FISCAL IMPACT OF INDUSTRIALIZATION ON LOCAL SCHOOLS*

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IT is not difficult to understand that in most local jurisdictions the favored policy goals are high level government services and low taxes. The situation has been well defined by Kjeld Philip for a federated political and fiscal system. He states,

> The policy of the local governments is first and foremost to acquire financially agreeable citizens. Even though it cannot be calculated in detail, it is possible to reckon more or less whether a citizen is a credit or a liability financially to the local government. The latter has an interest in an influx of people who pay more than they cost. Thus the wealthy are welcome, and elderly people of independent means, who will not give rise to expenditure on schools or roads, provided their income is above the old-age pension level. Poor people, and those with many children are on the other hand not particularly welcome. Certain age-groups cost more than others. The aim is to have many in the cheap age-group. [1]

But the government unit that most directly affects the influx of people, namely through zoning and development policies, is not always the same one that provides the public services. A good example is public education, which, in terms of expenditures as well as other considerations, is a most important service. The city council or board of aldermen make many crucial decisions, which affect the demand for public education. School boards often find themselves in fiscal difficulties, some of which stem from decisions made by the city administration.[2]

It has usually been assumed that industrialization brings more in revenue than it requires in public expenditures. This contention has been based mainly on comparisons of those revenues that accrue directly from the new industrial development and the costs which are directly chargeable to it.[3] Such an analysis obviously is incomplete and thus inadequate. Nevertheless, it has been widely accepted and local and state government officials have often called for rapid economic expansion as a means of improving the fiscal health of the jurisdiction, including that of the public schools.[4]

Our plan is first to develop a conceptual framework within which we can test the contention that local industrialization improves the fiscal health of the local school district. Next we propose to attempt an empirical test. For this purpose a large metropolitan area will be used on the assumption that it has a single school district. Our final step is to present and interpret the empirical findings.

Public School Net Fiscal Resources Model

The issue of concern can be stated in precise terms as follows: will a given local industrial development add to, or subtract from, the net fiscal resources available to the public schools of a region? A positive answer will mean, for instance, that local industrial development permits a reduction in local school tax rates, while services are maintained at their existing quality (per unit served) and the price level remains unchanged.

There is actually a further question to be considered which will merely be stated in this paper. Does industrial development increase or decrease the ultimate money burden of taxes for people in the region, while services rendered by their public schools remain at the existing level? Answering the second question requires

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An investigation of the first question is carried out with the aid of the net fiscal resources status concept, and that of the second with the aid of the final fiscal residuum concept. Estimates of a region's net fiscal resources status make an understanding of the fiscal position of a region's schools possible, without reference to the individuals who bear the ultimate money burden of taxes and who are the recipients of services. The net fiscal resources status of a region's public schools is the balance between direct, indirect and income induced contributions made by all levels of government and the direct, indirect and income induced cost of public education services returned by all levels of government in the region.[5]

In the United States, county and state governments, as well as the federal government, all participate in the financing of public education in the local school districts. Each can be treated separately. Since local school boards are the single most important decision makers with regard to primary and secondary public education in the United States, this paper will focus its attention on the effect of local industrialization on the net fiscal resources status of a school district and will neglect the effect upon final fiscal residuum. However, if the equity issue were to be considered, and the effects of local industrial development on both the ultimate money burden and public school services of the region's population are included, residuum of a region's public schools, an examination of the taxes shifted and the services rendered to "foreigners," would be required.

The model is composed of two major elements — regional input-output analysis and fiscal side calculations. Regional input-output analysis is used in calculating regional employment, output, and income multipliers.[6] Indirect and income induced employment, output, and income are then estimated and translated into tax payments and public service cost estimates.

1. The decision making and fiscal unit of concern is the local school district.

2. All local school taxes are in the form of property taxes and to the extent that taxes are shifted, no major income effects result.

3. Factor prices are not bid up, because the regional economy is making adequate and full use of existing labor resources and the requirements of new industrial development are met by workers who come naturally (by migration or through becoming of employable age) into the work force.[7]

4. Local industrial development involves the instantaneous establishment of a new local industry associated with a known change in the region's final demand and technical coefficients. School facilities made necessary because of the industrial development are also established instantaneously.

5. The values obtained with the aid of the inverse matrix of the regional input-output table assume that the effects of the initial stimulus have been permitted to work themselves out.

6. During the time period under consideration, the region's industrial structure and technology, as well as the local purchase-import mix of inputs, do not change.

7. Production functions are approximately linear, and the average and marginal technical coefficients are about equal.

8. Those who find new employment as a result of the industrial development send their children to schools inside the region. The "immigrants" are typical in that they show

[7] This assumption of constant prices is necessary if the input-output coefficients are to remain unchanged. At the same time, it is desirable to examine a regional economy which is operating close to capacity and where an industrial or commercial impact will create new residential housing and new industrial and commercial plant and equipment, that will give additional property tax revenues.

Deviations from this assumption of full employment have interesting policy implications. For example, if the region has a high percentage of unemployed workers who possess skills needed in the new industrial development, the same preference for public, private, and parochial schools as does the rest of the region's population. They are also typical in that they have the same average numbers of school children and wage earners per family as the rest of the population.

The Detailed Model

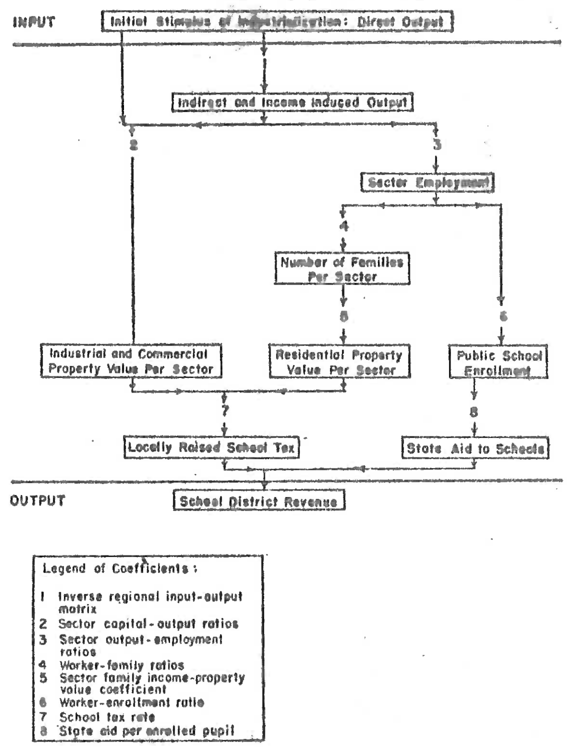
It is useful to separate the model into two submodels; one that relates the initial stimulus, in the form of industrialization, to school revenue, and one that relates it to school costs.

The revenue submodel is summarized and presented in flow chart form in Chart 1. The portion above the line constitutes the input into the system and that below the lower line, the output. The initial stimulus takes the form of additional direct output which, in turn, through a very complicated maze of interactions, can change the industrial and commercial property tax base as well as the residential tax base. The relation between direct output and industrial and commercial property tax base is depicted on the left hand side of Chart 1, and that between direct output and residential tax base, on the right. Thus the direct output plus the indirect and income induced output, which is obtained with the aid of the inverse regional input-output matrix, are multiplied by capital-output coefficients to yield estimates of changes in the industrial and commercial property tax base of each sector.

At the same time, the direct, indirect and income induced output for each sector is multiplied by sector output-employment ratios to yield sector employment estimates. The worker-family ratio is used to convert the employment figure into a number of family figures for each sector. With the aid of data on family income by sector and an income-residential property value coefficient, residential property values per family per sector were obtained. Each of these values, multiplied by the number of families per sector, yields an estimate of residential property values per sector.[8]

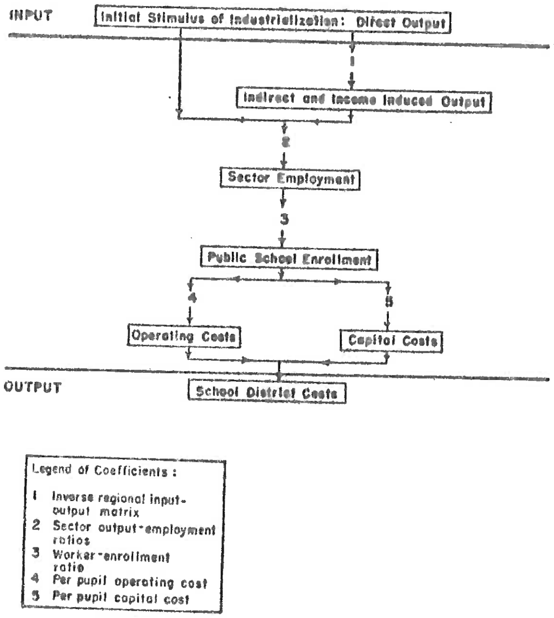
on the other, are multiplied by the prevailing school tax rate to yield an estimate of the locally raised school tax. The state school aid is added to the locally raised school tax to obtain the final estimate of the school district revenue. State aid is estimated on the lower right hand side of Chart 1; the number of workers is multiplied by a worker-enrollment ratio and the resulting enrollment is multiplied by an enrollee state aid figure.

CHART 1.—FLOW CHART OF REVENUE SIDE



The cost sub-model is presented in flow chart form in Chart 2. The initial stimulus, in the form of industrialization, generates direct, indirect and income induced sector output changes which, with the aid of sector output-employment ratios, are translated into sector employment. The ratio between employment and

CHART. 2.—FLOW CHART OF COST SIDE



Case Study: The St. Louis Standard Metropolitan Area

Because of the existence of a regional input-output table for the St. Louis Standard Metropolitan Area for 1955, this area was chosen for pilot study purposes.[9] The St. Louis SMSA in 1955 included St. Louis City, St. Louis and St. Charles counties in Missouri, and Madison and St. Clair counties in Illinois. The area is clearly delineated, since it is far removed from other metropolitan areas and is surrounded by a sparsely populated and mainly agricultural hinterland. Virtually the entire labor force both lives and works inside this area. Its 1955 population was estimated at 1.9 million, of which 840,000 lived in St. Louis City and 570,000 in St. Louis County. The Illinois counties had a population of almost 450,000. Actual expenditure and revenue data for the school year (1954–1955) were used. However, it was assumed that the entire St. Louis revenue was in the form of property taxes. Most of the remaining school revenue was provided by state grants (in Missouri, mainly in the form of lump sum grants).

We will next briefly review the nature of the information and the assumptions used to estimate changes in the industrial, commercial and residential property value, in state aid, and in cost to the local school district. The initial stimulus of industrialization was assumed to take the form of a one million dollar increase in the final demand of a specific industrial sector. In estimating the value of industrial and commercial property, capital-output ratios developed by Daniel Creamer and Robert Grosse were used.[10] The data by Creamer pertain to the United States in 1953, and the data by Grosse, to the United States in 1947, and it was assumed that they reflect the St. Louis situation in 1955.

Estimation of residential property values was aided by the following information. Employment was translated into the number of families per sector, using information from the United States Census of Population which indicated that in 1950, the St. Louis SMSA had 1.595 workers per family. Average employee income was obtained from the United States Census of Manufactures and Business, 1954. For manufacturing sectors, this information was further broken down into income of production workers as opposed to salaried employees. From the same Census, information was gained on production workers versus salaried employees per sector. With the aid of United States Census of Population information, worker income was correlated with family income in the United States. The resulting figure, 1.29, was multiplied by worker income to give family income in the St. Louis SMSA. Finally the value of residential property was estimated and related to levels of income with the aid of housing cost data published by the

Housing and Home Finance Administration which are assumed to hold for the St. Louis SMSA.[11]

School district revenue from residential, and industrial and commercial property values was determined by applying an adjusted weighted average school tax rate for the entire metropolitan area, that is, \$.58 per \$100 of market value.[12]

Information on state aid to local schools was gained from United States Office of Education publications.[13] Since more than three-fourths of the SMSA's population lived in Missouri, it was assumed that Missouri State aid would apply to the entire area. Based on the fact that Missouri paid \$75 per pupil in Average Daily Attendance and \$200 per teacher, the 1954-1955 state aid per student enrolled was estimated at \$65.

Finally, cost estimates were made for operating and capital costs. The 1950 Census of Population, together with school district figures, made estimating the number of public school children per worker possible. The St. Louis figure was found to be .347. Thus in the chemical industry sector, for example, the number of public school children that would enter the school district as a result of a one million dollar final demand increase was estimated by multiplying the number of new workers, that is, 101.25 by .347, to give an estimate of 35.13 new public school enrollees. Operating costs for 1954–1955 were found to be \$265 per student and were multiplied by 35.13 to provide an estimate of operating cost increases.

Next, per pupil capital construction costs were estimated. These estimates are based on the following assumptions:

1. Consistent with the overall capacity assumptions of this study, it is assumed that the school district has been operating at full capacity and needs to build facilities to accommodate the new students.
2. The period of capital depreciation is fifty years.
3. The period of debt servicing is fifty years.
4. The quality of school building construction falls into a middle range.
5. Repayment and debt service charges were imposed for one year only on pupils attendant during the present school year, that is, only 1/50 of the total repayment plus debt servicing cost.

Based on these assumptions, capital construction costs were computed with the aid of a study by the Connecticut Public Expenditure Council, which shows detailed square footage per pupil requirements and relates the costs per square foot for three standards of quality, "high average," "low average," and "mid-range." [14] The computations here are based on the "mid-range" figures, that is, \$16.70 per square foot at 1959 Connecticut cost level. These 1959 Connecticut costs have been deflated by using a 1959 Boston-St. Louis comparative construction cost index.[15] The 1954 St. Louis cost corresponding to a 1959 Boston cost of \$16.70 per square foot was found to be \$13.82 per square foot.

In addition, debt service charges were estimated. Assuming an interest rate of four per cent and a period of fifty years as the life of school buildings, and dividing costs evenly over the fifty-year period, capital repayment and debt service charges per year per pupil were found to be \$56. Thus the total per pupil cost was estimated to be \$321 per year.

Findings and Conclusions

Employment, income, tax base, revenue, cost and net fiscal resources impact estimates for the St. Louis SMSA in 1954–1955 are presented in Table 1 for the 16 major industrial sectors of the area on the assumption of a one million

Housing and Home Finance Administration, *13th Annual Report*, Part III (Washington, D. C., 1959), 123.

School district revenue is derived from both real and

TABLE 1. — DIRECT, INDIRECT AND INCOME INDUCED EMPLOYMENT, INCOME, PROPERTY VALUES, SCHOOL TAX REVENUES, COSTS, AND SCHOOL DISTRICT NET FISCAL RESOURCES IMPACTS OF ONE MILLION DOLLAR FINAL DEMAND CHANGES FOR EACH OF SIXTEEN INDUSTRIAL SECTORS — ST. LOUIS, MISSOURI, 1955

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Property Value Impact		School Tax Revenue Impact				School District Net Fiscal Resources Impact	
Industrial Sector	Employment Impact (Number of Employees)	Per Family Income Impact ($)	Residential Use ($000)	Industrial and Commercial Uses ($000)	Residential Property ($)	Industrial and Commercial Property ($)	Total ($)	Annual School Cost Impact ($)	Without State Aid ($)	With State Aid ($)
Food and Kindred Products	75	5860	833	493	4829	2859	7688	8364	− 676	973
Textiles and Apparel	182	4230	1594	646	9243	3748	12991	20347	−7356	−3361
Lumber and Furniture	194	5120	1882	1044	10917	6056	16973	21623	−4650	− 404
Paper and Allied Products	148	5290	1523	1101	8833	6388	15221	16541	−1320	1928
Printing and Publishing	185	5840	1939	931	11244	5399	16643	20605	−3962	100
Chemicals	101	5710	1156	1064	6706	6173	12879	11291	1588	3808
Products of Petroleum and Coal	42	6050	550	802	3188	4649	7837	4704	3133	4063
Leather and Leather Products	174	4510	1559	632	9040	3666	12706	19436	−6730	−2899
Iron and Steel	145	5480	1545	1090	8961	6323	15284	16183	− 899	2284
Non Ferrous Metals	126	5410	1324	1045	7682	6059	13741	14024	− 283	2470
Plumbing, Heating Supply	189	5250	1931	1113	11197	6457	17654	21094	−3440	710
Machinery (Non-Electric)	178	5530	1827	865	10595	5016	15611	19900	−4289	− 375
Motors and Generators	194	5500	1956	794	11346	4605	15951	21623	−5672	−1426
Motor Vehicles	81	5550	869	601	5040	3483	8523	7775	748	2525
Other Transport Equipment	123	5740	1300	754	7540	4373	11913	13663	−1750	938
Miscellaneous	171	5140	1731	1028	10039	5963	16002	19088	−3086	662
Average	144	5388	1470	875	8525	5076	13601	16016	−2415	750

ample, a one million dollar final demand increase of the St. Louis food and kindred products industry is estimated to lead to direct, indirect and income induced employment increases of 75 employees. Two industries, motors and generators, and lumber and furniture, topped the list with 194 new employees. (See column 1 of Table 1.) At the bottom are the products of the petroleum and coal industry, known for highly capital-intensive production methods. New employment generated by the first group of industries is almost five

the smallest employment impact (products of petroleum and coal) has the largest per-family impact; about $6,050. As expected, such low wage industries as textiles and apparel, and leather and leather products have the smallest income impact; $4,230 and $4,510, respectively.[16] However, income impacts appear to differ much less than employment impacts.

Columns 3 and 4 of Table 1 represent the residential, and industrial and commercial property impact, respectively. Mainly in view of its employment characteristics, the motors and coal industry with $.55 million is at the other end of the spectrum. The average is $1.47 million.

Increases in industrial and commercial property values varied relatively little among the different industries. The high was $1.1 million for the plumbing and heating supply, paper and allied products, iron and steel, and chemical industries. The low was the food and kindred products industry with $.49 million. The average was $.88 million.

In columns 5 and 6 of Table 1, the school tax revenue generated from residential and industrial and commercial property, respectively, is stated. The former varied from a high of $11,346 to a low of $3,188 and the latter from $6,457 to $2,859.

A comparison of columns 5 and 6 of Table 1 is most revealing. There can be no doubt that if full employment and full plant utilization are assumed, a given final demand increase tends to bring about a greater variation in newly generated residential than in industrial and commercial property tax receipts. The standardized range of the residential property tax increases is almost 60 per cent larger than the industrial and commercial property tax increases.

Furthermore, and this is even more significant, the increased revenue from new residential property values exceeded that from industrial and commercial property by a substantial margin. In all but one case, the increased residential property tax revenue exceeded the industrial and commercial revenue. The exception was the products of petroleum and coal industry. The ratio was more than two to one in favor of the residential property tax in five cases: textiles and apparel, printing and publishing, leather and leather products, nonelectric machinery, and motors and generators. The average revenue increase from new residential property was $8,525 and that from industrial and commercial property, $5,076.

creased property tax revenue generated by a one million dollar final demand increase. The plumbing and heating supply industry tops the list with $17,654 and the food and kindred products industry shows a low of $7,688.

Turning now to annual school costs, we find the motors and generators, and lumber and furniture industries on one end of the spectrum with an annual cost increase of $21,623, and the products of the petroleum and coal industries at the other end, with $4,704. The average was $16,016.

The last two columns are perhaps the most interesting. Column 9 of Table 1 represents the net fiscal resources status change of public schools exclusive of state aid as a result of a one million dollar final demand increase. Thus, 13 out of 16 types of industrialization led to losses. (See Table 2.) The greatest loss

TABLE 2.—NUMBER OF INDUSTRIES WITH POSITIVE, NEGATIVE OR NO NET FISCAL RESOURCES STATUS CHANGE RESULTING FROM GIVEN FINAL DEMAND INCREASE—ST. LOUIS, MISSOURI, 1955

	Without State Aid	With State Aid
Positive Net Fiscal Resources Status Change	3	10
Negative Net Fiscal Resources Status Change	13	5
No Net Fiscal Resources Status Change	0	1

Source: Table 1.

in the net fiscal resources status was incurred when industrialization took the form of textile and apparel manufacturing. In that case a one million dollar final demand increase resulted in a $7,356 deterioration of the net fiscal resources status of the district. Industrialization also led to major losses when it took the form of leather and leather products, motors and generators, and lumber and furniture in-

In order to more fully reflect the fiscal position of the school district, it is necessary to add to the locally raised revenue intergovernmental transfer payments, that is, state subsidies. (See column 10 of Table 1.) If adjustments are made for state aid, the picture changes and 10 of the 16 industries produce improvements in the net fiscal resources status of the school district, five continue to lead to a deterioration and one is about neutral, in that it leads to a change of a mere $100, not enough to warrant placing it in either of the other two groups. (See Table 2.) Even after adjusting for state aid, the net fiscal resources status of the district would have deteriorated most if the textiles and apparel industry would have expanded ($3,361 per $1 million final demand) and improved most if the products of the petroleum and coal industry would have expanded ($4,063 per $1 million final demand). Other industries contributing net fiscal losses are leather and leather products, motors and generators, lumber and furniture, and nonelectrical machinery. It can be concluded furthermore, that under the stipulated assumptions and after adjusting for state aid, a one million dollar final demand increase in each of the 16 major St. Louis industries would have led to a $750 improvement in the 1955 net fiscal resources of the school district.

What can we say about the relative order of magnitude of the net fiscal resources? The 1955 St. Louis final demand of these 16 industries amounted to about $3.3 billion. For example, a major industrial expansion of ten per cent equally distributed among the 16 industries, would have improved the schools' net fiscal resources status by $2.5 million, which is about four per cent of 1955 public school expenditures.

Let us summarize the results. The case study confirms the claim that industrialization, on the average, improves the fiscal health of

benefits from education may exceed the cost increases.

What are the reasons why some industries affect the net fiscal resources status of a school district positively and others negatively? Apparently, on the one hand, low wage industries have many employees with school age children, and yet their plants and the homes of their employees have a relatively low assessed valuation. About the opposite appears to hold for high wage, capital intensive industries, such as products of coal and petroleum. But even here the gains perhaps are smaller than expected, since parents with high incomes tend to insist on high quality education, which is costly to the school district unless private schools are preferred by parents.

It is interesting that the eight St. Louis industries which generated an employment increase in excess of 170 employees either led to net fiscal resources losses or to very small gains. There was a reasonably high negative correlation between the number of new employees generated by an industry and the school district's net fiscal resources change, excluding state aid. The rank correlation coefficient is − 0.805, which for 16 observations is statistically significant at a probability level of 0.05.

Can we estimate the net fiscal resources impact of a given type of industrialization at a time when we have only employment and income impact estimates? In other words, is there perhaps a short cut which can give us good estimates without complicated cost and revenue side calculations? Our hypothesis would be that the net fiscal resources impact is negatively correlated with the employment impact and positively with the family income impact, that is,

$$X_1 = a_{1.23} - b_{12.3}X_2 + b_{13.2}X_3;$$

where X_1 = net fiscal resources impact after adjustment for state aid, tion coefficients. With 13 degrees of freedom, these coefficients are statistically significant at a probability level of .05, if they are larger than .514. Thus, both are significant. The coefficient of multiple determination adjusted for degrees of freedom lost ($\bar{R}^2_{1.23}$) is .6363. It, too, is statistically significant at a probability level of .05.

In general, it appears that the net fiscal resources status improves the most if an industry with major income and only minor employment effects expands.

Let us now turn to the question, by what means can improvements of a district's net fiscal resources status be obtained? Three major opportunities appear to offer themselves. On the one hand, the school district can pursue a carefully planned industrial development policy in cooperation with the municipal government of the area. It would want to use its influence to pick for development those industries which promise to make major contributions to the fiscal health of the school district.

On the other hand, the school district could seek greater state and federal aid. Such a step could improve the net fiscal resources status of the school district; but depending on the way in which the aid is financed and on the income level of the school district's residents, disproportionate state and federal tax burden increases might accompany such a step. Thus, while the net fiscal resources status of the district might improve, the final fiscal residuum of its residents may decline.

Finally, a further step is zoning designed to keep out large families with low income. In practice this takes the form of zoning for single dwelling units on large lots. Regardless of the injustice that accompanies such a step, it is likely to be self-defeating in the long run. The "underprivileged" will tend to use their vote to obtain better education through a number of devices including lobbying for better education financed through progressive state and federal income taxes. Thus, this step, too, in the long run will tend to produce a deterioration of the final fiscal residuum of a district.

If we can generalize from the case study, it appears that financing public education locally will become easier, if the school board and municipal government cooperate to stimulate the kind of selective industrial development that is most consistent with the fiscal health of the school district. There is a need for better and more sophisticated research to produce improved information for joint school-municipal government decision making. Furthermore, there is a place to experiment with novel arrangements between school boards and municipal governments to assure adoption of promising development policies and their successful execution. Finally, the case study points to the possibility that local industrialization may not solve major fiscal problems of school districts. Particularly in a high income area, the residents might be better off paying higher taxes to maintain or improve education than spending time and money to bring in new industry.