | 103598   | 67175.953259| 1.542                 | 0.1616 |  |

### Model: Total Revenue

**Dependent Variable: TR**

<table>
<thead>
<tr>
<th>Source</th>
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<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Prob&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1</td>
<td>9.0776505E12</td>
<td>9.0776505E12</td>
<td>19.044</td>
<td>0.0024</td>
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<tr>
<td>Error</td>
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<td>3.8132987E12</td>
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<tr>
<td>C Total</td>
<td>9</td>
<td>1.2890949E13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | -20106427| 6882490.8520| -2.921                | 0.0193 |  |
| YEAR    | 1  | 331711   | 76011.349374| 4.364                 | 0.0024 |  |

### Model: Grants

**Dependent Variable: GRANTS**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Prob&gt;F</th>
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<tbody>
<tr>
<td>Model</td>
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<tr>
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<td>8</td>
<td>3.5545269E12</td>
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<tr>
<td>C Total</td>
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<td>1.1.370381E12</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | -6151777 | 1824703.0524| -3.371                | 0.0098 |  |
| YEAR    | 1  | 102632   | 20152.317554| 5.093                 | 0.0009 |  |

### Model: Mainstage Revenue / Total Revenue

**Dependent Variable: MAINPER**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Prob&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
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<td>0.00128</td>
<td>0.00128</td>
<td>1.158</td>
<td>0.3132</td>
</tr>
<tr>
<td>Error</td>
<td>8</td>
<td>0.000885</td>
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<td></td>
<td></td>
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<tr>
<td>C Total</td>
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<td>0.001015</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | 0.764337 | 0.33152598| 2.306                | 0.0500 |  |
| YEAR    | 1  | -0.003390| 0.00178016| -1.076               | 0.3132 |  |

### Model: Endowment Revenue / Total Revenue

**Dependent Variable: ENDOWPER**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Prob&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.01493</td>
<td>57.096</td>
<td>0.0001</td>
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<tr>
<td>Error</td>
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<td>0.002026</td>
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<tr>
<td>C Total</td>
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<td>0.002026</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | -1.115458| 0.16118534| -6.900                | 0.0001 |  |
| YEAR    | 1  | 0.013451  | 0.00176016| 7.556                | 0.0001 |  |

### Model: Mainstage Revenue / Endowment Revenue

**Dependent Variable: GRPERTR**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
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<td>8.1909081E-6</td>
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<td>0.8968</td>
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<tr>
<td>Error</td>
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<td>C Total</td>
<td>9</td>
<td>0.000046</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameter Estimates**

| Variable | DF | Estimate | Error | T for H0: Parameter=0 | Prob > |T| |
|----------|----|----------|-------|-----------------------|--------|---|
| INTERCEP| 1  | -1.579059| 847626.10391| -15.444               | 0.0001 |  |
| YEAR    | 1  | 162965   | 9803.0671808| 16.624                | 0.0001 |  |
The following diagram presents the trend in profit over the time period.

The following diagram illustrates the cost of physical production.

Analysis of Regional Data using PROC PLOT: Arena Theatre, Washington, D.C.

The variables available for analyzing the Arena theatre are box office revenue, grants and gifts revenue, congressional funding, total income, production cost (including salaries), and total expenses. Following are plots illustrating there movement over time.
In order to see the proportional relationships over time, box office revenue, grants and gifts and the amount of congressional funding are divided by total income for the theatre. Following are the plots of these variables over time.

Plot of BOXPROP*YEAR. Symbol used is 'b'.
Plot of GRPROP*YEAR. Symbol used is 'g'.
Plot of CONGPROP*YEAR. Symbol used is 'p'.

Model: Box Office Revenue
Dependent Variable: BOX

Parameter Estimates

| Source | DF | Mean Squares | F Value | Prob>|T| |
|--------|----|--------------|---------|-----|
| Model  | 1  | 2.36329E12   | 2.36329E12 | 20.587 | 0.0001 |
| Error  | 8  | 7229921552.7 | 903740194.0 |  |  |
| Total  | 9  | 49622401240 | 49622401240 | 54.908 | 0.0001 |

Parameter Estimates

| Variable | DF | Estimate | Error | Parameter=0 | Prob>|T| |
|----------|----|----------|-------|-------------|-----|
| INTERCEP | 1  | -2710819 | 3339670.7560 | -0.812 | 0.4404 |

Model: Grants / Gifts
Dependent Variable: GRANTS

Parameter Estimates

| Source | DF | Mean Squares | F Value | Prob>|T| |
|--------|----|--------------|---------|-----|
| Model  | 1  | 34928E12   | 34928E12 | 4.482 | 0.0021 |
| Error  | 8  | 897876989787 | 112234623723 |  |  |
| Total  | 9  | 897876989787 | 112234623723 | 2.545 | 0.1493 |

Parameter Estimates

| Variable | DF | Estimate | Error | Parameter=0 | Prob>|T| |
|----------|----|----------|-------|-------------|-----|
| INTERCEP | 1  | -11374478 | 3419257.9113 | -3.327 | 0.0104 |

Model: Congressional Funding
Dependent Variable: CONGRESS

Parameter Estimates

| Source | DF | Mean Squares | F Value | Prob>|T| |
|--------|----|--------------|---------|-----|
| Model  | 1  | 588400000000 | 588400000000 | 4.519 | 0.0021 |
| Error  | 8  | 112858454776 | 13043384032 |  |  |
| Total  | 9  | 588400000000 | 588400000000 | 4.519 | 0.0021 |

Parameter Estimates

| Variable | DF | Estimate | Error | Parameter=0 | Prob>|T| |
|----------|----|----------|-------|-------------|-----|
| INTERCEP | 1  | -2710697 | 3339670.7560 | -0.812 | 0.4404 |

Analysis of Variance

Dep Mean 417386.40000 Adj R-sq 0.8569
Root MSE 30062.27194 R-square 0.8728
C.V. 7.20250

Dep Mean 2614231.50000 Adj R-sq 0.2413
Root MSE 335014.36346 R-square 0.2413
C.V. 12.81502

Dep Mean 3942488.80000 Adj R-sq 0.7152
Root MSE 342998.03674 R-square 0.7152
C.V. 8.70004

Analysis of Variance

Dep Mean 124525 3309.7472101 Adj R-sq 0.8569
Root MSE 30062.27194 R-square 0.8728
C.V. 7.20250

Dep Mean 24525 3309.7472101 Adj R-sq 0.2413
Root MSE 335014.36346 R-square 0.2413
C.V. 12.81502

Dep Mean 36035 3309.7472101 Adj R-sq 0.7152
Root MSE 342998.03674 R-square 0.7152
C.V. 8.70004

Analysis of Variance

Dep Mean 1982295412400 46829412400 Adj R-sq 0.8569
Root MSE 30062.27194 R-square 0.8728
C.V. 7.20250

Dep Mean 24525 3309.7472101 Adj R-sq 0.2413
Root MSE 335014.36346 R-square 0.2413
C.V. 12.81502

Dep Mean 24525 3309.7472101 Adj R-sq 0.7152
Root MSE 342998.03674 R-square 0.7152
C.V. 8.70004
### Analysis of Variance

**Model: Total Income**  
Dependent Variable: TOTINC  
**Source** | **DF** | **Squares** | **Square** | **F Value** | **Prob>F**  
--- | --- | --- | --- | --- | ---  
YEAR | 1 | 0.001434 | 0.00043357 | 3.307 | 0.0107  
INTERCEP | 1 | -0.077674 | 0.03925789 | -1.979 | 0.0832  

### Analysis of Variance

**Model: Ratio of Grant Income to Total Income**  
Dependent Variable: GRPROP  
**Source** | **DF** | **Squares** | **Square** | **F Value** | **Prob>F**  
--- | --- | --- | --- | --- | ---  
INTERCEP | 1 | -0.034378 | 0.19260063 | -0.178 | 0.8628  

### Analysis of Variance

**Model: Ratio of Box Office Revenue to Total Income**  
Dependent Variable: BOXPROP  
**YEAR** | 1 | 244363 | 70462.819043 | 3.468 | 0.0085  
**INTERCEP** | 1 | -14937298 | 6380096.0181 | -2.200 | 0.0590  

### Analysis of Variance

**Model: Total Expenditure**  
Dependent Variable: TOTEXP  
**YEAR** | 1 | 139140 | 44413.449383 | 3.133 | 0.0140  
**INTERCEP** | 1 | -8678321 | 4021441.0296 | -2.158 | 0.0630  

### Analysis of Variance

**Model: Model of Total Production Cost**  
**YEAR** | 1 | 250556 | 74268.008675 | 3.374 | 0.0097  
**INTERCEP** | 1 | -14694319 | 6724639.0771 | -2.185 | 0.0604  

### Parameter Estimates

**Variable DF** | **Estimate** | **Error** | **Parameter=0** | **Prob>|T|**  
--- | --- | --- | --- | ---  
**INTERCEP** | 1 | -14943419 | 6724639.0771 | -2.185 | 0.0604  
**YEAR** | 1 | 250556 | 74268.008675 | 3.374 | 0.0097  

---

### Preliminary Conclusions

The following table summarizes the results of using PROC REG with relevant revenue and income variables for the Guthrie and Arena Theatres.

<table>
<thead>
<tr>
<th>Theatre</th>
<th>Variable</th>
<th>Direction of Coefficient</th>
<th>R²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guthrie</td>
<td>Base Revenue</td>
<td>Up</td>
<td>0.2929</td>
<td>0.1616</td>
</tr>
<tr>
<td>Arena</td>
<td>Total Revenue</td>
<td>Up</td>
<td>0.7042</td>
<td>0.0024</td>
</tr>
<tr>
<td>Guthrie</td>
<td>Endowment Revenue</td>
<td>Up</td>
<td>0.8771</td>
<td>0.0001</td>
</tr>
<tr>
<td>Arena</td>
<td>Grants/Gifts</td>
<td>Up</td>
<td>0.7643</td>
<td>0.0009</td>
</tr>
<tr>
<td>Guthrie</td>
<td>Congressional Funding</td>
<td>Up</td>
<td>0.8778</td>
<td>0.0001</td>
</tr>
<tr>
<td>Arena</td>
<td>Total Income</td>
<td>Up</td>
<td>0.5672</td>
<td>0.0057</td>
</tr>
<tr>
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<td>Production Cost</td>
<td>Up</td>
<td>0.5509</td>
<td>0.0140</td>
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<td>Arena</td>
<td>Total Expenditure</td>
<td>Up</td>
<td>0.6005</td>
<td>0.0085</td>
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<tr>
<td>Guthrie</td>
<td>Box Office Revenue/Total Income</td>
<td>Up</td>
<td>0.4397</td>
<td>0.0255</td>
</tr>
<tr>
<td>Arena</td>
<td>Congressional Revenue/Total Income</td>
<td>Up</td>
<td>0.5775</td>
<td>0.0107</td>
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<tr>
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<td>Grants/Gifts</td>
<td>Up</td>
<td>0.7643</td>
<td>0.0009</td>
</tr>
<tr>
<td>Arena</td>
<td>Total Income</td>
<td>Up</td>
<td>0.2194</td>
<td>0.1721</td>
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</tbody>
</table>

The trend of most of the revenue and expenditure variables associated with regional theatre for the two data sets discussed is upward. The coefficient of determination, R², and the p-values are presented in the above table to enable us to determine the statistical significance of the trend. For the Guthrie Theatre, mainstage revenue relative to total revenue shows a downward trend. This indicates that an alternative source of revenue is becoming more important relative to total revenue such as the endowment draw and grants/gifts. For the Arena Theatre it is interesting to note that Congressional Revenue, contrary to general belief, has actually increased in absolute as well as a percent of total income.

### Notes

SAS is a registered trademark of the SAS Institute Inc. in the USA and other countries. R indicates USA registration.

### References:


data a;
input year shows main educrev support specrev grants endow tr cards;
86 8 3893000 51000 829000 939000 2515000 318000 8545000
87 7 3288000 52000 955000 1012000 2598000 373000 8288000
88 7 3766000 54300 1097600 322400 575200 9351700
89 7 4627300 63500 315600 1097600 322400 575200 10113300
90 7 3898000 89600 672400 703600 3172800 854700 10113300
91 7 4110900 105300 588600 703600 3172800 854700 10278100
92 7 3471700 87000 659900 703600 3172800 854700 10113300
93 7 3900900 48200 582000 797700 3544300 1475300 10348400
94 7 3893400 62900 690800 797700 3544300 1475300 10418000
95 9 5615800 85200 695000 990000 3607000 1600000 12593000
;
data b;
input Year art physprod peroper educexp specexp general concess comm devel finance te surdef @@;
cards;
86 1763000 1454000 418000 650000 374000 668000 1012000 1037000 577000 677000 8630000 -85000
87 1827000 1741000 328000 791000 651000 392000 907000 1059000 506000 686000 8870000 -582000
88 2261000 1818000 336500 27000 962200 402400 459100 1257000 605200 1153800 9282200 69500
89 3058500 2064600 466500 122500 475300 486000 557200 1250800 539200 1179800 10195400 -86100
90 2645000 1887700 396100 135800 1013600 528300 505100 1106400 557300 1198700 9974000 -192200
91 2659300 1857300 348000 212300 1102500 489700 507500 1124700 688700 1189900 10179900 98200
92 2658800 1856000 347000 199800 749800 591900 437400 1187100 738200 1158000 9856000 -181900
93 2810800 1993200 366900 175900 740800 827800 422200 1341900 690300 1160000 10530300 -181900
94 3030900 1976700 396500 196200 651700 649100 494000 1168900 679900 1280300 10524200 -106200
95 3697700 2515200 592100 261600 950000 645000 487700 1481200 654200 1292400 12778300 -185300

data total;
merge a b;
by year;
profit = tr - te;
mainper = main / tr;
endowper = endow / tr;
proc plot;
plot main ’year = ’m’
tr ’year = ’r’
endow ’year = ’e’ / overlay;
run;
proc reg;
model main = year;
model tr = year;
model endow = year;
run;
proc plot;
plot mainper ’year = ’m’
endowper ’year = ’e’ / overlay;
run;
proc reg;
model mainper = year;
model endowper = year;
run;
proc print data = total;
run;
proc corr;
run;
proc plot;
plot tr’year = ’r’ te ’year = ’e’ / overlay;
run;
proc plot; plot profit ’year = ’p’;
run;
proc plot;
Plot physprod ’year = ’p’;
run;
proc reg;
model physprod = year / p r cli dw;
run;
proc plot;
plot (shows main educrev support specrev grants endow tr art physprod peroper educrev specrev general concess comm devel finance te surdef ) ’year;
Run;
proc plot data = a;
plot grants ’year = ’g’;
plot grpertr ’year = ’g’;
run;
proc reg data = a;
model grants = year;
model grpertr = year;
run;
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