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A STUDY OF THE ECONOMIC IMPLICATIONS
OF THE REFINERY PROPOSED FOR TIVERTON, RHODE ISLAND

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INTRODUCTION

The following report was prepared for the Town Council of Tiverton, Rhode Island. Tiverton is located on the east shore of Narragansett Bay and is bordered on the north and east by Massachusetts, on the south by Little Compton, Rhode Island, and on the west by the Bay. According to the 1970 Census, Tiverton had a population of 12,449, a 31 percent growth from 1960. The average population growth in Rhode Island for the same period was about seven percent. The town covers 29.6 square miles which gives a population density of 419 per square mile, less than half the Rhode Island average. Most of the land within the town's borders consists of woodlands and pastures. Residential and commercial land use is concentrated near the Bay. By road, the town is only a few minutes distance from the cities of Fall River, Providence, and Newport.

In August 1970, Northeast Petroleum Refining, Inc. proposed the construction of a 65 thousand barrel per day refinery in the northern part of Tiverton, on the Bay. The company seems to have been attracted by the existence of a sheltered, deep-water harbor which is close to railroads, highways, and major marketing centers. It is also attracted by the fact that it already has a storage terminal in Tiverton which could be readily integrated into the refinery operation. Northeast maintains that construction of the refinery could lead to lower property taxes for Tiverton residents, increased job opportunities, stimulation of local sales, and lower

fuel costs for the region. Northeast also maintains that the refinery could be built and operated without damaging the environment or causing discomfort to the residents in the immediate neighborhood. The proposed site is bordered on three sides by private homes, and on the fourth by water.

In order to permit the construction of the refinery, certain zoning ordinances would have to be altered. In September 1970 the Town Council began open hearings on the issue. The Town Council also asked the University of Rhode Island to provide assistance in gathering and analyzing pertinent information. This report was written as part of that effort.

I Purpose and Scope of Study

The town of Tiverton is presently considering the granting of a zoning variance to permit the construction of an oil refinery in North Tiverton. This report will examine the economic implications of such an action. We will consider the impact which the proposed refinery might have on local government finances, on local economic activities, and on the environment.

II Local Fiscal Impact

It would seem useful to begin the discussion of fiscal impact with a description of the present state of Tiverton town finances.¹ The 1970 census showed that Tiverton had a population of 12,449 people, which is about 3700 households. The assessed valuation of all real estate, tangible and intangible personal property in Tiverton in 1969 was about \$58.5 million. Total revenues of the town government in 1968 were about \$2.12 million, of which about 66 percent came from the property tax. Town revenues were \$193.53 per capita which ranks 24th highest of the 39 towns in Rhode Island (23 towns were higher). Town expenditures were \$183.29 per capita which ranks 29th highest, and per capita net debt was \$200.25 which ranks 24th highest in Rhode Island. The effective tax rate was \$21.64 per thousand which was 25th highest in Rhode Island. The overall picture of Tiverton, then, is that of a medium sized town with per capita town revenues, expenditures, debt, and effective tax rate somewhat below the median for Rhode Island.

It is difficult to make any absolute predictions as to how the proposed refinery would affect the condition of Tiverton's town finances. However, it is possible to look at other Rhode Island cities and towns and see how they have been affected by changes in manufacturing activity. For this purpose various types of data were collected covering all 39 Rhode Island towns for a period roughly including 1958 to 1968.²

Tests were run using these data to determine how the effective tax rates, per capita net debt, locally assessed taxes, and per capita expenditures of these 39 towns had changed over time compared to some index of change in manufacturing activity. Two indices of manufacturing activity were used. One index was the percent of the town's property tax receipts that were paid by industry. If this rose over time for some given town then it was assumed that manufacturing activity had risen. The other index was the percent of a town's total employment that was accounted for by manufacturing. If this index rose over time then it was assumed that manufacturing activity had risen in relative importance. Notice that the first index measures manufacturing activity by means of a capital index and the latter by means of a labor index. (In all tests the dependent variable was some index of town financial activity such as effective tax rate, and the independent variables were population, and one of the indices of manufacturing activity.)

The results of the tests were as follows. There was no significant relationship between the change in effective tax rates (1960-68) and either of the indices of change in manufacturing

activity. In other words, it cannot be said that, on the whole, effective tax rates either rose or fell as manufacturing activity either rose or fell. The experience of Rhode Island towns was mixed. The ambiguity of these results is quite significant. Judging from the experience of Rhode Island towns over the past decade it cannot be stated that the net effect of an increase in manufacturing activity will be either to raise or to lower a town's effective tax rate.

Tests comparing the change in per capita town debt and per capita town expenditures (1962-68) to change in manufacturing activity were similarly ambiguous. In other words, it cannot be said that either per capita debt or per capita expenditures consistently rose or fell as manufacturing activity either rose or fell. The experience of the 39 towns during this period was varied. The relevance of this is that Tiverton cannot determine, based on the past experience of other towns, whether its per capita debt or per capita expenditures would be likely to rise or to fall if the proposed refinery were constructed.

Tests comparing the change in locally assessed taxes with changes in manufacturing activity (measured by either index) showed a strong positive relationship. In other words, as manufacturing activity rose or fell, locally assessed taxes rose or fell in the same direction. This information is, in itself, of limited usefulness. The term "locally assessed taxes" refers to the amount of tax money collected by a local government within its own boundaries. There is no indication of who paid the extra taxes (whether it

came from industry or from homeowners) or how the money was spent (whether it was used to provide services to industry or to improve general services for residents). What it does indicate is that the increase in tax base associated with the increase in manufacturing activity was used to a large degree to increase the income of town governments rather than to reduce tax rates.

All of the tests described above measure changes over time. Tests were also run to determine relationships at a given point in time. Again, these tests covered all 39 towns in Rhode Island. For the year 1968 the tests showed that there was a strong positive relationship between effective tax rates and the level of manufacturing activity (measured by either index). In other words, the towns that had the highest level of manufacturing activity, also tended to have the highest effective tax rates. The tests also showed a weak, but positive, relationship between per capita town debt and manufacturing activity (as measured by the percent of employment in manufacturing index). In other words, the towns with the highest manufacturing activity tended to have the highest per capita debt. (In this last test the regression coefficient was significant at the 15 percent level. All other tests for which positive results were reported were significant at the 5 percent level or better.)

The significance of these data for Tiverton is the following. The town cannot tell from looking at the past experience of other Rhode Island towns whether its effective tax rate, per capita debt, or per capita expenditures would be likely to go up or down over time if the proposed refinery were constructed. Other Rhode Island

towns have had a varied response to changes in levels of manufacturing activity. Tiverton can tell that, if it behaved in the same way as other Rhode Island towns, it would have a rise in locally assessed taxes. The significance of this depends on who ends up paying the extra money and how it is spent. Tiverton can also tell that its neighbors with high levels of manufacturing activity generally have a higher effective tax rate and a higher net debt than its neighbors with a low level of manufacturing activity.

The above tests on the historical data show the impact that manufacturing activity has had on Rhode Island town revenues, expenditures and tax rates over the past decade. None of the manufacturing firms included in this analysis were oil refineries. Data on the impact of oil refineries on local finances are scarce and incomplete. However, we will analyze the few cases for which data have been obtained.

In 1954 a refinery was constructed in Whatcom County, Washington, near the town of Ferndale, by the Mobil Oil Company.³ Residents of Ferndale pay taxes to the Town of Ferndale, to School District #502 which includes, but is not limited to, the Town of Ferndale, and to other special tax districts such as fire and water. Assessed valuation of the Town rose \$.47 million (82 percent) between 1954 and 1955, while the assessed valuation of the School District rose nearly \$7 million (176 percent) for the same period. It cannot be determined exactly how much of this can be attributed to the refinery. The tax rate in mils for the Town of Ferndale dropped from 17.50 in 1953 to 15.00 in 1956. The rate in mils for

the School District went from 17.00 in 1953 to 19.00 in 1956. The Tax Assessor of Whatcom County has said in a sworn statement "that the aggregate tax rates of all taxing bodies during the years 1953 through 1956 in Ferndale School District No. 502 remain quite consistently at approximately 51 mils each year." In other words "that its (the refinery's) construction did not have the overall effect of lowering tax rates in that area."

From the above data it would appear that total tax payments by Ferndale taxpayers to the City of Ferndale and the Ferndale School District rose nearly 30 percent from 1953 to 1956, but tax rates did not go down. In other words, the benefit of the increased tax base was taken in the form of higher tax revenues, rather than lower tax rates. There is no definite information as to whether this extra revenue was used to pay the costs of servicing the new additions to the tax base (among which was the refinery) or to expand and improve government services. In either case, the windfall of the increased tax base was apparently used to increase expenditures rather than lower the tax rates.

Another refinery on which some data is available is the Humble Oil facility in Benecia, California.⁴ This refinery has a capacity of about 72 thousand barrels per day and cost over \$150 million dollars to build. It is evaluated at about \$44 million or about 28 percent of construction costs. Construction of the refinery raised the town's tax base from \$8 million to \$52 million, or 550 percent. Tax rates dropped from about \$9.94 per hundred before the refinery to about \$7.89 per hundred after, or about 21 percent. These tax rates are a composite of taxes paid by Benecia property owners to the town, the county, and the school district. Based on

the above data, revenue paid to these taxing bodies by Benecia taxpayers rose from \$.8 million before the refinery to \$4.1 million after the refinery. Some of these new receipts are held as surplus but most are spent, indicating that expenditures of the combined taxing bodies has increased greatly. Some of this increase in expenditures probably goes to providing direct and indirect services to the refinery and its employees. Much of it has gone into improving governmental services in the form of a larger police force, new police cars, a city planner, and increased recreation expenditures. Notice that Benecia has chosen to "spend" about 28 percent of the potential benefits of the increased tax base on lowering tax rates and the remaining 72 percent on increased revenues. (By keeping the old tax rates they could have had \$5.7 million in tax revenues after the refinery, but they lowered tax rates and received \$4.1 million, giving up the other \$1.6 million for the sake of lower tax rates. It is interesting that the major beneficiary of this reduction was the refinery itself since it captures a \$.9 million benefit from the lower tax rate. The remaining \$.7 million went to the residents of Benecia.)

Now let us look specifically at the fiscal impact that the proposed refinery might have on Tiverton. It has been stated that the refinery will cost \$50 million to construct. Let us assume that this would be considered its full fair market value. In 1968 Tiverton calculated assessed valuation at 72.14 percent of full value, which would be \$36.07 million in this case. If the refinery had been added to the tax rolls in 1968 the assessed value of all property would have been \$89.76 million (and the full market value \$124.42 million). In 1968 the actual tax rate, applied to assessed

value, was \$30 per thousand (and the effective tax rate, applied to full market value, was \$21.64 per thousand).⁵ This would yield a property tax revenue of \$1.61 million without the refinery on the tax rolls. With the refinery on the tax rolls an actual tax rate of \$17.94 per thousand (equivalent to an effective tax rate of \$12.94 per thousand) would have been necessary to raise the same \$1.61 million.

In other words, if the presence of the refinery cost the town absolutely nothing in terms of direct services, services to refinery employees who commute in, services to refinery employees who move in, loss of state aid, or loss of tax revenues from other sources (these will all be discussed later), the town could have maintained its 1968 level of revenues and expenditures with an actual tax rate of \$17.94 per thousand (or an effective tax rate of \$12.94 per thousand). This would have resulted in a savings of \$8.70 per thousand of full market value, or \$174 for the owner of a home with a full market value of \$20,000. (For a property with a full market value of x thousand dollars, multiply x times 8.70 to find what the savings would have been.)

In order to arrive at this conclusion, numerous assumptions have been made. Let us now examine these assumptions. It was assumed that the full fair market value of the refinery would be placed at \$50 million, equal to proposed construction costs. The Tiverton tax assessor should look into past experience to see if this will indeed be the case, or if full fair market value will turn out to be below construction costs. In the latter case, potential benefits would be reduced. The tax assessor should also determine

whether the assessed value will decrease over time as the book value of the refinery depreciates. Finally, the tax assessor should determine what would happen to assessed value if the refinery were to cease operations at some future date. To protect against any dangers from such an eventuality, it might be useful to request that Northeast post a bond sufficient to permit razing of the refinery and return of the land to alternative use in the case that production were permanently terminated sometime in the future.

In the above analysis it was also assumed that the refinery imposed no costs upon the town government. In practice it seems likely that a refinery would impose costs on government in several ways. The most obvious category of demands are those for direct services. A refinery needs water, sewage disposal facilities, fire protection, police protection, roads, and other general services. Northeast has testified that it will provide its own water, sewage, and fire protection services. The Town Council should verify that this will be done and that it will impose no costs on the town. In other areas such as improving roads, traffic control, and police services, the town will bear the capital costs and the costs of annual operations and maintenance.

Aside from demands for direct services, the refinery is likely to give rise indirectly to demands for a whole range of general services. These would be services to employees of the refinery. As will be discussed later, it is likely that a substantial portion of the refinery's work force would consist of individuals commuting in from other communities. These people would demand mostly traffic services. This could require improvement and widening of roads, installation of new traffic control devices, and expansion of the

traffic control arm of the town police force. The individuals demanding these services would not be paying any form of taxes in Tiverton.

It is also likely that a number of the individuals employed at the refinery would move into the community as permanent residents. These people would demand the full range of public services. In 1968 the average household in Tiverton demanded services costing \$500 (\$137 General & Debt Costs, \$363 School Costs). By comparison the average household paid \$278 in property taxes.⁶ The difference had to be made up by seeking state and federal aid, or by going into debt. By far the largest component of local expenditures was in the Public School's category. In 1967-68 the school system spent an average of \$551 per student, of which \$364 came from local funds and the rest from state and federal aid.⁷ It seems clear that if employees of the refinery did settle as residents, the town's net fiscal position would be worsened. If these new residents had a higher than average number of school children the problem would be even more acute. This is quite possible since the immigrating families would be led mostly by males of prime working age, rather than by very young men who might not have children yet, or by older men whose children are already grown.

Aside from these fairly obvious direct and indirect demands for service, the proposed refinery might impose costs on local government in several less obvious ways. The existence of the refinery might lead to a reduction of the value of property in the North Tiverton vicinity (or perhaps a slowdown in the growth of land values). This would eventually be reflected in the form of a

reduced tax base and a loss of tax revenue. The problem of monitoring the activities of the refinery has been mentioned numerous times during the public hearings. Dr. Nelson Marshall, of the Graduate School of Oceanography at U. R. I., has estimated that an environmental monitoring program could cost \$100 thousand a year. As yet, Northeast has not stated a willingness to cover such costs. If it does not, the town might have to pay part or all of these costs. The question of state school aid has also been discussed at the hearings. Mr. Stuart Essex, of the State Agency for Elementary and Secondary Education, has stated at the hearings that the addition of \$50 million to Tiverton's tax base may lead to a reduction of state aid to Tiverton for the construction of its public schools. This reduction could total nearly \$800 thousand over the next twenty years (or an average \$40 thousand per year) based on the assumption of a \$6.5 million school building program. He also indicated in later private conversations that if \$50 million had been added to Tiverton's tax base in 1968 (with nothing else being changed) state aid for school operating expenses would have dropped about \$53 thousand. The drop would have been even larger except that Tiverton was already receiving little more than the minimum amount and could not be reduced below the minimum.

The refinery could also "cost" Tiverton money in another way. In the historical tests presented earlier it was noted that locally assessed taxes increased as manufacturing activity increased. This was interpreted to mean that the increased tax bases were being used to support larger expenditures rather than to lower tax rates. Some of these increased expenditures probably went to servicing

the new manufacturing activities and their employees. Some probably went towards expanding public services. In the cases of the two refineries studied a similar situation occurred. The added tax base was used to generate funds for greatly expanded government spending, some of which would be required to service the refineries and some of which would go towards expanding public services. The point here is that town governments, like most governments, seem to regard increasing revenues as a basis for increasing expenditures, rather than as a basis for reducing tax rates. This may well reflect the desires of the community and may in fact be the most desirable course to follow. However, those who would hope that the increase in the tax base would be used to reduce tax rates may well be disappointed.

Let us now incorporate all of the above qualifications into a hypothetical example. Suppose that the refinery were judged to have a full fair market value of only \$35 million, or an assessed value of \$25.2 million. Suppose that for various reasons Tiverton's original property tax base fell \$2 million as a result of the construction of a refinery. Suppose that Tiverton had to raise an extra \$.25 million from property taxes in order to finance services to the refinery and its employees, and to make up for lost state education aid. Suppose that Tiverton also decided to spend an extra \$.25 million a year on expanded public services. If all of these suppositions had been true in 1968 then Tiverton would have had to raise \$2.1 million dollars in revenue from a tax base of \$78.8 million. This would have required an actual tax rate of \$26.65 per thousand (or an effective rate of \$19.19). For the

owner of a \$20,000 full market value home this rate would have yielded a total savings of \$49 (\$2.45 per thousand) over what he actually paid in 1968. This homeowner would also have received a certain amount of benefit from the expansion of public services. If we now drop the assumption of a \$.25 million expansion of public services then the above example would yield an actual tax rate of \$23.48 per thousand and an effective rate of \$16.91 per thousand. This works out to a savings of \$94.60 (\$4.73 per thousand) for the owner of a home with a full fair market value of \$20,000. There would be no added benefit from expanded public services.

It should be noted that the above examples abstract completely from considerations of agglomeration effects. In other words, it is assumed that the only change in the community is the addition of a refinery. No account is taken of the fact that other types of industries may follow. These other industries may be desirable or undesirable (by some criterion) and may affect town finances for the better or for the worse. However, in terms of this study, they will have to remain unaccounted for since there is no reliable way of predicting their nature or magnitude.

It should also be noted that, although the hypothetical examples given above indicate a drop in effective tax rates, the outcome in reality could be quite different. Introducing an oil refinery into a small community is a complex process which could have many unforeseen effects. The historical tests described above indicate that some communities have experienced a drop in effective tax rates as a result of an expanded manufacturing base, while others have experienced quite the opposite. In Tiverton, as else-

where, it is impossible to be sure in advance about what will happen.

III Impact on Local Economic Activities

Let us turn now to the impact that the refinery might have on local economic activities aside from government finance. The proposed refinery could conceivably affect local sales, local employment levels, local marine-oriented activity, and local fuel costs. These will each be considered in turn.

It could be expected that a refinery would give rise to a large demand for inputs both during construction and operation. To the extent that Tiverton firms could supply these construction and operating supplies and services, they would derive a benefit. It appears, however, that few firms in Tiverton are prepared to meet the specific supply needs of a refinery operation. Moreover, local firms that could meet certain needs will obtain the business only if they can offer the most attractive prices. It seems reasonable to conclude then, that only a limited amount of the direct demands of the refinery will be met by local firms.

However, local firms might derive a benefit from supplying the employees of the refinery. Historical data for Rhode Island indicate that, during the period 1960-68, towns showing a rise in total employment also showed a rise in retail taxable sales (the correlation coefficient was positive and significant at the one percent level).⁸ So the increase in work force during construction and operation could well give rise to an increase in business at the retail sales level.

The proposed refinery could also offer benefits to Tiverton

in the form of new or higher paying jobs for residents. According to a memorandum prepared by Purvin & Gertz, Consulting Engineers for Northeast, the proposed refinery would employ between 130 and 150 people. For convenience we will assume the number to be 140. Northeast has stated that the payroll for the refinery will be about \$2.25 million.⁹

If the preceding figures are correct, Northeast expects to pay an average salary of over \$16 thousand a year to its refinery employees. According to the 1967 Census of Manufacturers¹⁰, the average salary received by all employees in the Petroleum Refining Industry (S. I. C. 2911) in 1967 was \$9,947. The average salary received by production workers in refineries was \$8,362. If we focus only on refineries employing between 100 and 249 employees, the average salary of all workers was \$8,453 and of production workers \$7,905. Even accounting for the fact that wages have risen since 1967, the Northeast figures seem to be unusually high. It would not be surprising if the average salary turned out to be somewhat less than \$16 thousand per year in practice.

It is also interesting to note that the share of value added going to labor in the refining industry is extremely low. Value added is basically the difference between the cost of inputs (exclusive of capital and labor) and the revenue received for outputs. In the petroleum refining industry in 1967, only 20 percent of value added was paid out as payrolls, while the other 80 percent was paid to the owners of the capital. Since the owners of capital in this case do not reside in Tiverton, all of this money goes outside the community.

It would be difficult to predict exactly how many of the 140 jobs will go to Tiverton residents. However, some information exists to give us an indication. According to the State Director of Employment Security,¹¹ there were 39 residents of Tiverton available for and actively seeking work as of October 1970. A review of the files of these individuals shows that few of them would be able to fill positions at the refinery. It seems unlikely, then, that the pool of unemployed local labor would receive much direct benefit from the advent of the refinery.

Nevertheless, a number of Tiverton residents who are now employed in other jobs within the town, or in other towns might choose to give up their present jobs if they could procure jobs at the refinery. This would be a net benefit to the extent that the salary at the refinery exceeded the salary that was previously being received (it would not be as great a benefit as it would be to put an unemployed person to work). However, it should be pointed out that Tiverton is not an isolated labor market. Residents of other towns take jobs in Tiverton and residents of Tiverton take jobs in other towns. According to a 1965 survey,¹² 57 percent of the automobile work trips which originate in Tiverton actually have a destination outside of Tiverton (large numbers go to Bristol, East Providence, Little Compton, Newport, Pawtucket, Portsmouth, Providence, and Warren). The survey also showed that 59 percent of the automobile work trips which terminate in Tiverton originate outside Tiverton (large numbers come from Barrington, Bristol, Cranston, East Providence, Little Compton, Middletown, Newport, Pawtucket, Portsmouth, Providence, Warren, and Warwick). It should

be noted that the survey included only trips originating and terminating within Rhode Island. If it had included trips to and from Massachusetts, it is likely that the data would show even a larger proportion of Tiverton residents going to work in other towns and a larger number of Tiverton employees coming from other towns.

These data indicate that Tiverton residents compete for jobs against other individuals from a fairly large geographical area. The residents of this larger labor market are very diverse and highly mobile. The fact that so many people come into Tiverton to work while so many Tiverton residents are going elsewhere indicates that Tiverton employers are hiring the workers best suited for the job rather than the workers who live closest to the job. This means that Tiverton residents would get jobs at the refinery only to the degree that they are more qualified than other workers in the region to fill the particular skill needs of refinery operations. If the refinery hiring pattern were to parallel the average hiring pattern in Tiverton, only about one third of the refinery's staff (about 46 workers) would be recruited from the local Tiverton population. Northeast has indicated that it would favor local residents in its hiring practices. This is, of course, possible (if the relevant unions permit it). But it would be most unusual for a corporation to hire a local worker over a non-local worker if the latter were more qualified for the job. Such a practice could turn out to be very costly for the refinery.

Being on the water, Tiverton attracts a good deal of marine-oriented activity and many residents of Tiverton derive a livelihood from such activities. In 1970 the town's marine-oriented firms,

including boatyards, fisheries, fish processing firms, and others, did a business estimated at about \$1.5 million. There are two beaches located in Tiverton which received a total of 86 thousand user days in 1967. There were about 450 boats moored in the Sakonnet River vicinity in the summer of 1970 (this figure includes boats moored along the entire river, not just Tiverton). No figures are available to show how much business was generated by these bathers and boaters. Also, in 1968 there were 290 parcels of land in Tiverton, assessed at \$1.17 million, which were classified as Seasonal Beach (these are mostly summer homes).¹³

It would seem clear from the above information that Tiverton's economy is significantly dependent upon the continued well being of the marine environment. Without a tremendous volume of scientific and economic data, no estimate can be made of how much the town's marine-oriented activities would be affected by the proposed refinery. However, Tiverton should be aware that a risk of financial loss due to steady minor pollution or occasional major spills would undoubtedly exist if the refinery were constructed.

Northeast has indicated that construction of the proposed refinery would lead to lower prices for petroleum products,¹⁴ especially home heating oil, in the New England region. It is not completely clear why this should occur. There are two possibilities. First, if the refinery could produce petroleum products more cheaply than the refineries now producing the products used in New England, it could sell them more cheaply. But it is not obvious why it should be cheaper to ship crude from the well-head to New England and refine it here, as opposed to refining the crude near the well-head and shipping only the finished products. Even if it

does turn out that it is cheaper to refine the crude here, this still does not guarantee lower prices for the consumer. The refinery would be quite likely to sell its output at the going market price and keep the difference in the form of increased profits.

The second reason why the proposed refinery might lower regional fuel costs would be if it increased the supply. However, the proposed refinery will not necessarily do this. If Northeast simply brings in 65 thousand barrels of crude a day and refines it here before distribution rather than bringing in a similar amount of already refined products (as it now does) there is no net increase in supply. On the other hand, if Northeast plans to add the output of the refinery to the amount that it presently puts on the market then there will be an increase in supply. But it is still not clear why it is better to increase supply by building a new refinery in the region rather than by simply bringing a larger quantity of refined products into the region.

The above analysis should not be interpreted to mean that the construction of the proposed refinery would definitely not lower fuel costs in Southern New England. However, if one were going to consider the possibility of lower fuel costs as an argument in favor of approving the refinery, it would be desirable to seek more conclusive proof that this argument is valid.

IV The Question of Environment

It would seem likely, based upon the testimony which has been given and upon the experience of other areas such as Benecia, that the proposed refinery would have some degree of negative impact on

the environment. This impact could take the form of air pollution, odors, noise, water pollution, and visual pollution. Some aspects of this environmental impact can be treated in fairly direct economic terms. If oil spillages damage the fishermen we can estimate economic loss. If land values drop within sight and sound distance from the refinery we can measure the financial loss. Other aspects of environmental damage, however, are not so easy to measure. What is the loss associated with noise or odor, or with the disappearance of an attractive view, or with the decreased enjoyment of recreationists and boaters? These losses are very real - yet there is no valid and reliable way to measure them in economic terms. There is no way to produce a figure for dollars lost through environmental degradation and then compare this to possible dollars gained through stimulated business and expanded tax base.

Let us, then, approach the question from a slightly different direction. Regard Tiverton's environment as an asset belonging to the general community. This asset can bring returns to the community in many ways. From its mere existence in a high quality state it confers benefits in the form of attractive surroundings for residential homes, as a base for supporting a tourist and recreation industry, and as a magnet for businesses which would be attracted by the pleasant nature of the community. On the other hand the environment can bring benefits through development (which usually means some degree of degradation) as in the case of the refinery. In such a case a certain amount of environmental quality is traded for some amount of other types of benefits.

In deciding the issue of whether or not to approve the proposed refinery, the Town Council is facing the reality that it is, in fact, the body charged with managing the environment in such a way as to bring the greatest benefits to the community. The Council is being asked to determine whether the community would be better off in its present state (no possible benefits from a refinery, present quality of the environment intact) or in some altered state (possible benefits of a refinery, altered quality of environment).

It would seem fair to say that most of the expected benefits are economic. This paper has attempted to summarize these benefits and derive some estimate of their magnitude. Let us review the conclusions. It is possible that the expansion of the tax base associated with the proposed refinery would permit an immediate lowering of tax rates, or an increase in public services, or a little of both. On the other hand, there is a chance that in the longer run the refinery could turn out to be a net tax loss for the community. It has been estimated that to a small degree local business might gain from supplying the refinery during construction and operation. Local business should also profit from servicing the employees of the refinery. Some present Tiverton residents may successfully compete for jobs at the refinery and may end up earning higher salaries than at present (although it is unlikely that many of those presently unemployed will derive much direct benefit). Local fuel costs could decline but it is not clear yet whether or not this will, in fact, occur. On the side of negative economic benefits (economic costs), it is possible that land values in the

vicinity of the refinery would be reduced and that land values in the larger community would feel some effect. Also, the entire marine-oriented sector of Tiverton's economy would be exposed to risk of economic loss from constant minor pollution or from occasional major spills. No economic estimate can be made of the long term losses (if any) resulting from the fact that businesses which would be attracted by an undeveloped environment would be alienated by the presence of a refinery.

Against the net value of the above measurable (or at least definable) economic gains and losses, one must balance the intangible value of the loss in environmental quality which might result from the approval of the proposed refinery. The precise magnitude of this degradation is difficult to determine even though much enlightening (and sometimes conflicting) testimony has been given on this point. Nevertheless, some subjective valuation must be attached to this loss. This valuation must then be compared to the net economic gains (if any) to determine whether the refinery is offering the community a high enough compensation to justify the risk of damage to the environment.

In closing, it should be pointed out that even if the community as a whole were to derive a positive net benefit from the refinery, there could be serious distributional effects within the community. In a sense, wealth and well-being might be shifted away from some members of the community and towards others. Specifically, homeowners (especially those near the refinery), those dependent on marine-oriented activities, and recreationists could face a decline in well-being, while local wholesale and retail establishments, and those who obtain jobs at the refinery could face a rise in well

being. Property taxpayers would face an increase or decrease in well-being depending on whether the refinery lowered or raised tax rates in the long run. These distributional implications would arise directly from a decision to approve the proposed refinery.

Footnotes

1. The following information was gathered from the "Annual State Report on Local Government Finances and Tax Equalization", by the Rhode Island Department of Community Affairs, and from "Rhode Island Basic Economic Statistics", by the Rhode Island Development Council, 1970.
2. Data for these tests was gathered from the two sources cited above plus "Indicators of Economic Change for Rhode Island Cities and Towns 1957-68" by Lucy Griffiths, Department of Resource Economics, U. R. I., Occasional paper #70-59, and from the 1970 Census of Population.
3. The following information is contained in a sworn affidavit by Harold Adams, Assessor of Whatcom County, Washington, October 16, 1970.
4. This data was gathered from the Providence Evening Bulletin of October 21, 1970 and from a memo by Bruce Putnam of A. D. Little, Inc.
5. Data from the "Annual State Report on Local Government Finances and Tax Equalization."
6. This was calculated as follows: In 1968 the full market value of all property in Tiverton was \$69.359 million, of which \$45.083 million (65%) was residential. Estimating that there were 3500 households in Tiverton this comes to \$12,881 per household. At a \$21.64 per thousand effective tax rate, the average household would pay about \$278 in property tax. In 1968 the General and Debt Service expenditures totaled about \$739 thousand. Sixty five percent of these costs are allocated to the residential sector. School costs were \$1.27 million of which 100% is allocated to the residential sector. Again assuming 3500 households, this works out to \$137 in General & Debt Service expenditures and \$363 in School Expenditures per household (\$500 total).
7. Data from "Annual State Report on Local Government Finances and Tax Equalization."
8. Data from sources listed in footnotes 1 and 2.
9. This was stated in the letter accompanying the Northeast brochure entitled "A Refinery Proposal for Tiverton."
10. Census of Manufacturers 1967, Bureau of the Census, U. S. Department of Commerce, Section 29A.
11. Sworn affidavit of Mary C. Hackett, Director of the Department of Employment Security, State of Rhode Island, October 22, 1970.

12. This information was provided by the Statewide Planning Program, Department of Administration, State of Rhode Island.
13. This information was provided by J. F. Farrell, Research Associate, Department of Resource Economics, U. R. I.
14. This is stated on page 10 of the Northeast brochure, "A Refinery Proposal for Tiverton".

