"ASPECTS OF THE POTENTIAL ECONOMIC IMPACT OF A WEST COAST OIL PORT-PIPELINE DEVELOPMENT"

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by

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ABSTRACT

A conceptual framework for the evaluation of the costs and benefits of an oil port and pipeline is provided. Two perspectives used for this framework are the economic impact of the construction of the project and the implication of the existence of a west coast oil port for the long run economic development of British Columbia. The opportunity cost of resources and the alternative uses of labour and other factors of production are considered.

RÉSUMÉ

Le présent rapport fournit un cadre d'analyse pour évaluer les coûts et les bénéfices d'un port pétrolier et d'un pipe-line. Deux perspectives s'imposent à ce cadre, soit l'incidence écomomique de la construction des installations et l'apport au développement écomomique à long terme de la Colombie-Britannique d'un port pétrolier sur la côte ouest. Les auteurs considèrent le coût de l'utilisation opportune des ressources ainsi que des affectations alternatives de la main-d'oeuvre et des autres facteurs de production.

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WEST COAST OIL PORTS INQUIRY

In March, 1977, Dr. Andrew R. Thompson was commissioned by the Government of Canada to inquire into the environmental, social and navigational safety aspects of a proposed port at Kitimat, B.C. and the broader Canadian concerns and issues related to west coast oil tanker traffic.

The Inquiry hearings were adjourned in November, 1977 because there was then no active application in Canada for a west coast oil port. The Commissioner summed up his findings to that point and presented his Statement of Proceedings to the Minister of Fisheries and the Environment and the Minister of Transport on February 23rd, 1978.

The Ministers subsequently announced that "the Federal Government sees no need for a west coast oil port now or in the foreseeable future and doubts that the benefits of establishing such a port would be sufficient to offset the danger of risking a major oil spill". Consequently the Inquiry did not continue.

This report contains material which was prepared for the Inquiry but was not examined due to the termination of the Inquiry.

This report was prepared under contract and does not necessarily represent the views and policies of the Department.

PREFACE

This report is divided into two chapters. In the first we focus on the economic impact of the construction of an oil port on the west coast of B.C. and a pipeline to Edmonton. In the second we focus on the implications of the existence of a west coast oil port for the long run economic development of British Columbia.

We see our principle contribution to be the provision of a conceptual framework for the evaluation of costs and benefits. In particular this requires consideration of the alternative uses of labour and other factors of production: the opportunity cost of resources. In Chapter 1 we have provided a consistent theoretical framework which emphasizes issues of short run adjustment because we feel that conventional techniques yield misleading results in their situation. In Chapter 2 we approach the evaluation of long run development prospects associated with the existence of an oil port from an economy-wide perspective as opposed to a narrow, regional perspective.

Chapter 1

SHORT RUN IMPACTS

I. INTRODUCTION

Assessment of the short-run impact of the construction of an oil-port and pipeline involve consideration of both changes in the economy that will result from the project and an assessment of the costs and benefits of the changes. A major construction project like the proposed Kitimat pipeline will effect the economy of British Columbia in various ways. A construction labour force will have to be recruited. This will effect the market for construction labour and effect wages and the level of unemployment. Since the construction activity associated with a port and pipeline will probably be located in remote Northern areas of the province, the wages paid to workers will have a significant impact on the local economies. This will involve the effect of the demand generated by pipeline wages in the local markets for goods and services. The pipeline construction will also generate a considerable demand for various construction materials that will influence the markets for these commodities in Western Canada, and perhaps the entire country.

The ultimate task of the investigation that the Inquiry is undertaking is to attempt to assess the costs and benefits of the changes that will accompany the port and pipeline development. We are therefore interested in identifying the benefits and the costs that the various economic changes bring. Who will benefit from the project, and to what extent? Who will bear costs, and of what magnitude? Are the benefits of the project greater than the costs and what are the distributional effects of the changes that will accompany the project?

In this report we have seen our principal objective to be the provision of a framework for making an assessment of the net benefits of the project.

We have attempted to identify the changes we expect to occur but our main attention has been focused on identifying the possible costs of the diversion of resources to the project. The labour and other resources that will be used to build a port and associated pipeline have other possible uses in the economy. To the extent that the resources are diverted from other uses the output that they would have produced in their other uses is a real cost of the project and must be offset against the output of the resources in the project. This foregone output is the key to the economist's concept of "opportunity cost". We feel that our principal task in this report is to identify the opportunity cost of the resources that will be used in the port and pipeline construction. To that end we have devoted our attention to the organization of the market for construction labour, consumer goods and services in the construction area and elsewhere, and the markets for construction materials. Once we understand the nature of markets we can estimate the opportunity cost of the diversion of resources associated with the project and thus its net benefit or cost to the economy as a whole.

Since we have conceived our task as that of aiding the task of assessing the impact of the project on the economy as a whole, we find that the methods of assessing economic impact that are usually employed by regional planners are inadequate for our task. For many purposes of regional analysis such standard methods as "economic base" analysis, "input-output" studies and "income and/or employment multiplier" techniques, which use studies of the local economy, to generate an estimate of the multiplied impact of a project change on the local economy, are very useful. They are however, inappropriate for our task. In the first place, these tools are designed to predict changes in the local economy and do not focus on the

issue of opportunity cost that we see as central to our analysis. Secondly, these tools are appropriate for analysing the effect of sustained changes in primary demand in a locality, but a pipeline and port construction project will be temporary in its impact. As a result it seems inappropriate to assume that all factors of production can be increased at their current price and without important distortions to the local economy. Instead we expect that price changes, shortages and other distortions will be among the most important characteristics of the construction period.

In our analysis we have examined the effect of the oil-port and pipeline construction on various relevant markets. This has involved the presentation of a conceptual framework of analysis and the consideration of what we see as the most important features of any likely pipeline project. We have looked in some detail at the labour market, and in less detail at the markets for consumer goods and services and for construction materials.

Initially we had hoped to be able to provide empirical estimates of the various impacts that we expect from our conceptual analysis by reference to existing analysis of other short-run construction projects in similar environments. We were both surprised and disappointed to discover that such studies do not exist. Understanding of the impact of major construction projects demands such retrospective studies and in their absence we can do little except offer sophisticated speculation.

Although retrospective studies have not been available we are not entirely without empirical evidence. In particular we have devoted a considerable amount of effort to study the recent impact of the Alyeska Pipeline on the Alaskan economy. We have presented below a discussion of that evidence as it relates to our conceptual analysis of the likely impact of a pipeline in British Columbia.

Our analysis also suggests that the particular characteristics of the project will effect its impact. Some of these characteristics may be subject to modification by appropriate policy actions. We have concluded our discussion of the labour market impact of the construction of oil-port and pipeline by examining various policies that could be used to reduce the real economic and social costs of the project.

II. SOME IMPORTANT CHARACTERISTICS OF THE PROJECT

Although many of our conclusions are not specific to any one particular pipeline proposal, we have focused our analysis on the Kitimat Pipeline Limited proposal to develop an oil port in Kitimat and construct a pipeline from there to Edmonton. This proposal appears to be the most likely to be implemented. In addition the salient features of any development that lands oil on the West coast and transports oil to eastern markets will be broadly similar to those outlined below.

(i) The project is large. It involves the expenditure of half a billion dollars over a four year period; KPL itself requires 24,000 man months of labour over this period.

(ii) The project is of short duration. The initial construction phase is spread out over a four year period, however the bulk of project activity is concentrated in one six month period. More than three fourths of the project labour requirements are concentrated in this six month period when KPL would employ more than 3,000 workers. These 3,000 jobs represent approximately 3.5% of total construction employment in B.C.

(iii) The direct labour demands are heavily concentrated in specific labour markets. Most of the employment is in the construction trades. Many of the jobs are highly skilled. In addition, pipeline construction will require a mix of skills that differs considerably from the mix of skills available in the construction labour market. In particular, the pipeline will require many welders and few carpenters.

(iv) A large portion of the project impacts are concentrated on relatively small and isolated communities along the route from Kitimat to Edmonton. Virtually all of the direct employment is along this route and the project employment is significant relative to the base level of employment in these communities. For example, direct employment is the Kitimat Terrace area would be roughly 10% of the base level of employment in these communities.

(v) Earnings of individuals employed by KPL are high relative to average earnings in the construction industry. Average project earnings exceed $4,000 per month, while average earnings in construction in B.C. are less than $2,000 per month.

(vi) KPL's materials demands are heavily concentrated in a few industries. More than 60% of KPL's demand for materials consists of pipe and pipe fittings. KPL's demand equals the annual production of these products in Western Canada and is roughly 15% of annual Canadian production.

III. LABOUR MARKET RESPONSES TO DIRECT LABOUR DEMANDS

The oil port, pipeline development will create a substantial increase in demand for construction labour at premium wages. Premium wages will be offered in order to insure that project jobs are filled and we can expect that the wages will be high enough to ensure that a stable labour force is recruited for the project. KPL's proposal estimates that the direct project wage bill will be $103 million; we have no information on which to revise that figure. This estimate of gross wages is, however, little more than a starting point for our analysis. In order to assess the net impact of the project we need to know the earnings of this labour force in the absence of the project. These alternative earnings are an excellent estimate of the opportunity cost of the labour. In addition, to reasonably assess the impact of the project wages on output, prices and wages elsewhere in the economy we need to know the net increase in employment and income that will result from the project.

The opportunity cost of labour and the net increase in income and the induced effects of the increased project earnings depends crutially on where the employees come from; what would be their alternatives? The net impact of project employment will clearly be greater if the employment is a net addition of jobs than it will be if workers are reallocated from other projects. If the workers would otherwise be unemployed the net benefits of direct employment will be large and so will be the induced effects. If, on the other hand, workers on the project would otherwise have been employed but were diverted to the pipeline by the high wages offered the net benefits and induced effects will be correspondingly smaller. In order to estimate the sources of project workers and to estimate the net increase in wages it is necessary to consider the labour market as a whole. That will involve

the consideration of some conceptual models.

A. Conceptual Models

Conceptual models of the labour market will allow us to organize and understand the issues involved in estimating the opportunity cost of labour and the net wage effect of project employment. The models that we consider here abstract from certain complexities of the actual labour market and set the stage for a subsequent consideration of important complexities of the real labour market. We will focus on a particular, stereotyped labour market--"the construction labour market." We assume that workers who are committed to this market are equally able and willing to perform "construction jobs", and that the number of workers committed to the market is fixed.

The appropriate starting point of analysis is to consider a situation where there is full employment in the labour market and the recruitment of workers for the port and pipeline construction involves the diversion of workers from other jobs. The second situation is one in which there is substantial involuntary unemployment and the jobs are filled by workers that would otherwise have been unemployed. Unfortunately we do not consider either of these models to be fully satisfactory for our purposes. Recent developments in macroeconomics, that have been accelerated by the concurrent existence of high levels of unemployment and inflation, and a consideration of the institutional characteristics of the construction labour market in British Columbia have led us to consider a situation in which there are different wage levels in different parts of the labour market and job search by workers is an important part of the operation of the market. We devote a considerable amount of time to explaining this view of the

labour market because we feel that this "dual-labour market" model offers the most useful model for the construction labour market. In the pages that follow we will present a verbal discussion of these labour market models. Those who want a more systematic and formal presentation are referred to the appendix to this chapter.

(a) Full Employment in Construction

First let us consider the situation in which all the workers in the construction labour market are fully employed. In this case, the direct labour demands of the project can be met only by a corresponding decrease in employment in other sectors of the construction labour market. For example, if the project workers are diverted from residential construction, this sector of the construction industry would experience a decline in employment which would exactly offset the project employment. There would be no change in the total employed in the industry and the net impact on employment would be zero. The diversion of workers would have an effect on the labour market as a whole. The project would attract workers by offering high wages. The resulting shortage of workers elsewhere in the industry would put upward pressure on wages elsewhere in the industry and we would expect wages in other sectors of the construction industry to rise.

Now we must consider the net benefits that would accrue from this process. First it is clear that workers in the industry will benefit. Those who obtain project jobs will receive premium wages and others in the industry will benefit to the extent that wages in general in the industry are bid up. There will also be potential losers. Higher wages in the industry will put pressure on profits. In addition rising wage costs will put upward pressure on prices and the diversion of labour to the project will reduce the output of the rest of the industry. Consumers will bear these costs.

What in balance is likely to be the effect? First consider a simplification where labour in the industry produces a single homogeneous unit of output per man-hour. In this case it is clear that if labour is diverted from one firm in the industry to another (by the expanding firm offering premium wages) there will be no net gain. The increased output of the firm gaining labour will equal the lost output of the firms losing labour. In our situation the analsysis is more difficult because the output of the industry is far from homogeneous but it seems likely that there will be little net gain. If labour productivity is the same in project employment as it is in other sectors of the industry the only gain in output will arise from increased intensity of work--overtime. Even this net gain must be reduced if the cost of foregone leisure is considered.

(b) Substantial Involuntary Unemployment in Construction

The alternate extreme situation occurs if there is substantial involuntary unemployment in the construction labour market and the project draws labour either directly or indirectly from the pool of unemployed. Two possibilities exist: the project may hire its labour directly from the unemployed or the project may divert labour from other employment in the industry and the vacancies thus created are filled by unemployed workers.

The net gains in this case are relatively easy to estimate. The increase in wages will equal the entire project wage bill. This increased income will either go to unemployed workers who are hired on the project or be divided between previously employed workers who now receive premium wages and the formerly unemployed who are now employed at the prevailing industry wage rate. In this case there are no costs to be born. Wages and prices will not be bid up by demand pressure. Nor will any production be diverted. Unemployed workers would not alternatively be producing anything.

These alternative views of the process and effects of recruitment of labour for the project are insufficient for our purposes. Simple text-book macroeconomic models assume that if unemployment exists the response to an increase in aggregate demand will be an increase in employment and output without changes in wages or prices. These simple models, on the other hand, assume that if labour is fully employed the response to increased demand will be upward pressure on prices as competing users of labour try to increase or maintain their labour force without any increase in employment or output. Observation of the aggregate relationship between employment, wage change and inflation, on the one hand, and more detailed research into the operation of labour markets, on the other, have forced abandonment of this simple view. The most widely accepted views of labour market behavior and aggregate demand now emphasize the role of job search, of worker expectations, of implicit contracts, and of institutional market arrangements in the process of adjustment to changes in demand. These more sophisticated models emphasize that, except in extreme situations, increases in aggregate demand result in both increases in employment and output and increases in wages and prices. In general, more of the adjustment occurs through price changes when unemployment is low and more through changes in employment and output when unemployment is high.

The theories of adjustment to changes in aggregate demand are currently an area of active research in macroeconomics and it would take us far beyond our task to try to summarize the state of knowledge. We do, however, feel that the insights offered by these more complex models is crucial to understanding the likely opportunity cost of the labour drawn to a port and pipeline project. Consequently we have developed one such model below that we feel is of particular relevance to the institutional situation

that prevails in the construction industry.

(c) Construction as a Dual Labour Market

The most useful model of the labour market in construction is one that emphasizes the job search behavior of workers and explicitly recognizes the existence of a high wage unionized portion of the industry and a non-unionized portion of the industry where wages fluctuate and are generally lower than in the unionized sector. In this discussion we will abstract from potentially important issues of uncertainty, false expectations and other issues that appear important in the general literature of labour market behavior. We will return to these in a rather informal manner later. The main conclusion from this view of labour market behavior we wish to emphasize here is that it is likely that there will be significant unemployment in the industry as a result of its institutional structure. In this situation an increase in employment in the unionized sector will result in a decline in employment in the non-unionized sector and a decline in output in that sector. In fact, it is possible that the decline in employment and output of the non-unionized sector will exceed the increase in employment and output in the unionized sector. The general outline of the model and its conclusions are outlined in the next few pages; detailed discussion may be found in the appendix to this chapter.

The key characteristic of this dual labour market model is that the worker has the choice of searching for a job in the high-wage unionized sector, where jobs are limited, or searching in the low wage non-unionized sector where jobs will become available as wages adjust to forces of labour supply and demand. Clearly if the prospects of finding a job in both sectors is the same the worker will chose to look for a job in the unionized sector. The market will then come into equilibrium when the prospects of

finding a job in the lower wage non-unionized sector are sufficiently better than the prospects in the unionized sector to offset the lower wage.

The equilibrium in this market may be illustrated with an example. Suppose the non-union jobs paid wages equal to ninety percent of the wage in the union sector and unemployment compensation were equal to half the wage in the unionized sector. Also assume that jobs can always be had in the non-unionized sector. In this situation it would pay a worker to concentrate his job search activities on the unionized sector if he could expect to be employed at least eighty percent of the time and collect unemployment compensation the rest of the time. If we assume that union jobs are awarded randomly to all the workers committed to the sector, whether employed or unemployed, we would expect to find a body of unemployed workers equal to a quarter of the workers employed in union jobs looking for union jobs. If half of the workers in the industry hold unionized jobs this would imply that 12 1/2% would be unemployed waiting for union jobs.

To be sure this example is hypothetical and abstracts from many potentially relevant issues. The specific results will be influenced by personal and community attitudes to unemployment, the ability of the worker to finance periods of unemployment and union seniority and other hiring rules, to mention a few. In addition, there will always be a few workers unemployed while changing jobs, perhaps about 2% of the labour force. Nonetheless this example will satisfactorily illustrate the conclusion we wish to draw about the opportunity cost of labour to an expansion of the high wage sector.

Let us consider what will happen to the distribution of workers in this labour market if the number of union jobs is increased from 50% to 55% of the labour force. The results are not unambiguous because they are crucially dependent on the behavior of the wage rate in the non-unionized sector as its labour force contracts. If the non-unionized wage rate does not change then there will be an apparently paradoxical result in this market; non-union employment will contract by more than the increase in union employment and the number of unemployed will increase. This will occur because as the union sector expands the prospect of receiving employment there 80% of the time improves and so more workers will choose to join the pool of unemployed workers waiting for union jobs. In our specific example, the work force will now be distributing with 55% of the workers in the unionized sector, just over 31% in the non-unionized sector and nearly 14% unemployed. In this case the opportunity cost of the increased employment will exceed the wages paid in the new high wage jobs. If, however, the non-unionized wage increases to 92% of the union wage the results will be somewhat different. In this situation a worker will only choose to enter the union sector of the industry if he can expect to be employed 84% of the time. There will now only be 16 workers waiting for jobs for every 84 employed instead of 20 searching for jobs for every 80 employed as there was when the non-union wage was 90% of the union wage. In this new equilibrium the unemployment rate will drop to about 11% of the labour force. Thus the project will have drawn 30% of its workers from the unemployed and 70% from other employment.

The conclusion of this exercise is that in ordinary circumstances the opportunity cost of labour to a project will not be zero even if there

is substantial unemployment in the industry. If the non-union wage does not increase unemployment will increase; unemployment will only decrease if the wage in the non-union sector rises by a sufficient amount. The rise in non-union wages will only occur if labour is induced to leave that sector, so some labour will necessarily be diverted from other uses.

B. Indicated Size of the Opportunity Cost of Project Labour

In the previous section we have indicated why we believe that it is highly unlikely that the opportunity cost of labour to the project will be close to zero. In order to evaluate the net benefits from the project it is necessary to have some estimate of the orders of magnitude that may be involved in expanding project employment. Unfortunately case studies of these types of projects are practically nonexistent. There are, however, estimates available that indicate that the opportunity cost may be surprisingly high.

Studies by Haveman and Krutilla have been made from some American evidence. Not surprisingly they find that opportunity cost declines as the rate of unemployment in the occupation rises but the opportunity cost does not approach zero until the rate of unemployment is quite high. The results of these studies are summarized in the table presented below. When occupational unemployment rate is 5%, they estimate that almost all

OPPORTUNITY COST OF LABOUR MEASURED IN JOBS*

Occupational Unemployment Rate	Best Estimate of Opportunity Cost	Lower Bound on Opportunity Cost
5%	.95 to 1.0	.75
10%	.75 to .9	.45
15%	.45 to .55	.20
20%	.10 to .15	.04

*Adapted from Robert Haveman and John Krutilla, "Unemployment, Idle Capacity, and the Evaluation of Public Expenditures", John Hopkins Press, Baltimore, 1968, pp. 70-75.

project jobs are filled by workers who have given up previous jobs. Even at unemployment rates of 10% they estimate well over three-quarters of the jobs are filled by workers who have given up other jobs.

Unfortunately there is no comparable study utilizing Canadian data. Although we have not attempted to apply Haveman and Krutilla's methodology systematically to data relevant to our particular task we are confident if such an exercise were undertaken that the conclusion would arise that for any level of unemployment the opportunity cost in Canada would exceed those we have reported for the United States. This conclusion would arise from the fact that Canadian levels of unemployment are ordinarily higher than they are in the United States. These higher unemployment rates reflect a higher level of frictional unemployment in Canada that arises from the geographic and occupational characteristics of the Canadian labour market.

C. Going Beyond the Simple Models

We are now in a position to consider some important characteristics of the labour force recruitment process that take up beyond the bounds of our simple models. In the discussion that follows, however, much of our thinking has been related to our previous discussion of the nature of the labour market and certain characteristics of the dual labour market model underly our understanding and predictions.

(a) Project Hiring Arrangements and the Dual Labour Market

The precedents established in connection with the Alyeska, Alcan, and the now defunct MacKenzie Valley projects imply that hiring arrangements for an oil port-pipeline project (OPPD) will probably include preferential hiring arrangements for qualified "locals", and that the hiring of non-locals will be through hiring halls located in the lower mainland. These hiring arrangements serve to exacerbate the problems which arise in the context of a dual labour market. These arrangements imply that the dual labour market model is particularly appropriate for analysis of an OPPD. If workers wish to avail themselves of local hire preference they must either physically move to the project area or, if already resident there, they must remain. Workers not normally resident in the lower mainland who wish to obtain project employment through a lower mainland hiring hall must move to the lower mainland to establish their claim for consideration for project employment. In a very literal sense such workers must forego alternative employment opportunities in order to qualify for project employment.

(i) Speculative migration

Projects such as Alyeska, Alcan and the proposed Kitimat-Edmonton project do not simply materialize out of the blue, but rather they are subject to a long and well publicized process of public scrutiny. As a

consequence they come to be anticipated well in advance of the beginning of the construction. The hiring arrangements discussed above have special significance in this context. The publicity of the projects and the anticipated high wages encourage speculative migration to the project areas.

The preference for hiring "locals" will provide a construction worker with an incentive to migrate to the construction area before construction begins in order to establish "local" status. Since the project will be located in a small and relatively isolated area, the project labour force will be large relative to the isolated labour market. The speculative migration of workers to the area to establish residence will inevitably result in a large, perhaps overwhelming, proportion of the migrants being unemployed, at least until the project gets underway. Speculative migration may also have adverse effects on "genuine" locals. Migrants will obtain some of the limited construction jobs which become available prior to the project and create unemployment among the old residents.

Preferential hiring arrangements for locals have been instituted in order to compensate locals for being forced to bear a disproportionate share of the environmental and social costs. In compensation they are felt to have a valid claim to the high earnings associated with project jobs. This rationale is acceptable only insofar as the preference for locals has the intended effect. Our analysis suggests that speculative migration may confound this. Increased unemployment among local construction workers prior to project initiation may result from speculative migration. In addition migrants who are successful in establishing their claim to be a local may reduce the benefits to legitimate locals. The effectiveness of local preferences in conferring the benefits of project jobs on locals will depend on the effectiveness of procedures

for identifying locals. The Alaskan experience suggests that this may be difficult. The procedures adopted there seem to have been substantially ineffective.

The Lysyk report on the Alcan project recommends a "grandfather" clause--preference will be given to locals of two years standing. The extent to which such grandfather caluses will be effective remains to be seen. It is clear however that project jobs are highly valued and there is then an incentive to migrate to the Yukon now in order to establish legitimate local status. Indeed there is some evidence that this process has begun (Maclean's, October 31, 1975, pp. 64-66). In addition there is obviously an incentive to attempt to establish an illegitimate claim to be a local and the possibility of a "black market" in documents purporting to establish a claim of residence cannot be dismissed.

On these grounds it is not at all obvious that the preference for local will in fact be successful in conferring substantial net benefits (particularly net of the unemployment costs prior to project initiation) on local construction workers. Speculative migration will also cause serious distributional problems to other residents along the project route. Substantial speculative migration will cause social disruption in varying degrees. The costs of this social disruption will be born by residents who are neither interested in nor qualified for project jobs. Most local residents will fall in this category. The KPL proposal, for example, indicates that only 10% of all project jobs would be filled by locals. In the Kitimat-Terrace area at the height of the project only 300 locals would have project jobs.

The preference for hiring locals may also cause serious adjustment problems following completion of the project. Speculative migration into the area will result in many permanent jobs, vacated by locals who accept project jobs, being filled by disappointed migrants. When the project is completed a large portion of the locals who had project jobs will again seek permanent employment in the area. But many of the permanent jobs will now be held by migrants and the locals will find it difficult to obtain employment. This displacement effect will cause a protracted period of adjustment in the area. Ironically the problem would not arise, or would at least not be as severe, if all project jobs were held by migrants. The migrants will have less attachment to the area and when they become unemployed they will leave the area more quickly.

(ii) Lower Mainland Hiring

The issues raised by the funneling of non-locals through union hiring halls located in the lower mainland are similar, although the consequences are not likely to be as severe. The basic problem is that workers living in other areas of B.C. or Western Canada will have incentives to migrate to the lower mainland prior to project initiation in order to establish their position in the union queue. This will necessarily involve unemployment for them, and perhaps for construction workers already resident in the lower mainland.

(b) The Adjustment Process

The labour market analysis we have presented refers to a labour market in equilibrium. We have compared the labour market equilibrium without the project jobs with the equilibrium which would occur after the jobs have been created. This analysis tells us nothing about the dynamic process

which carries the labour market from one equilibrium to the other. The short duration of the project suggests that the dynamics of adjustment may be very important.

In any market the dynamics of transition from one equilibrium to another are difficult to analyze. A particular problem associated with an oil port pipeline development arises from the publicity which is necessarily associated with the approval and initiation of the project. This publicity will generate a serious risk that workers will overestimate potential earnings and/or the probability of obtaining project employment. To the extent that there is over optimism there will initially be "too many" workers seeking project employment; too many because the returns they expect to receive are greater than the returns they can objectively expect to receive. Of course once the project is underway information will be generated which will enable workers to objectively evaluate the returns they can expect to receive. In this manner the labour market will shake down to its new equilibrium. However, during the shake down or adjustment period unemployment will be above the new equilibrium level. The excess unemployment will be directly proportional to the extent initial expectations were over optimistic and to the speed with which expectations adjust once the project is underway.

In analyzing continuing employment opportunities these adjustment costs may be ignored. The adjustment costs are not likely to be of great concern because the adjustment costs relative to the long term impacts on the labour market are likely to be insignificant. It will, perhaps, be safe to ignore them. This will not be the case with highly publicized projects of limited duration. Here adjustment costs will be significant; and the shorter the project duration the higher will be these adjustment

costs relative to long term project impacts. Our review of the Alaskan experience indicates these adjustment costs may be very large.

(c) A Wages Hangover?

Dynamic problems of adjustment may not be confined to the recruitment of the project labour force. Our discussion of the labour market has assumed that non-union wages will adjust downward on project completion when there will be an excess supply of labour. Downward movements of wages may be difficult. In this section we will briefly explore the implications of downward stickiness in the wage rates.

First consider the extreme situation where the non-union wage rate fails to adjust downward at all on project completion. This implies that non-union employment will not expand as project workers are laid off. Thus the level of unemployment after the project is completed will be higher than it would have been in the absence of the project. If the non-union wage adjusts with a lag to excess labour supply, the unemployment rate will eventually return to the pre-project level. Unemployment will be above the pre-project level over the period of adjustment, however. Our review of the Alaskan experience indicates that wages may indeed fail to rapidly adjust to pre-project levels. The importance of such a "wages hangover" is that it may give rise to high levels of unemployment as the economy adjusts to the project completion. Any unemployment which results from this wages hangover must be accounted as a cost of the project and deducted from gross benefits.

We demonstrate in the Appendix to this chapter that project induced increases in the union wage rate are another possible source of a wages hangover. If unions manage to extract higher wages as a result of labour demand pressure created by the project then post project unemployment will

be higher than it otherwise would have been. Again this unemployment must be accounted as a cost of the project.

IV. Interpreting the Alaskan Experience

In this section we use our model of the dual labour market to interpret the observed labour market impacts which the Alyeska Pipeline had on Alaskan labour markets. We consider separately the impact which the pipeline had on construction labour markets and on other labour markets in Alaska.

The Alyeska Pipeline was first conceived in 1969 after oil discoveries at Prudhoe Bay but, because of a series of economic and environmental questions, actual construction was delayed until 1974. The actual construction period lasted from mid 1974 through mid 1976. The total cost of the project was in the neighborhood of $9 billion. At the height of construction in the summer of 1975 more than 20,000 persons were employed by Alyeska. These 20,000 jobs represented approximately 17% of non-agricultural employment in Alaska prior to the initiation of pipeline construction and more than 200% of pre-pipeline construction employment.

Thus the project was large both in absolute terms and relative to the Alaskan economy. This experience should then display in bold relief the nature of labour market impacts associated with large construction projects of short duration in an isolated area.

A. Impacts on Construction Labour Markets

Alyeska's construction labour requirements were obtained through negotiation with various construction unions. Whereas on previous large pipeline projects in the U.S. union labour represented only a small fraction of total employment, often as little as 5%, on the Alyeska project virtually all of the labour was union labour. This concession on Alyeska's part was

apparently granted in return for a guarantee of labour peace.[1] The bulk of pipeline hiring occurred through hiring halls located in Fairbanks, but a significant portion of skilled pipeline labour was supplied through hiring halls in Tulsa, Oklahoma (pipeline welders) and Seattle, Washington (operating engineers).

The wage rate received by construction workers on the Alyeska project was substantially higher than that obtainable in the lower 48 states. For example in 1975 the average hourly wage in construction in Alaska was more than twice the average rate in the U.S. ($15.32 versus $7.25, see Table 3 below). The differential in earnings was substantially higher than the differential in wage rates owing to the lavish use of overtime by Alyeska. The work week on the project fluctuated between 60 and 72 hours per week. Average weekly earnings on the pipeline were in the neighbourhood of $1000 per week while average earnings in the lower 48 in construction were about $300.

We argue below that there was a significant excess supply of construction labour to Alyeska. In these circumstances it is at first surprising to observe the lavish use of overtime, at time and a half rates, by Alyeska. There seem to be three factors which contribute to this apparently anomalous result. First the construction unions appear to have been willing to moderate their demands for a higher base rate in return for longer hours of work.[2] Second, there is good reason to believe that even in the absence of union pressure Alyeska would have opted for a longer than normal work week. Alyeska had to house, feed and transport to and from the work site a large portion of its employees. These activities give rise to costs to Alyeska which are proportional to the number of employees and not to the number of man hours worked. The only way in

which Alyeska could economize on these costs was through the use of overtime. Although a longer work week meant higher labour costs per hour, the longer work week enabled Alyeska to reduce to some extent the costs of housing, feeding and transporting its employees.[3] Finally Alyeska had only a limited incentive to minimize costs. Tariffs for pipeline use are publically established and are intended to guarantee a "fair rate of return" on costs incurred.

The picture of the Alyeska project presented above indicates that for the construction labour market in Alaska relative to the lower 48 states the conditions of our dual labour market model are satisfied. Alyeska represented a significant increase in the demand for construction labour at premium earnings. We outline below the major aspects of the labour market response to this increased demand.

In order to get some idea of the lure of high pipeline earnings it is instructive to consider the "false boom" associated with the announcement in 1968 of a possible Trans-Alaska pipeline. As Table 1 indicates, there appears to have been a minor wave of speculative migration in 1968 and 1969. Net migration into Alaska jumped from 1,700 in 1967 to over 3,000 in 1968 and over 4,000 in 1969. Statistics on total non-agricultural employment in Alaska do not reflect a corresponding increase in the level of economic activity in Alaska during this period.

Table 1

ESTIMATED POPULATION CHANGE IN ALASKA BY POPULATION COMPONENT, 1960-1975

Year	Number of Births	Number of Deaths	Natural Increase In Population	Estimated Net Migration	Total Increase In Population	Population at Year End	Migration as a % of Increase
1960	7,518	1,265	6,253	+ 2,148	8,401	232,468	25.6
1961	7,586	1,283	6,303	+ 972	7,275	239,743	13.4
1962	7,675	1,308	6,367	+ 251	6,618	246,361	3.8
1963	7,676	1,332	6,344	- 1,151	5,193	251,554	*
1964	7,266	1,438	5,828	+ 1,816	7,644	259,198	23.8
1965	7,063	1,400	5,663	+ 3,488	9,151	268,349	38.1
1966	6,605	1,333	5,272	+ 1,084	6,356	274,705	17.1
1967	6,317	1,297	5,020	+ 1,668	6,688	281,393	24.9
1968	6,453	1,353	5,100	+ 3,227	8,327	289,720	38.8
1969	6,913	1,300	5,613	+ 4,428	10,041	299,761	44.1
1970	7,560	1,431	6,129	+ 2,812	8,941	308,702	31.5
1971	7,312	1,455	5,857	+ 4,047	9,904	318,606	40.9
1972	6,948	1,467	5,481	+ 3,236	8,717	327,323	37.1
1973	6,611	1,464	5,147	+ 8,292	13,439	340,762	61.7
1974	7,006	1,468	5,538	+31,597	37,135	377,897	85.1
1975	7,470	1,522	5,948	+27,955	33,903	411,800	82.5

*Average Annual Outmigration

Column 1 and 2 Birth and death data by place of residence

Column 3 Natural increase in population is the excess of births over deaths in the resident population

Column 4 Estimated net migration is obtained by subtracting the natural increase in population from estimated total increase in population (Col 5 minus Col 3)

Column 5 Total increase in population is the annual increase derived from Column 6

Column 6 Population at year end are estimates interpolated from mid year estimates of the Department of Labour

Column 7 Column 4 divided by Column 5

Source: reprinted from Alaska, Department of Commerce and Economic Development, "The Alaskan Economy Year-End Performance Report 1976", Table 15, p. 46.

Employment in Alaska was increasing during this period but there is no evidence of an acceleration in the rate of increase (see Figure 2 at end of Section).

It is significant that during 1968 and 1969 the U.S. economy was in the midst of the Vietnam boom--the rate of unemployment in the U.S. was less than 4% during this period.

As the project delays mounted the flow of migrants to Alaska was somewhat reduced, and the steady pace of growth (6% per year in employment) in Alaska continued. Despite this steady growth, unemployment rates in Alaska during the early 70's increased from the rate of approximately 9% which held for the period 1964 to 1970 to 10% or 11% for the early 70's. One is tempted to attribute this increase in unemployment to speculative migration in anticipation of the eventual construction of the pipeline. The problem with this interpretation is that the increase in unemployment in Alaska coincided with the recession in the U.S. in the early 70's. However the fact that Alaskan employment continued to increase at a steady rate of about 6% per year during this period, the fact that unemployment rates did not decline in Alaska in 1972 and 1973 as they did in the U.S.

Table 2

Year	U.S. Unemployment Rate	Alaskan Unemployment Rate	Number Unemployed in Alaska
1965	4.5	8.7	--
1966	4.0	9.0	--
1967	3.8	8.8	--
1968	3.5	9.2	--
1969	3.5	9.0	--
1970	5.0	9.0	--
1971	6.0	10.8	--
1972	5.6	10.8	--
1973	5.0	11.0	14,000
1974	6.0	10.0	14,700
1975	8.5	8.7	15,700
1976	--	11.0	19,300

Source: Bureau of Labour Statistics, "Employment, Hours, and Earnings," January 1976, Alaska Economic Trends, June 1977.

as a whole (see Table 2), and the fact that migration into Alaska continued at a relatively high rate suggest that speculative migration contributed to the increased unemployment in Alaska during the early 70's.

In 1973 construction of the Alyeska pipeline, to begin in mid-1974, was announced and a flood of migration was touched off. The estimates in Table 1 indicate that net migration jumped from 3,000 in 1972 to 8,000 in 1973 (the last pre-construction year), to 31,000 in 1974, and to 28,000 in 1975. The impact of this migration on the Alaskan labour market is even greater than the raw numbers would suggest. An exceedingly high proportion of the migrants were labour force participants. For example in one survey of migrants, the 156 male migrants brought only 9 children with 20 more to follow.[4]

Estimates of net migration are quite useful in assessing labour market impacts of the Alyeska project but they do not reveal an important element of the waste of resources involved. Based on a U.S. Department of Labour survey, David Boorkman, in testimony before the Lysyk Inquiry estimated that gross migration into Alaska in 1975 was 56,000, or twice the net in migration figure reported in Table 1 for 1975.[5] The substantial divergence of gross from net migration reveals a pattern of speculative migration to Alaska, the discovery of limited pipeline opportunities due to the long hiring hall queues, and subsequent return to the U.S. as a "disappointed migrant". It is interesting to note that the flow of migrants into Alaska seems to have continued in 1976. No official estimates are available, but the data reported in Figure 1 below on unemployment insurance claims in Alaska from employment in the lower 48 indicate a substantial continued flow of migrants in 1976.

Much of the speculative migration into Alaska must be attributed to the hiring arrangements adopted. In 1972 the Alaskan State Legislature passed the Local Hire Act which was designed to give residents of Alaska employment preference in all projects relating to oil/gas leases. A resident is defined to be anyone who has, among other things, been physically present in Alaska for one year, and who maintains a residence in Alaska. This provision, in combination with the high project earnings obviously invited speculative migration in order to establish residence.

With the exception of Pipeline Welders (hired through Tulsa) and Operating Engineers (hired through Seattle), virtually all of the pipeline labour was hired through union hiring halls in Fairbanks. Membership in the union and seniority were the primary criteria in allocating jobs. In addition most unions required prospective workers to register in person in Fairbanks and to be physically present in order to be dispatched to jobs as they came up. Again, such hiring arrangements invite speculative migration.

Another important factor contributing to speculative migration was the extreme seasonality of pipeline employment. The seasonality dictated large hires during the spring and summer months of 1974,75 and 76, and the queueing process in the hiring halls recurred in each year. This process clearly inhibited the process of equilibration in this labour market. The conditions conducive to speculative migration were recreated in each year.

Table 2 reveals a steady increase in the official level of unemployment as the project got underway (the average for 1973 is 14,000 unemployed, rising to 19,250 for 1976), a decrease in the official unemployment rate from 1973 to 1975, and a rising unemployment rate from 1975 to 1976. Given the magnitude of the migration into Alaska it is perhaps surprising that unemployment is not higher over this period. Indeed, there are good

reasons to suspect that the official unemployment figures are significantly less than actual unemployment. The official unemployment rate is calculated from a labour force survey similar to the one employed in Canada. In each month seven eighths of the persons surveyed are retained in the survey for the current month and one eighth of those surveyed are new to the sample. It follows that if every person in Alaska had the same probability of being included in those newly surveyed in any month, it would take eight months for a population of migrants in any month to be fully represented in the survey. Given higher rates of unemployment among migrants than among residents, the official unemployment figures will understate real unemployment, and the higher the rate of migration the larger will be the divergence of real unemployment from measured unemployment. The U.S. Department of Labour Survey cited in note 4 indicated that roughly one third of the migrants entering Alaska were unemployed. Measured unemployment is likely to understate real unemployment for yet another reason; migrants would appear to have a lower probability of being selected for inclusion in the survey. The procedure for constructing the sample involves a process of selection based on residence. We know, however, that a significant number of migrants were housed in motels, hotels, tents, and campers and it is unlikely that those people would be adequately, if at all, represented in the survey. This is particularly true of the short term, disappointed migrant who returned to the lower 48 after a short period of job search. We are thus left with the strong impression that official unemployment figures are low, but we have no means of accurately determining how low.

As a result of the pipeline boom there appears to have been a substantial wage inflation in the construction trades in Alaska. Average earnings in construction in Alaska increased by 144% from 1973 to 1976. A large share of this increase arose from overtime work but there was also a substantial escalation of base rates. For example, wage rates in six of the principal construction unions (Operating Engineers, Teamsters, Laborers, Carpenters, Engineers, and Electricians) increased approximately 47% from January 1974 to the end of 1976.[6] Table 3 presents data on hourly earnings in all construction in Alaska and in the U.S. as a whole for the period 1974 through 1976. The data reveal that the average

Table 3

HOURLY WAGE RATES IN CONSTRUCTION: ALASKA VS. U.S.

Year	Alaska unadjusted	Alaska adjusted for overtime	U.S.A.	Column (2) divided by column (4)	Column (3) divided by column (4)
1972	10.48	10.48	6.03	174	174
1973	11.04	11.04	6.37	173	173
1974	12.56	11.80	6.75	186	175
1975	15.32	13.19	7.25	211	181
1976	17.36	14.93	7.68	226	194

Source: U.S. Department of Labour Files.

base wage in construction increased very rapidly in Alaska as compared to the entire U.S. The average base wage increased by 35% in Alaska over this period and by only 20% in the U.S.

B. Impacts on Other Alaskan Labour Markets

The impacts of Alyeska on Alaskan labour markets other than construction arose because a substantial proportion of the Alyeska jobs involved unskilled labour and because Alyeska had a significant demand for overhead labour--secretarial, clerical, security, managerial and camp maintenance employees. Following the pattern with respect to skilled construction trades Alyeska offered premium wage rates for its overhead labour and for unskilled labour. Table 4 presents comparative wage rates and earnings for various jobs. In November 1974 the Alyeska wage rates were roughly

Table 4

WAGE AND EARNINGS DIFFERENTIALS:

PIPELINE VS. NON-PIPELINE

Job	Hourly Wage Rate		Monthly Earnings	
	Non-Pipeline	Pipeline	Non-Pipeline	Pipeline
Clerk	$3.00	$4.04	$ 550	$1,225
Janitor	3.87	8.31	671	3,061
Cook	5.87	9.12	1,017	3,359
Dishwasher	3.68	8.31	638	3,061
Laborer	4.00[1], 9.60[2]	9.60	693[1], 1664[2]	3.536

1. non-union
2. union

Source: Fairbanks Impact Information Center, Report No. 10, November 1974.

twice the wage rates obtainable from other employers in Alaska. Again the lavish use of overtime on the pipeline resulted in even wider differentials in earnings --pipeline earnings exceeded earnings elsewhere by as much as 5 times.

Differentials of this magnitude, in combination with the preference for hiring locals, apparently put severe strain on many labour markets within Alaska. In particular the high earnings for unskilled labour seems to have induced many individuals to temporarily abandon their normal occupation in search of unskilled pipeline jobs. The hiring hall queues were particularly long at the Fairbanks hiring hall of the laborers union.[7] Almost no systematic information is available with respect to the magnitudes of the labour flows between various labour markets in Alaska and Alyeska. However, a great deal of anecdotal evidence exists. Boorkman reports that "approximately half the Fairbanks police officers left the Department in order to take higher-paying pipeline security jobs" and that by January 1976 "the Fairbanks Police Department was still approximately 30 men short".[8] Turnover in commercial banks was so severe, over 100% in 1975, that one banker was reported to have joked that diamond seniority pins were being offered to tellers having 30 days experience. Reports circulated that school teachers were "flocking" to Fairbanks hiring hall in 1975.[9] The University of Alaska reported great difficulty in attracting new employees and holding on to existing employees. "In 1974 the number of positions available (unfilled positions) began to grow from a normal level of about 10-15 to over 300 by the end of the year and has stabilized at about 200... The university is having great difficulty recruiting and maintaining custodial persons at a beginning wage of $6.39 an hour... Between January 1975 and June 1975, 79 employees terminated from the (custodial) department, whose authorized strength is 77... many applicants refuse work because they are expecting the university to pay pipeline wages and are disappointed when they find otherwise."[10] Turnover rates in the post office in Fairbanks more than doubled as a result of the pipeline.[11]

Thus it appears that despite high levels of unemployment non-pipeline employers had difficulty holding on to their employees and/or attracting new employees. Two responses to the lure of the pipeline are readily documented. Significant wage pressure developed in the entire Alaskan

Table 5

Selected Hourly Wages in Alaska

Year	Mining	Manufacturing	Wholesale and Retail Trade
1973	$ 6.82	$5.97	$5.02
1974	7.99	7.10	5.85
1975	11.19	8.09	7.03

Source: U.S. Department of Labour Files.

economy. Table 5 presents some evidence on the hourly wage in various Alaskan industries over the period 1973-1975. In mining the wage rate increased by 64% from 1973 to 1975, in manufacturing the increase was 35%, in wholesale and retail trade the increase was 40%. Further evidence indicates that from 1973 to 1976; "all (non-construction) sectors combined average 75% (increase in income), transportation, communications, and utilities increased 125%, wholesale and retail trade 63%, finance, insurance, and real estate 41%, services 125%, and government 39%".[12]

A second response was to promote less experienced workers and to lower hiring standards. Again there a good deal of anecdotal evidence. Boorkman reports such up-grading in contracting and postal employment.[13] Mr. Quisenberry, a vocational rehabilitation counsellor reported in 1976

that "more disabled persons have been able to find jobs" and that "the more severely disabled have been able to secure jobs."[14] Finally, many of the low wage industries tapped resources of secondary labour existing in housewives and students to fill positions.[15] In the case of the latter group, a survey of Fairbanks High School students revealed that 50% of those sampled were working and that over 50% of those working were working in excess of twenty hours per week while attending school.[16]

C. Adjustment Problems

The Alyeska pipeline was finished in July of 1977 and the Alaskan economy is now adjusting to pipeline completion. It is, of course, too early to assess in any reliable fashion the magnitude of the problem. However, it is possible to identify some of the problems which the Alaskan economy will face.

The most obvious and potentially the most serious adjustment problems relate to general wage inflation which accompanied the Alyeska project. The health of the Alaskan economy is dependent on the ability of Alaskan producers to compete in export markets where they are price takers. Any significant increase in wage rates in the export sector will adversely affect the competitive position of Alaskan exporters. As a result employment and output in this sector will decrease, and this will result in decreased employment and output in non-basic sectors. The important questions, which remain unanswered at this point in time, are the extent to the Alyeska wage inflation has reduced the ability of Alaskan exporters to compete, and the rapidity with which Alaskan wages will readjust relative to wage rates in the U.S. as a whole. Another possible adjustment problem

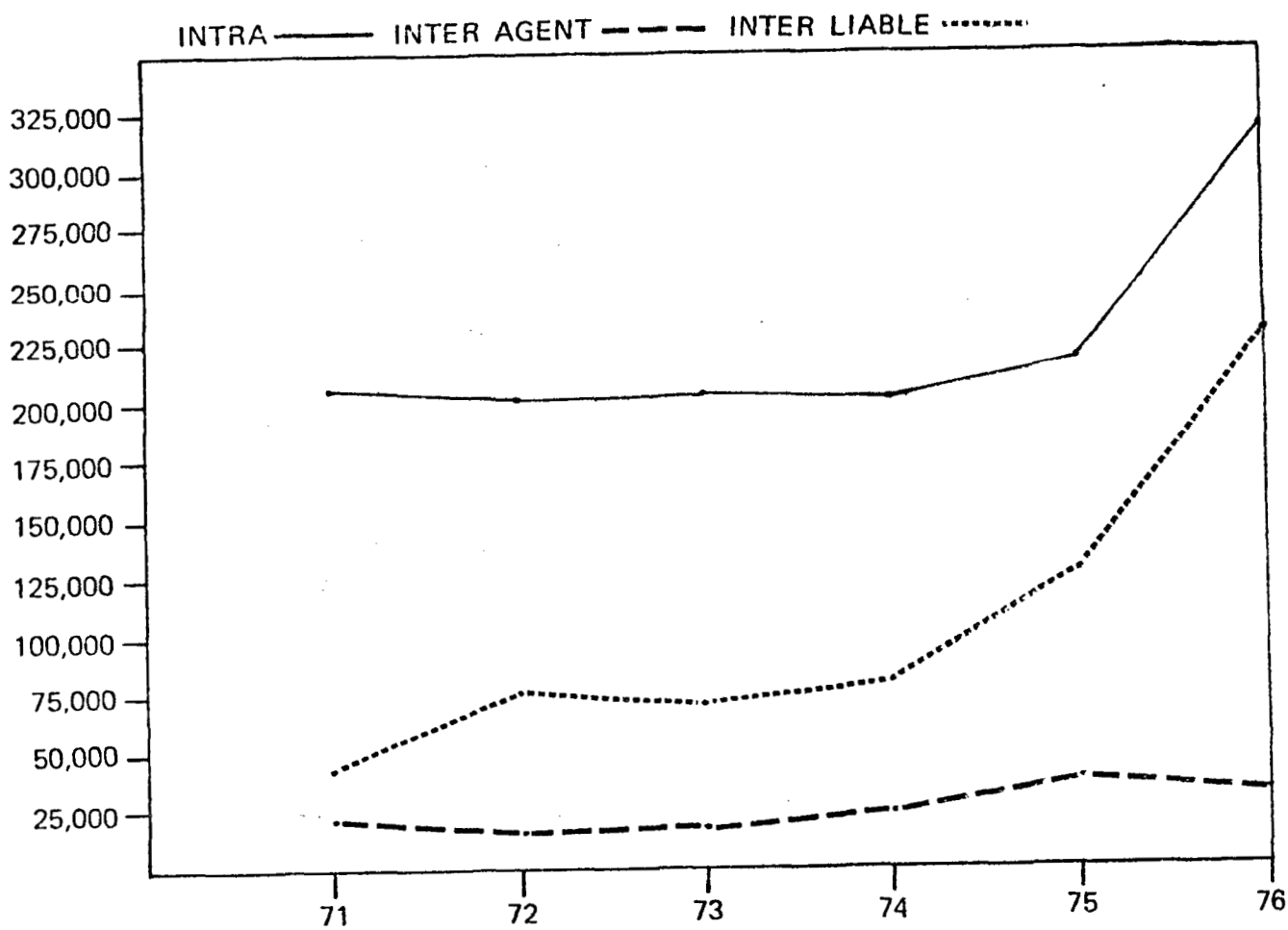
related to the inflated pipeline earnings concerns productivity. In construction, electrical contractors have observed a significant adverse effect on labour productivity.

> "the productivity of workers is down considerably from what it was before the pipeline. Because they were able to get higher hour jobs on the pipeline and when they work in town their productivity is going down by at least 20-25 percent."[17]

A second adjustment problem relates to the reversal of the flow of migrants. There is some evidence relating to the intensions of migrants. Survey results in 1976 indicated that while half the migrants sampled expected to remain in Alaska for at least a year, fully one-third expected to remain six months at most.[18] The sharp rise in 1976 of unemployment insurance claims filed outside Alaska for work done in Alaska, seen in Figure 1 below, indicates that a significant portion of the migrants will return to the lower 48 when pipeline employment is no longer available. On the other hand, in his testimony before the Berger Inquiry, David Boorkman indicated that a significant number of migrants, failing to find pipeline jobs, took non-pipeline employment.[19] Thus the potential for a displacement effect--Alaskan residents taking pipeline jobs and migrants taking permanent jobs in Alaska--would seem to exist. Complicating and perhaps dominating the whole adjustment process is the Alcan Pipeline. The lure of large pipeline earnings will undoubtedly exercise a holding effect on many migrants who, in the absence of the Alcan Pipeline would have returned to the lower 48.

Figure I

UNEMPLOYMENT INSURANCE CLAIMS



intra: claims in Alaska for work done in Alaska

inter agent: claims in Alaska for work done elsewhere

inter liable: claims made elsewhere for work done in Alaska

Source: Alaska State Manpower Review, March 1977.

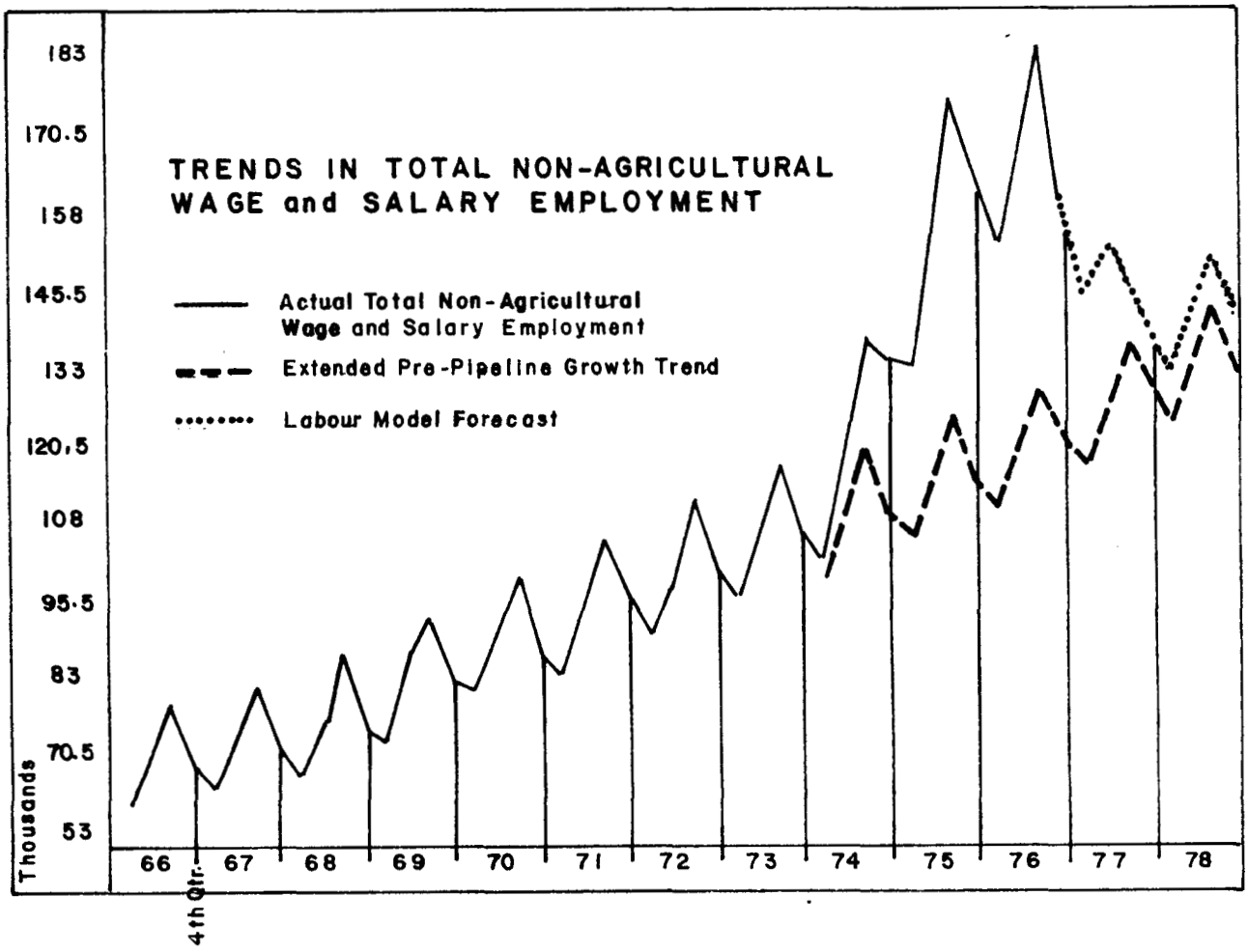


FIGURE 2 SOURCE: ALASKA DEPARTMENT OF LABOUR, LABOUR FORCE HIGHLIGHTS

Footnotes

1. Fairbanks Impact Information Center, Report No. 12, January 15, 1975.
2. Minutes of the meeting of the Fairbanks Impact Advisory Committee, September 4, 1974.
3. See David Donaldson and B. Curtis Eaton, "Person Specific Costs of Production, Hours of Work, Rates of Pay", University of British Columbia Discussion Paper, June 1976.
4. U.S. Department of Labour, "Alaska Pipeline Labour Impact Study", November 1975.
5. David Boorkman, Testimony Before the Lysyk Commission on the Alcan Pipeline, Exhibit No. 145.
6. M. C. Thomas, The Impact of the Trans-Alaska Oil Pipeline on Fairbanks Alaska", unpublished paper, May 1974.
7. Ibid.
8. Boorkman, p. 8.
9. Thomas, p. 4
10. Fairbanks Impact Information Center, Report No. 22, November 1975, p. 8.
11. Fairbanks Impact Information Center, Report No. 16, May 1975, p. 6.
12. Thomas, p. 3.
13. David Boorkman, Testimony Before the MacKenzie Valley Pipeline Inquiry, Exhibit No. 649, pp. 4-5.
14. Fairbanks Impact Information Center, Report No. 25, July 1976, p. 6.
15. C. Miller, "Women in Alaska's Labour Force", Alaska Economic Trends, August 1977.
16. Fairbanks Impact Information Center, Report No. 13, February 1975, pp. 6-8.
17. Thomas, p. 5.
18. C. Miller, "Pipeline Completion and its Impact on Alaska's Labour Market", Alaska Economic Trends, November 1976, p. 1.
19. Boorkman, Exhibit No. 649, p. 5.

V. An Overview

In our view the key to understanding the Alaskan experience lies in labour markets. The operation of labour markets in Alaska can be interpreted in terms of the interaction of three groups--the "public", various trade unions, and the pipeline company.

The most important aspect of the public's role relates to the regulatory function--the setting of rates or tariffs for the use of the pipeline. Tariffs on common carriers are ordinarily set so as to allow a fair or reasonable rate of return to the operator, Alyeska in this case. The importance of the fair rate of return formula, for our purposes, is that it eliminated or certainly reduced the incentive which the pipeline company had to minimize costs of construction. The public also was concerned to guarantee preferential hiring arrangements for local residents, presumably on the grounds that since locals would have to bear a disproportionate share of the environmental and social disruption created by pipeline construction, they ought to have first shot at the pipeline jobs.

The trade union's concerns were to control the hiring of pipeline labour and to increase wage rates and earnings. There is some evidence, from the Alaskan experience (and also from such projects as the St. Lawrence Seaway) that the construction unions were willing to moderate to some extent their demands for increased base rates in return for longer hours of work. Alyeska's primary concern seems to have been to complete the pipeline as rapidly as possibly. Given the fair rate of return formula for setting pipeline tariffs, Alyeska had little or no incentive to minimize costs. They could always expect a "fair" return on their expenditure. On the other hand Alyeska and its creditors had a great deal of capital tied up in the pipeline and their motivation seems to have been

to rapidly get the pipeline revenues flowing.

In these circumstances the bargain struck between Alyeska and the unions was predictable--all pipeline labour would be union labour, most of the labour would be hired through Fairbanks hiring halls, base rates of pay were increased significantly, Alyeska made lavish use of overtime at time and half rates, and the unions agreed not to strike.

Thus the conditions envisaged in our dual labour market model were created--a significant increase in the demand for construction labour at premium wage rates and premium earnings. The hiring arrangements--local preference and the use of Fairbanks' hiring halls, served to focus the labour market process on Fairbanks.

The labour market in general behaved as the dual labour market model predicts. Unemployment in Alaska increased substantially. The lure of premium pipeline earnings led to the queuing process central to the model. And wage rates in the entire Alaskan economy increased markedly as non-pipeline employers attempted to retain their old employees and/or to attract new employees.

The short run dynamic processes in the labour market also appear to have been extremely important in Alaska. Migrants continued to flow into Alaska over the entire construction period. The substantial divergence of gross from net migration into Alaska suggests that the market never really converged to the equilibrium envisaged in the model. There are several reasons for this. The hiring was done in Alaska so it may have been necessary for workers to travel to Alaska to obtain accurate information on pipeline employment prospects. The seasonality of pipeline employment served to recreate the initial conditions where large numbers of workers were hired at high wage rates each spring and summer. A large number of

pipeline jobs were allocated through the hiring halls each year. Finally the vast publicity given to the project and particularly the exaggerated reports of possible earnings, seem to have created overly optimistic expectations.

The most serious consequences of this process were a significant waste of labour (wasted in the queueing process, wasted in efforts to attain "local" status, and most importantly wasted in speculative migration) and the potential for a significant wages hangover. The wage scale in almost all sectors of the Alaskan economy increased dramatically as a result of pipeline construction, and this may have serious adverse effects on the export sector of the Alaskan economy.

The extent to which Britich Columbia may be subjected to a similar experience depends primarily on the relative magnitude of such projects. The KPL proposal, by itself, would not create the extreme situation observed in Alaska. While KPL would create a significant demand for construction labour, relative to the construction labour market in B.C. it would not have the overwhelming impact on B.C. that Alyeska had on Alaska. In the event, however, that the Alcan and KPL projects were being constructed at the same time, B.C. could be subjected to considerable disruption. Direct labour demands for the two projects combined would represent 8 to 15% of total construction employment in B.C. This would put considerable bargaining power into the hands of B.C. construction trade unions and a process similar to that observed in Alaska could be set in motion.

Public policy might appropriately be directed to minimize the adverse impacts of such a development. First, it would seem obvious that the timing of a west coast oil port and pipeline development should be arranged so that there is no significant overlap with the Alcan pipeline

since the disruption generated by such projects is directly related to their relative magnitude. (In fact, it would seem to make sense to have an oil port-pipeline project immediately follow or precede the Alcan project.) In a related vein some attention should be directed to the possibility of spreading the project over a longer period of time so that its labour market impact is reduced.

Second it seems appropriate to seek arrangements which would give the developer more incentive to minimize costs. This would partially reduce the ability of trade unions to extract extravagant wage rates.

Third a great deal of attention should be paid to possible union hiring arrangements. An oil port-pipeline development will undoubtedly attract labour from other western provinces. Hiring exclusively through lower mainland hiring halls will inevitably result in some speculative migration which will be focused on Vancouver. While this will not lead to disruption on anything like the scale observed in Fairbanks it will, nevertheless, result in a waste of human resources. The impact could be reduced if hiring were through union locals in all of the western provinces. This would serve to insure that only individuals with jobs in hand would migrate to B.C.

Finally, it appears to us that the local hire preference creates more problems than it solves. In Alaska and in the Yukon it created an incentive to migrate long before the project got underway in order to establish residence. It creates the potential for a serious displacement effect--drawing locals out of permanent jobs which might then be filled by new migrants. This clearly exacerbates the post construction adjustment process. Finally it increases the wage pressure which the development inevitably puts on local labour markets. If the justification for such arrangements is to provide compensation to residents who are forced to

bear the disruption of such developments it would seem more equitable and less costly to force the developer to compensate residents directly.

VI. Induced Demand Effects

A. Conceptual Problems

Any increase in labour income will result in an increase in the demand for consumer goods and services and any decrease in labour income will decrease the demand for consumer goods and services. Induced demand effects are the effects on output and prices of consumer goods which are attributable to changes in labour income. In this section we are interested in developing a conceptual framework for analyzing what might be termed the net induced demand effects of an OPPD.

The analysis of the previous sections indicates that the net increase in labour income attributable to an OPPD will, in most circumstances, be significantly less than the gross increase in labour income associated with direct project employment. The gross increase in labour income is simply the product of the number of direct project jobs and the average project wage rate, while the net increase is the gross increase minus the labour income foregone in other sectors of the economy as workers are diverted from other employment to project employment.

These observations suggest that one might approach the analysis of net induced demand effects by estimating the net increase in labour income attributable to the project and allocating the net increase in income to demand for various consumer goods and services. However, a very large proportion of project employees will be diverted from other regions of B.C. and the rest of Canada to isolated and relatively small communities along the oil port-pipeline route. Along the route the increase in labour income will be substantially greater than the net increase in labour income and there will be a decrease in labour income in the areas supplying direct project labour. Thus the net induced demand effects will be composed of the effects of increased demand for goods and services along the oil port pipeline route

and of the negative induced demand effects of decreased demand for goods and services in the areas supplying labour to the project.

Before we can develop a framework for viewing net induced demand effects we need some propositions from elementary economic theory. In Figure 1 we portray a consumer goods market.

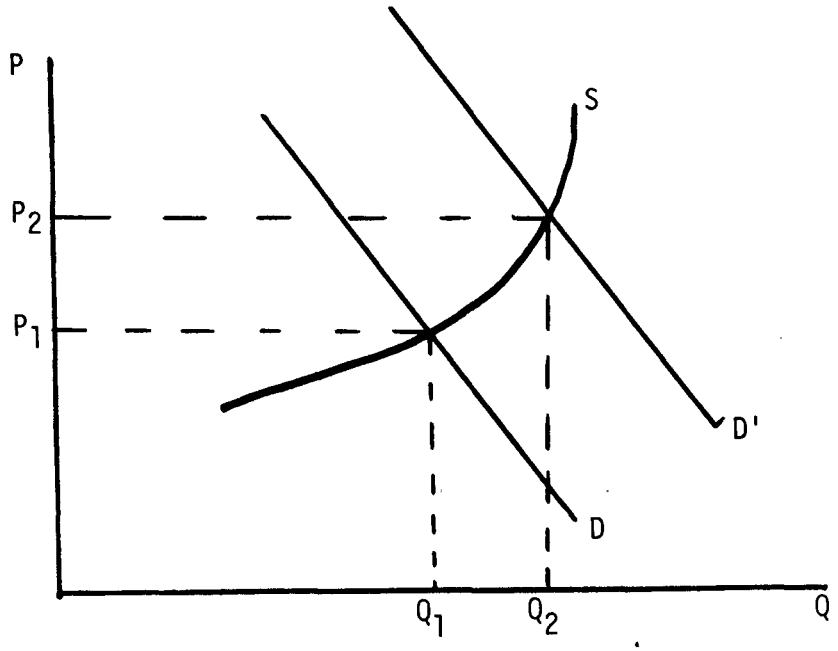


Figure 1

Initially the market is in equilibrium at price P_1, where quantity demanded is equal to quantity supplied, Q_1. Now let demand shift to D' as a result of an increase in labour income. The market response is an increase in quantity from Q_1 to Q_2 and an increase in price from P_1 to P_2. The increase in the dollar value of goods and services in this market in $P_2Q_2 - P_1Q_1$. We can regard $P_1(Q_2 - Q_1)$ of this increase as a real increase resulting from the increased production of the goods, and $(P_2 - P_1)(Q_2 - Q_1)$ as an inflationary or money increase resulting from the induced increase in prices. (As always there is an index number problem here, but our purpose is to develop a conceptual framework and we simply ignore the problem.)

Most consumer goods have a substantial import content. For purposes of evaluating the impact of the induced demand effects on the Canadian economy we are interested in Canadian value added. Letting C represent the import content of consumer goods, measured in dollars, then $(P_1 - C)(Q_2 - Q_1)$ represents the increase in Canadian value added. It is a measure of the increase in real output resulting from the induced demand effect.

Reversing the above scenario we can focus on the forces which will impinge on areas supplying labour to the oil port-pipeline project. In figure 1 let demand shift from D' to D as workers move to project jobs. In the supplying area there will be a decrease in quantity from Q_2 to Q_1 and a decrease in price from P_2 to P_1. The decrease in the dollar value of consumer goods in the supplying area will be $(P_2 - P_1)(Q_2 - Q_1)$, of which $P_2(Q_2 - Q_1)$ is a real decrease, and $Q_1(P_2 - P_1)$ is a money decrease. The decrease in Canadian value added is $(P_2 - C)(Q_2 - Q_1)$.

Ordinarily in analyzing induced demand effects one assumes that the price responses are negligible and that changes in demand result in changes in output at constant prices. With sustained demand changes or with demand changes which are small relative to the market, the assumption of negligible price change is defensible. However, the demand changes resulting from an OPPD will be of short duration and in the communities along the oil port-pipeline route the increased demand will be large relative to the market. Hence the assumption of negligible price change in these communities is inappropriate.

In what follows we will concentrate primarily on net real induced demand effects. This concept is the increase in value added of consumer goods in the communities where project employment is available minus the decrease in value added of consumer goods in labour supply areas. It measures the extent

to which Canadian output is increased as a result of the induced demand effects of the project. The reader should bear in mind, however, that there are significant redistributional effects associated with the induced price changes. In particular, with positive induced demand effects the inflationary increase in value, $(P_2 - P_1)(Q_2 - Q_1)$ in the above example, represents a redistribution of income from consumer's, who face higher prices, to retailer firms, who enjoy higher profits.

The following propositions regarding price and quantity responses to demand changes of short duration are necessary to conceptualize the net induced demand effects of an OPPD.

i) The shorter is the anticipated duration in time of the increased (decreased) demand, the greater will be the price increase (decrease). In other words, demand changes of short duration result in relatively large price changes and relatively small quantity changes.

ii) The greater is the increase in demand relative to the initial level of demand in the market, the greater will be the price increase relative to the quantity increase. In other words, relatively large demand increases give rise to large price increases relative to the quantity increase.

The reasoning behind the first of these propositions is that in response to demand increases of short duration firms will not find it profitable to increase their physical capital but rather will respond to the demand increase by using more labour and other variable inputs in combination with their fixed capital. In response to permanent demand increases, on the other hand, firms would respond by increasing fixed capital, labour and other variable inputs. The first method of increasing output is more expensive than the second and hence prices will increase more in the first case than in the second. The reasoning behind the second proposition is that increasing

output with fixed capital becomes progressively more expensive as the magnitude of the increased output increases.

Both of these propositions assume special relevance in the context of an OPPD. The increased demand will be of short duration, six to eighteen months, and much of it will be focused on relatively small communities.

It seems appropriate to adopt the working assumption that project jobs will be concentrated in isolated, relatively small communities and that the lion's share of project jobs will go to migrants who are attracted to the project from a large labour supply area. In the project communities there will be a substantial increase in demand relative to baseline community demand (the increase will be on the order of 15%) which will be met by some combination of increases in prices and quantities. In the labour supply area there will be a moderate decrease in labour income (on the order of $500,000 per month) which is small relative to baseline demand over the supply area, and which will be met largely through decreases in quantity.

To this point our analysis of induced demand effects has implicitly assumed that the only increase in labour income in the project communities arose from workers who managed to obtain project jobs. However, we know that there will be some speculative migration into project communities. Speculative migration will also have induced demand effects which must be attributed to the oil port-pipeline project. The real net induced demand effects associated with speculative migration will be unambiguously negative. Workers leaving the labour supply area to seek project jobs, but who are unable to obtain project jobs, will effectively be taking their spending power from a large labour supply area and concentrating it in the small project communities. The effect in the labour supply area will be to decrease output with negligible price change.

In the project communities the increase in output will be less than the decrease in output in the labour supply area since increased demand in project communities will be met by a combination of price and output increases. Substantial speculative migration will certainly reduce the net real induced demand effect of project.

We have not attempted to estimate the likely magnitude of the net real induced demand effects of an OPPD because reliable estimates of the short run supply elasticities are not available. Many studies of such projects do compute such estimates (which we believe to be unreliable) and they are often interpreted as "net benefits" of the project. Clearly they are a net benefit only if the opportunity cost of the resources used to produce the output is zero. The opportunity cost of those resources is likely to be high, and the net benefit low.

B. The Alaskan Experience

A well specified, retrospective analysis of the induced demand effects of the Alyeska project is not feasible for several reasons. Accurate data on direct Alyeska employment and earnings are not available. Although most of Alyeska's materials demands were focused on markets outside of Alaska (pipe in particular) a significant but unknown portion of these demands (sand and gravel, for instance) were focused on the Alaskan economy. Finally the Alaskan economy was subject to other shocks of significant magnitude over the construction period: the Alaskan government increased its expenditures by approximately $850 million over the period 1973-1976 (these increases were financed largely from the Prudhoe Bay oil and gas lease revenues); Alaska's export markets were recovering from the recession of the early 70's; a large portion of the $312 million Indian Land Claims Settlement was spent over this period.[1]

Thus it appears to be extremely difficult to identify in a precise manner the Alyeska impacts on the Alaskan economy. A proper retrospective analysis would require accurate data on all of the above in addition to accurate data on output, prices and employment by industry. In these circumstances we have chosen to briefly review H.R.P.I.'s economic base projection of Alyeska impacts and to use the available retrospective data to provide a crude check on the economic base projections. The conceptual problem with the economic base methodology is that it implicitly assumes that increased output will be produced by a proportionate increase in all productive inputs, an assumption which is not appropriate for a short term increase in demand. Thus we use available empirical evidence to provide a crude check on these projections.

The economic base study focuses on the employment response by sector to increased employment in the construction industry. The economic base employment multipliers are reproduced in Table 1. The aggregate employment multiplier is 1.61, indicating that 100 pipeline jobs, assumed to be in the construction industry, will result in the creation of 61 additional jobs. The largest effects are in the service, transportation and retail trade industries.

As a very rough check on these results we estimated directly the relationship between changes in employment for each nonbasic industry and changes in construction employment, for the period July 1974 to July 1977. The results of this exercise are reported in Table 2. There is indeed a rough agreement between these estimates and those derived using the economic base methodology. However, the Table 2 estimates indicate a substantially larger impact on the trade (retail and wholesale) sectors, .25 as opposed to .14. The employment multiplier in Table 2 associated with employment in "eating and drinking" establishments is particularly interesting. The economic base employment multiplier for retailing as a whole is .11 and the raw data reveal an employment multiplier in "eating and drinking places" of .07. This is quite obviously consistent with the phenomenon of speculative migration.

The only reliable information on prices in Alaska relate to the city of Anchorage. Since a disproportionate share of the Alyeska work force was concentrated in Valdez and Fairbanks the price data for Anchorage will not accurately reflect the inflationary pressure generated by Alyeska. (In the two years following announcement of the Alyeska pipeline in 1973 the population of Valdez more than tripled and the population of Fairbanks increased by almost 40%). However the Anchorage data do reveal the general pattern of the price response.

Table 1

H.R.P.I. BASIC/NON-BASIC MULTIPLIERS

Pipeline Construction Multipliers

State and Local Government	.02
Construction	1.01
Retail Trade	.11
Wholesale Trade	.03
Finance, Insurance, Real Estate	.03
Transportation	.17
Services	.24
Total Non-Basic	1.61

Note: To read the multiplier values in terms of jobs it is perhaps easier to multiply by 1,000. Thus 1,000 pipeline jobs add 130 transportation positions immediately and a total of 170 by the end of one year.

Table 2

EMPLOYMENT ASSOCIATED WITH PIPELINE CONSTRUCTION

MONTHLY EMPLOYMENT DATA FROM JULY 1974 TO JULY 1977

Industry	Employment Multiplier
Services and Miscellaneous	.224
Retail Trade	.1877
- merchandise and apparel	.037
- food stores	.042
- eating and drinking places	.072
- other	.038
Transportation et al	.115
- trucking-warehousing	.065
- water transport	-.003
- air transport	.023
- other	.030
Wholesale Trade	.061
Total Non-agricultural Employment	1.867

to Alyeska. Table 3 presents data on the consumer price index (CPI) and its components for Anchorage and for the U.S. as a whole from 1970 through 1976. During the early 1970's prices were increasing in Anchorage at a rate substantially below the U.S. rate. This gap was wiped out in 1974 and in '75 and '76 Anchorage experienced a significantly higher rate of inflation. The most rapid inflation in Anchorage relative to the U.S. as a whole was in food prices, particularly the food away from home category (note the 30% rate of inflation in 1975 in this category), and in housing.

Limited information on housing and food prices in Fairbanks indicates that the inflation was more severe in Fairbanks than in Anchorage. Data on rental rates for apartments advertised in the Fairbanks Daily News-Miner indicate price increases averaging over 50% from early 1975 to early 1976. The inflationary pressure appears to have been less in rental houses but still significant, averaging something like 25% over this one year period. The Fairbanks Impact Information Center conducted surveys on food prices in Fairbanks and in Anchorage which reveal a substantially greater rate of inflation in Fairbanks. To take an extreme example, during the first six months of 1975 food price increases in Fairbanks were more than five times the increases in Anchorage.[2]

The pattern of price increases in combination with the employment multipliers in Table 2 indirectly reveal the significance of speculative migration in the Alaskan experience. Alyeska both housed and fed a significant portion of its labour force and yet the data reveal that the inflationary pressure was greatest in the "food away from home" category and in housing. A spokesman for the Fairbanks Chamber of Commerce put it this way:

Table 3

PERCENTAGE INCREASES IN THE CPI: ANCHORAGE AND THE UNITED STATES (%)

Year / Region		CPI	Food Categories			Apparel and Upkeep
			Total	At Home	Away	
1970	U.S.	5.9				
	Anchorage	3.5				
1971	U.S.	4.3	3.0			3.2
	Anchorage	3.0	1.9	1.8	2.6	3.1
1972	U.S.	3.3	4.3			2.1
	Anchorage	2.7	3.6	4.1	1.0	3.1
1973	U.S.	6.2	14.5			3.7
	Anchorage	4.2	10.0	12.6	1.7	4.2
1974	U.S.	11.0	14.4			7.4
	Anchorage	10.8	17.1	20.0	11.1	6.6
1975	U.S.	9.1	8.5			4.5
	Anchorage	13.7	15.0	10.6	29.7	7.9
1976	U.S.	5.8	3.1			3.8
	Anchorage	70.7	3.9	2.4	7.5	6.1

Year / Region		Transportation	Housing Categories			Health Recreation
			Total	Rental	Owner	
1970	U.S.					
	Anchorage					
1971	U.S.	5.2	4.5			5.2
	Anchorage	4.2	3.0	2.3	2.0	3.4
1972	U.S.	1.1	3.9			2.9
	Anchorage	0.4	3.1	1.6	2.6	2.2
1973	U.S.	3.3	4.5			3.5
	Anchorage	1.2	2.6	0.8	3.9	3.6
1974	U.S.	11.2	11.6			7.8
	Anchorage	8.4	9.2	2.1	7.2	10.8
1975	U.S.	9.4	10.8			9.4
	Anchorage	9.8	16.1	9.7	8.1	12.0
1976	U.S.	9.9	6.2			6.4
	Anchorage	11.3	9.2	14.1	4.3	7.6

> "There's 20,000 men on the line today, 15,000 of those we have never seen--except at the airport coming and going. Maybe they stay a day or so in town, drop a little money here, but basically they haven't affected our economy."[3]

Data on cheque-clearings indicate that roughly half of the Alyeska pay cheques were cashed outside Alaska.[4] Thus the consumption demands in Alaska of the Aleska workers were significantly less than one might expect.

The induced demand effects of Alyeska on the rest of the U.S. are exceedingly difficult to estimate. A large portion of Alyeska earnings appear to have been repatriated, and obviously repatriation of earnings mitigates the negative induced demand effects in the sending region. On the other hand unsuccessful speculative migration is bound to give rise to substantial negative induced demand effects in the sending region. Speculative migrants must have their "cakes and ale" and they must be seen as transferring their spending power from the home region to Alaska. And as we indicated above the net real induced demand effect of disappointed migrants is unambiguously negative. The magnitude of the negative induced demand effects of course is directly related to the opportunity cost of the speculative migrants.

Footnotes

1. Alaska Department of Commerce and Economic Development, The Alaskan Economy Midyear Performance Report: 1977.

2. Fairbanks Impact Information Center Reports.

3. R. Knox, "Fairbanks: What Happens Next?", Alaska Industry, August 1976, p. 36.

4. Alaska Department of Commerce and Economic Development, The Alaskan Economy Year-End Performance Report: 1976, p. 5.

VII. Construction Materials Demands

A. Conceptual Problems

Construction of an oil port-pipeline complex will involve large volumes of materials, machinery, and equipment. The demands for these products by an OPPD could represent significant demand increases for several industries. From an economic point of view assessment of impacts on these markets is analagous to the analysis of the previous section. Differences in analysis arise primarily out of differences in the short run technology of production in materials industries versus consumer goods industries. In the short run in materials industries it is reasonable to assume that production up to capacity occurs at constant average costs and that production cannot be expanded beyond capacity.

Once again a key factor in our analysis is the relatively short duration of the materials (machinery, and equipment) demand increase. Pipeline construction is anticipated to take some 18 months to two years. In intermediate goods industries like steel pipe and electrical equipment, which are the main suppliers of products, such a short period of demand increase is unlikely to elicit an increase in the size and/or number of suppliers. The primary reason for such behavior is that these industries are capital-intensive and thus require large investments to increase capacity. Furthermore such investments require a long lead time. The lag between investment decisions and investment completion precludes their coming on-line before project completion. Thus for the remainder of this discussion we will assume that the size and number of firms in the industries under consideration are fixed.

Conceptually it is useful to consider two extreme cases: an industry experiencing substantial excess capacity, and one operating at capacity.

Capacity output in this case is merely the maximal output obtainable from our given number of suppliers. In the case of excess capacity the demands of the port-pipeline construction can be met by re-employing resources, i.e. labour and capital. At the other extreme we can consider an industry operating at capacity. In this situation demand increases cannot result in increased output, since by assumption we are producing maximum output. Demands must be rationed and the method of rationing is to increase prices to identify those most willing and able to pay. Selling the same output at higher prices means that the profits of suppliers increase while those rationed out of the market suffer reduced profits as they must either find other markets or postpone, perhaps forever, their demands. Since we are dealing with intermediate goods, i.e. those used by the purchasers to make other goods, the industries rationed out may therefore experience loss of orders generating unemployment in these markets.

In attempting to assess the impact of OPPD demands on these markets, one must first identify industries in which the OPPD demands are likely to push the industry to its capacity. Below we identify the steel pipe and coating industries as potential bottlenecks. Approximately 60% of the OPPD demands fall in these categories.

In assessing the benefits associated with increased output we must once again raise the issue of opportunity cost of resources. With respect to unemployed, fixed capital the opportunity cost can be regarded as virtually zero. With respect to labour the opportunity cost is again likely to be relatively high.

B. Potential Bottlenecks

In this section we consider possible bottlenecks in supply which might arise as a result of an OPPD. We use the estimates of materials demand prepared by D. W. Ross Associates for the proposed Kitimat to Edmonton pipeline. These estimates are reproduced in Table 1. They are intended to be taken as estimates of what could be supplied by Canadian producers and are not necessarily projections of what would be supplied by Canadian producers.

In order to search for possible bottlenecks we have attempted to express the demands in Table 1 relative to peak and average industry output in the 1970's. Approximating the values of average industry output and peak industry output initially involves the allocation (in some cases the "arbitrary" allocation) of the materials demands in Table 1 to Statistics Canada industrial categories.[1] Fortunately the steel pipe and pipe fittings, which represent 60% of the total dollar demand in Table 1 clearly fit into the rather narrowly defined "Steel Pipe and Tube Mills" industry. A second problem which must be confronted involves comparison of the data in Table 1, which is based on 1976 prices, with Statistics Canada data, which is based on prices for the years 1971 to 1975. This problem is partially avoided through the use of Statistics Canada industrial price indices. We have converted the materials demands in Table 1 to derived labour demands by industry, and in Table 2 we compare the derived labour demands with average (1970-1975) and peak industry employment by region. The figures reported in Table 2 represent output/production labour.[2] The peak employment figure is interpreted as an index of industry capacity.

Table 1

INITIAL CONSTRUCTION PHASE
POTENTIAL SUPPLY SOURCE OF MATERIALS, STRUCTURES & EQUIPMENT

MATERIALS, STRUCTURES & EQUIPMENT	B.C.		ALBERTA		OTHER CANADA		FOREIGN		TOTAL	
	Tons	Medium $'000	Tons	Medium $'000	Tons	Medium $'000	Tons	Medium $'000	Total Tons	Total $'000 Medium
Pipe	-		225,744	108,881	-	-	-	-	225,744	108,881
Pipe Fittings	20.7	183	41.4	365	20.7	182	193.2	1,705	276	2,435
Coating & Wrapping	-	2,295	-	2,295	-	-	-	-	-	4,590
River Weights	-	595	-	255	-	-	-	-	-	850
Valves-Gate	-	-	221.6	725	886.56	2,901	-	-	1,108.8	3,626
-Check	-	-	-	-	71.28	233	403.92	1,321	475.2	1,554
Flanges	-	-	49	498	196	1,992	-	-	245	2,490
Pump Station Materials	-	3,296	-	824	-	-	-	-	-	4,120
Pumps	-	585	-	293	-	292	-	130	-	1,300
Pump Station Bldgs.	200	336	50	84	-	-	-	-	250	420
Diesel Motors	-	-	-	-	-	-	-	9,000	-	9,000
Electric Motors	-	-	-	-	-	7,000	-	-	-	7,000
Electrical Cubicles	-	750	-	-	-	-	-	-	-	750
Pump Station Sub-Station	4	400	1	100	-	-	-	-	5	500
Oil Storage Tanks	7,806	13,260	5,204	8,840	-	-	-	-	13,010	22,100
Sump Tank	1	40	1	40	-	-	-	-	2	80
Tank Prover	-	-	23	250	-	-	-	-	23	250
Air Eliminators	5	76	5	76	-	-	-	-	10	152
Tank Farm Building	20	70	-	-	-	-	-	-	20	70
Meter Equipment	-	-	-	-	-	-	61	230	61	230
Dock Structure	3,135	9,025	-	-	165	475	-	-	3,300	9,500
Unloading Arms & Fenders	-	-	-	-	-	-	136	1,600	136	1,600
GRAND TOTAL ($'000):-	11,191.7	30,911	231,340.0	123,526	1,339.54	13,075	794.12	13,986	244,666.0	181,498
Percentages:		(17%)		(68%)		(7%)		(8%)		(100%)

Source: D. W. Ross, Economic Impact of the Proposed Kitimat-Edmonton Oil Pipeline, vol. 1, p. 26.

Table 2

ESTIMATES OF EMPLOYMENT ASSOCIATED

WITH PIPELINE AND EXISTING DEMANDS
(man-years)

Products	Region	Port-Pipe Labour (1)	Ave. 70's Labour (2)	Peak 70's Labour (3)	(1)/(3) (4)
Steel pipe & fittings	Alberta	594.2	590.4	863	.69
Coating	Alberta	78.3	103.0	122	.64
Wrapping	B.C.	99.5	135.5	160	.62
Structural	Alberta	111.9	1070	1176	.10
Metal*	B.C.	354.4	1492	1747	.20
	Canada	6.8	10951	14916	.00
Misc.	Alberta	21.0	307.3	723	.05
Metal Fab.*	Canada	87.7	16808	23663	.00
Mis. Machinery	Alberta	19.8	1060	1342	.01
& Equipment*	B.C.	65.2	2993	3608	.00
	Canada	5.2	32923	36011	.00
Industrial	B.C.**	17.7	331.0	368	.05
Electrical*	Canada	108.8	15767	17636	.01

Table 2 reveals potential bottlenecks in Steel Pipe and Fittings in Alberta (the OPPD demands represent 69% of peak output in the early 70's) and in coating and in wrapping (the OPPD demands represent 64 and 62% of peak output in Alberta and B.C. respectively). It then seems highly probable that if the OPPD demands for these products were directed to the industries in Alberta and B.C. as indicated in Table 1, there would be significant upward pressure on prices and a degree of rationing out. In terms of the dollar magnitudes of materials demand steel pipe and fittings are by far the most significant demand generated by an OPPD.

Having concluded that steel pipe and associated products are likely to involve the use of alternative markets it is useful to consider other Canadian alternatives for those rationed out of the Alberta market. Table 3 presents the estimated employment in the Canadian steel pipe and tube industry net of Alberta. In terms of average employment the Alberta industry is roughly one-seventh (15%) the size of the industry in the rest of Canada. The presence of this market might permit those purchasers unable to buy in Alberta to buy elsewhere in Canada. This would, of course, reduce the price pressure in Alberta.

Table 3

EMPLOYMENT IN CANADIAN PIPE AND TUBE MILLS (net of Alberta)

Year	Value of Output ($000's)	Employment
1971	219,633	3797
1972	276,354	4425 peak
1973	284,062	4045
1974	373,406	4333
1975	447,154	4035
		4127

Source: Stats. Canada, "Steel Pipe and Tube Mills", 42-220

There is an obvious further consideration which leads us to suspect that rationing out would still be a problem even if the whole Canadian market were available. Foothills (Yukon) Pipe Lines Ltd. has also indicated a desire to purchase pipe from Canadian sources. From summer 1978 to winter 1981 they project shipping 371,538 tons of pipe from Eastern Canada to the pipeline site.[3] This volume of pipe is 65% more than the 225,785 tons of pipe and fittings estimated in Table 2. Clearly this demand will severely hamper the use of Canadian markets by those rationed out in Alberta should the Alaska Highway project and the Kitimat project come on-line at the same time.

The other industry for which port-pipeline demands are likely to strain capacity is the metal coating industry. This is not surprising, given the steel pipe problems, since this industry's capacity is closely related to the use of steel pipe. However, when looking at the whole Canadian market for metal coating one observes that combined B.C. and Alberta employment was, on average for the 1970's, only 6% of the rest of Canada's.[4] Without a more detailed study of the relationship between pipe production and the coating industry it can only be concluded that the use of the whole Canadian market is perhaps a viable alternative to those unable to satisfy demands in B.C. and Alberta.

Footnotes

1. We took as our guide in the allocation of these demands the SIC Manual, Statistics Canada 12-501.

2. The source data appear in various Statistics Canada industry surveys: 42-220, 41-227, 41-228, 42-214, 43-207, 41-214.

3. Trimac Consulting Services Ltd., Lysyk Inquiry Exhibit No. 8.

4. Statistics Canada, Metal Stamping, and Coating, 41-227.

VIII. Appendix: The Dual Labour Market Model

In this appendix we carefully develop a dual labour market model of the construction industry. We first develop the model and analyze it graphically. In this development we focus on the nature of equilibrium and on the opportunity cost of labour. We then analyze the model mathematically, focusing again on the opportunity cost of labour and on possibilities for a wages hangover.

A. Development of the Model and Graphic Analysis

The construction industry thoughout Canada is composed of a large unionized sector and a large non-unionized sector. The wage rate in the unionized sector, $\bar{w}$, is fixed by contract in the short term and is ordinarily substantially greater than the wage rate in the non-unionized sector, v. (Bars over symbols indicate that the variable is exogenously fixed while symbols without bars are determined endogenously.) If given the choice of a union or a non-union job the worker would, of course, prefer the union job. In the union sector selection of new workers for a project is done through the union hiring hall on a queueing basis. In the non-union sector jobs are obtained through a process of search. In this sector wages appear to be flexible and respond to market forces. The nature of construction employment in both sectors is such that construction workers become unemployed periodically as the job they are working on is completed. Many construction workers who hold a union card take non-union jobs when union jobs are not readily available. We use these features of the construction labour market to develop a dual labour market

model which focuses on the workers choice to seek union or non-union employment. The model is an adaptation of models developed by Todaro (American Economic Review, March 1969), Todaro and Harris (American Economic Review, March 1970) and Eaton and Neher (Journal of Political Economy, April 1975).

We assume that each time a worker becomes unemployed he must decide whether to seek a job in the union sector or in the non-union sector. Other things being equal, union jobs are preferred to non-union jobs since $\bar{w}$ exceeds v. But obtaining a union job entails a period of unemployment, D_n, which depends on the length of the queue in the hiring hall and on the rate at which union jobs become available. If the unemployed construction worker decides to seek a non-union job he may also expect to endure a period of "search" unemployment, D_c, but we argue that D_n must exceed D_c. Assume for purposes of argument that D_c and D_n are equal; then, since $\bar{w}$ exceeds v, some workers seeking non-union jobs would find it attractive to seek union jobs. But as unemployed workers join the union queue in preference to seeking non-union jobs D_n will increase and D_c will decrease. It then follows that D_n exceeds D_c. For convenience we will assume that D_c is zero; that is, non-union jobs are readily available and no job search is required.

Let $\bar{L}$ represent the number of union jobs available at the fixed union wage rate, $\bar{w}$. Let U represent the number of unemployed construction workers seeking union jobs. Then expected returns per period from employment in this sector will be

$$\bar{w}\left[\frac{\bar{L}}{\bar{L}+U}\right] \quad .$$

The total number of workers seeking union jobs is $\bar{L}$ + U, but there are only $\bar{L}$ union jobs available and hence a worker committed to the union

sector of the market must expect to be employed only $(\bar{L}/(\bar{L} + U))$ of the time. He will then be unemployed $(U/(\bar{L} + U))$ of the time. He will receive unemployment compensation while he is unemployed. Letting $\bar{c}$ represent the rate of unemployment compensation, the total expected returns per period to a worker committed to the unionized sector, averaged over the period of unemployment and the period of the job, are

$$(1) \qquad r = \frac{\bar{w}\bar{L} + \bar{c}U}{\bar{L} + U} \quad .$$

Non-union jobs are assumed to be freely available at the non-union wage rate, v. But as more workers enter this sector v declines. In Figure 1 below f(K) is the demand curve for non-union labour, where K is employment in the non-union sector.

The newly unemployed construction worker will choose to seek a union job if r exceeds v, and he will accept non-union employment if v exceeds r. This implies that in equilibrium r must equal v. This equilibrium condition can be expressed as

$$(2) \qquad v(\bar{L} + U) - \bar{w}\bar{L} - \bar{c}U = 0 \quad .$$

It is instructive to consider the way in which equilibrium is attained. Assume that v exceeds r. This implies that some unemployed workers seeking union jobs will find it attractive to accept non-union jobs. As these workers come into the non-union sector v is reduced, and the queue of unemployed workers seeking union jobs is also reduced, U is reduced. The reduction of U of course implies that r is increased. This process will continue until the returns from accepting non-union jobs equal the returns from union jobs, or until equation (2) is satisfied.

We assume that the number of workers committed to the construction labour market is fixed at $\bar{N}$, and thus we know that

(3) $\bar{N} = \bar{L} + K + U$;

that is, workers committed to the industry either have union jobs, non-union jobs, or are unemployed in search of a union job. Equation (3) implies that

(4) $U = \bar{N} - \bar{L} - K$.

Using (4) we replace U in equation (1) to obtain

(5) $r = \bar{c} + \bar{L}(\bar{w} - \bar{c})/(\bar{N} - K)$.

Notice that r as it is expressed in equation (5) depends on K, and as K increases r increases. Then we graphically depict equilibrium in the construction labour market by drawing the relationship between r and K, equation (5), and the non-union labour demand function, f(K), in Figure 1. Then the equilibrium wage rate in the non-union sector will be v*, and the equilibrium level of employment in this sector will be K*.

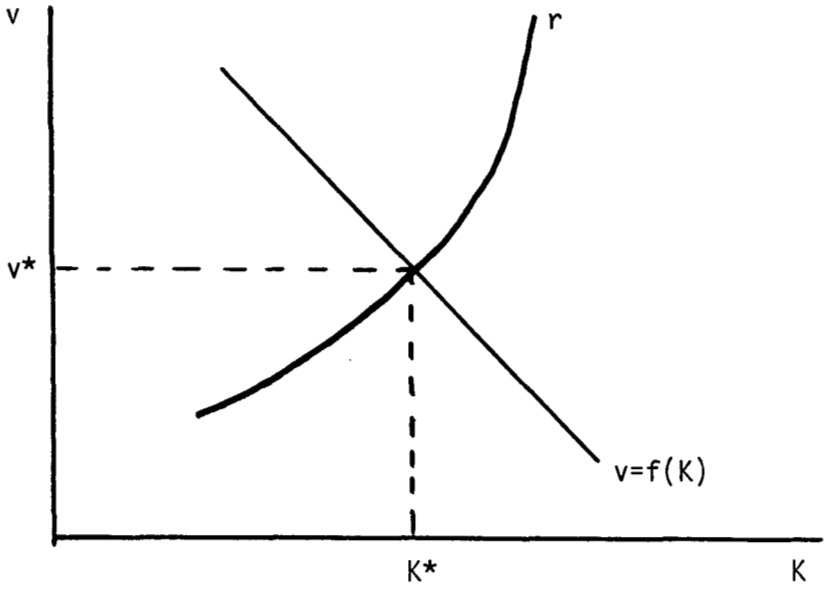


Figure 1

We can now turn out attention to the possible impact of an OPPD on the construction labour market. The direct employment on the pipeline can be regarded as an increase in the number of jobs available at the union wage rate. Looking at equation (5) we see that an increase in $\bar{L}$ will increase r, returns from seeking a union job. Letting $\bar{P}$ represent the number of direct OPPD jobs available we can write r', returns from seeking union jobs when union employment has increased to $\bar{L} + \bar{P}$, as

$$(6) \qquad r' = \bar{c} + (\bar{L} + \bar{P})(\bar{w} - \bar{c})/(\bar{N} - K) \quad .$$

With the aid of Figure 2 we can readily interpret the impact of $\bar{P}$ additional jobs on the construction market. When the $\bar{P}$ jobs appear returns

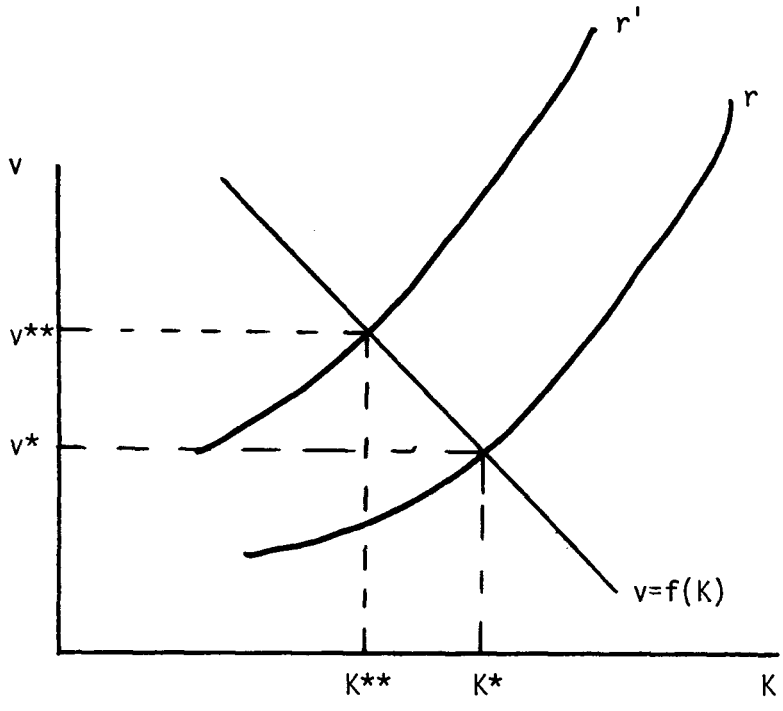


Figure 2

to seeking union work shift from r to r'. At the original non-union wage rate, v*, some workers in this sector are induced to seek union employment. As they leave the non-union sector in search of union employment the non-union wage increases. In the new equilibrium wages in this sector have risen to v** and employment has decreased to K**.

But what has happened to unemployment in the industry as a whole? Union employment has increased by $\bar{P}$ and non-union employment has decreased by K* - K** and thus the net change in U will be

$$\Delta U = \bar{P} - (K^* - K^{**}) \quad .$$

The net change in unemployment, ΔU, can be either positive or negative; that is, the $\bar{P}$ oil port-pipeline jobs can either increase or decrease unemployment in the industry as a whole. If wages in the non-union sector increase rapidly as workers leave this sector the change in non-union employment will be relatively small and unemployment in the industry will decrease. However under no circumstances will unemployment decrease by $\bar{P}$. Some workers will inevitably be diverted from the non-union sector. On the other hand, if wages in the non-union sector increase slowly as workers leave this sector unemployment will increase.

The significance of this view of the labour market is that it emphasizes that the opportunity cost of labour is not zero. The jobs created by an OPPD will be filled because the employer is willing to offer premium wage rates and, perhaps more importantly, premium earnings through the use of overtime. However, there will not be a one for one reduction in unemployment as project jobs are filled, rather some (perhaps most) of the labour will be diverted from other jobs. In fact it is conceivable

that unemployment will increase as a result of the increase in jobs at premium wage rates.

B. Mathematical Analysis of the Model

Equilibrium in the non-union sector is characterized by

(7) $v = f(K)\ ,\quad f'(K) < 0\quad .$

The equilibrium level of unemployment is determined by the condition that individual workers be indifferent between accepting non-union employment or devoting themselves to the high wage, union sector. This equilibrium condition is (equation (2) above)

(8) $v(\bar{L} + U) - \bar{w}\bar{L} - \bar{c}U = 0\quad .$

The labour force identity (equation (3)) completes the model.

(9) $\bar{N} = K + \bar{L} + U\quad .$

We totally differentiate (7), (8), and (9) and employ Cramer's rule to analyze the comparative static properties of the model. The model can then be represented as:

$$\begin{vmatrix} dv & dK & dU \\ 1 & -f' & 0 \\ \bar{L}+U & 0 & v-\bar{c} \\ 0 & -1 & -1 \end{vmatrix} = \begin{vmatrix} d\bar{L} & d\bar{w} \\ 0 & 0 \\ \bar{w}-v & \bar{L} \\ 1 & 0 \end{vmatrix} .$$

It is then easy to verify that $dv/d\bar{L} > 0$ and $dK/d\bar{L} < 0$. The response of unemployment to a marginal increase in $\bar{L}$ is

$$\frac{dU}{d\bar{L}} = \frac{\bar{w} - v + f'(\bar{L}+U)}{v - \bar{c} - f'(\bar{L}+U)} \quad ,$$

which will be positive if and only if the numerator is positive or if

$$|f'| < (\bar{w}-v)/(\bar{L}+U) \quad .$$

Thus if the wage rate in the non-union sector is relatively unresponsive to shifts in labour supply an increase in $\bar{L}$ will lead to an increase in unemployment. It is also easy to show that, if unemployment decreases as $\bar{L}$ increases, the decrease in unemployment will be less than the increase in $\bar{L}$. What is required is that

$$-\frac{dU}{d\bar{L}} \Delta\bar{L} < \Delta\bar{L} \quad ,$$

or that

$$-\frac{dU}{d\bar{L}} < 1 \quad ,$$

which is easily shown to be true.

It is possible to use this model to explore the potential for a wages hangover. The most obvious source of a wages hangover is an induced increase in the union wage rate, $\bar{w}$. Suppose that the increased demand for labour brought about by an OPPD enables the union to bargain for a higher wage rate, this is, to increase $\bar{w}$, and suppose further that the union wage does not decrease on pipeline completion. In these circumstances our model indicates that unemployment will be unambiguously higher when the project is completed than it would have been in the absence of the project. In terms of the model a wages hangover will arise if the response of unemployment to an increase in $\bar{w}$ is positive. And

$$\frac{dU}{d\bar{w}} = \frac{\bar{L}}{v - \bar{c} - f'(\bar{L} + U)} > 0.$$

A second potential for a wages hangover exists in the model. We know that v will increase as the OPPD jobs come on line. Suppose on project completion that either v does not adjust downward to its pre-project level, or that it does so only very slowly. What are the consequences of this wage stickiness in the non-union sector of the market? We know that employment in the non-union sector will decline over the duration of the project. If v does not decline on project completion, employment in this sector will not increase on project completion and it follows that unemployment after project completion will be higher that it would have been in the absence of the project. In the absence of the project unemployment would have been $\bar{N} - \bar{L} - K^*$ and if the non-union wage fails to decline on project completion post-project unemployment will be $\bar{N} - \bar{L} - K^{**}$ (K^* and K^{**} come from Figure 2).

Chapter 2

ASSESSMENT OF LONG TERM EFFECTS OF AN OIL PORT IN KITIMAT

Assessment of the Long-Term Effects of an Oil Port in Kitimat

In this portion of our report we are concerned with the likely changes in the Kitimat area that will arise after the pipeline and port have been completed. How much difference will the presence of an oil port make to the Kitimat-Stikene region and how should any changes in the local economy be judged. Here we are limiting our enquiry to the port area for we feel certain any secondary impact will be concentrated there. The oil port itself will have modest impact but its presence will alter the local economic environment and may create a situation where other industries would be induced to locate in the area. For example, the presence of the port and pipeline would assure a reliable source of crude oil and might lead to the construction of a local refinery; or navigational improvements associated with the oil port might make Kitimat an attractive location for a major mineral processing operation, such as a copper smelter.

Prediction of the effect of an oil port on other investment decisions involves consideration of the size and nature of the impact of the port on the local economic environment and an assessment of how changes of this magnitude will influence the investment plans of industries that might locate in the area. Our analysis suggests that the effects will be modest. The presence of an oil port will effect the costs, markets and prices of other potential industries very little. Furthermore the location decisions of the potential industries appear not to be influenced significantly by the changes in cost conditions that will result from port development.

Evaluation of the effect of port development on the economy must extend beyond the prediction of the changes that are likely to follow the oil port development. Assessment of the net economic benefits of any local development requires a careful assessment of the real costs of that

expansion. As a result, here, as we did in our discussion of the short-run effects of construction, we will devote a considerable amount of our effort to consideration of the opportunity cost of the labour and other factors that will be employed in any industrial development in Northwestern British Columbia.

I. Direct and Indirect Changes in Employment and Industrial Location

A. Impact of Port and Pipeline Operations:

Operation of an oil port and pipeline terminal will have a limited direct impact on the Kitimat region. Employment at the terminal, the tank farm and on tug boats based in Kitimat will amount to about sixty-five jobs. About thirty-five additional jobs would be associated with a fully upgraded system of navigational aids and marine traffic control for the North-West Coast of British Columbia. The integrated system of marine traffic control would serve the entire region, however, and most of the jobs associated with its operation would either be in remote areas or in a central facility based in Prince Rupert.

Thus fully improved navigational facilities would not create additional employment in the Kitimat port area. The greatest local impact of port operation will be its tax yield to the District of Kitimat. This is expected to be over a million dollars annually. Presumably this would be used to relieve the existing tax base.[1]

The direct employment associated with the port will be a very small increase in the Kitimat labour force and will affect the local economy only modestly. Not only will the increase in employment income be modest but also most consumer expenditure will be on commodities that are not locally produced. Since most consumption expenditure will not be on local

production there will be little multiplier impact on local production and employment. At most there will be a slight increase in commercial and service income and a few new jobs in these same sectors. The exact size of this impact is difficult to evaluate exactly; Craig Davis made estimates in connection with his analysis of the impact of a possible steel mill in Kitimat and concluded that a multiplier of 1.3 was appropriate for the region.[2] This figure is probably of the right order of magnitude.

B. Secondary Impact:

If port development is to have a significant impact on the local region it will have to result in sufficient change in the local economic environment to attract additional industries. Evaluation of this possibility involves, first, an examination of how the project will change the economic environment facing industries that might locate in Kitimat. Second, the locational and investment decisions of those industries that might be candidates for expansion in Northwest British Columbia must be considered to see if they are likely to respond to changes in the local economic environment. Even if the port development significantly improves the investment climate for a particular industry or firm investment will not occur if the prospects still do not appear profitable or if an alternative location remains preferable.

The port and pipeline project may effect other investments by influencing market conditions, costs, or the availability of services and resources. These effects may, of course, be both positive and negative. It is helpful to organize our thinking about these effects within a taxonomy of three influences. First, the project may enlarge the local market sufficiently to induce investment in demand oriented firms--these may be termed "final

demand linkages". For example, if the project enlarges the local economy it might become profitable to locate consumer oriented industries in the area. Second, the operation of the port and pipeline might require specific inputs in sufficient quantity to induce supplying industries to locate near the port--these may be termed "backward linkages". Thus marine service and machinery firms might locate to serve the needs of the port and pipeline. Both final demand linkage and the backward linkage may conveniently be seen as the creation of local production to replace imports. The third impact would arise from the output of the port--in this case port services and petroleum--becoming sufficiently cheaper and more reliably supplied to induce investment in industries that use these products as inputs--this may be termed "forward linkage". For example, the presence of petroleum might stimulate the construction of an oil refinery; or the improved port facilities lead to the location of a mineral processing operation in Kitimat.

As we examine the inducements that the port and pipeline might offer to expansion of other industries it is important to realize that all the effects are unlikely to be stimulating. In particular there will be some resources and services that are in limited and inelastic supply. To the extent that these resources are used by the port, their price to other users will rise providing a negative influence on investment decisions. In this case the most important resource in limited supply appears to be berth and back-up space in Kitimat harbour. A significant amount of this limited resource will be used by the project thus potentially increasing costs to potential other users.

a. Final Demand Linkage

The port and pipeline will have trivial final demand linkages because the addition to the labour force and to the local economy represented by the

project will be very small. There may be slight increases in retail and other services but the local market will not be changed sufficiently to alter the profitability of new industry.

b. Backward Linkage

The operation of the port will also be characterized by only modest demands for inputs. Operation of the port will involve little purchase of locally produced services or products. The operation of the pipeline will require local purchases of electricity for the pumping stations. In addition there is some possibility that more substantial amounts of electric power may be required in connection with tanker unloading operations. If the tank farm facilities are located adjacent to the tanker berths, the oil will be transferred from the ships to storage tanks by the ships' machinery. In this case the power requirements for unloading will be provided by the off-gas from the transported oil operating ship's machinery. If, however, the unstable marine clays of the west side of Kitimat Arm preclude the tank farm from locating adjacent to the tanker berth, and the tank farm is located north of the District of Kitimat boundary (as suggested in the Master Plan Study for the Port of Kitimat, [3]) oil will have to be pumped approximately fifteen kilometers from the berth to the tank farm. Since the economical operation of super-tankers is dependent on rapid turn-around this transfer of oil must be done rapidly. This will require the use of large amounts of hydro-electric power during the short unloading periods. Since the existing Kemano power station has excess capacity this demand for power is unlikely to stimulate new investment. Instead it may have a negative effect on other investment in the area by reducing the available electricity supply in the area. To be sure, the port's demand may accelerate the timing of capacity expansion at Kemano.

This will not, however, provide any net stimulus to other industries in the area since it will simply restore the present situation of available excess generating capacity.

c. Forward Linkages

Any substantial stimulus to local development will arise because other industries find Kitimat attractive, because of the improved port facilities or the availability of petroleum--the "forward linkages". Assessment of these potential forward linkages involves several empirical issues. The effect of port improvement and petroleum availability will be considered in turn.

(i) Post Improvement:

The Canadian Coast Guard's Termpol Assessment of the Kitimat B.C. Marine Oil Terminal Proposal has recommended that the navigational aids (lights and bouys) in the approach to Kitimat be supplemented and improved. The report also recommends implementation of a Vessel Traffic Management System for the entire North-West coast (p. 2-22). The Coast Guard has also recommended that Caamano Sound be carefully surveyed to determine if it can be usefully developed as a principal marine access into Kitimat. All these improvements to navigational aids have been recommended with particular reference to the navigational problems of supertankers but the improvements would be available to other potential users of the port.

The proposed navigational aids may be of limited value to general shipping that might use the Kitimat harbour. Alcan has conducted regular navigation to Kitimat for over twenty years without the proposed aids and without experiencing difficulties in efficient navigation.

More recently the Eurocan mill has exported a significant portion of its output in deep sea vessels through the Port of Kitimat. These two users of the port bring in excess of a hundred vessels annually into the port without apparent difficulty. Therefore the gains from improved navigational aids may be of marginal value for most port users.

The development of an oil terminal at Kitimat may have some negative impacts on the attractiveness of the port for other users. Frequent movements of super-tankers in confined and environmentally sensitive waters will require special organization and precautions. These will undoubtedly impose restrictions on other marine activity. In addition the oil terminal and its associated tank farm will preempt some of the already limited dock and harbor back-up land in Kitimat harbor. The proposed oil dock site appears to be the only area on the west side of Kitimat Arm where bedrock is sufficiently close to the surface that the unstable marine clays of the area are not a problem for dock construction. The tanker berth, therefore, preempts the best space for dockage of very large vessels.

Analysis of the effect of port improvement on investment in Kitimat involves not only an assessment of the cost changes that will occur in Kitimat but also consideration as to whether these cost changes are sufficiently large to make Kitimat attractive as a location in comparison to nearby locations that are currently preferred. In particular it is necessary to see if likely cost and quality changes in Kitimat will be sufficient to make the port more attractive than Prince Rupert. The navigational improvements associated with the oil port do not appear to lower shipping costs to Kitimat very much. Some of the benefits are likely to be offset by navigational restrictions that will be imposed to ensure safe operation of tankers in Douglas Channel and Kitimat Arm. The oil port development will also hinder other development by preempting

limited dock and back-up space at Kitimat. In general it seems likely that the net gains in port attractiveness that will arise from an oil port development will be insufficient to overcome Kitimat's current disadvantage in relation to Prince Rupert. Prince Rupert enjoys lower rail rates and regular service to the interior; it is the focus for existing development plans of the Provincial and Federal Governments and Prince Rupert is largely free from the potential harbour congestion that may be a problem for Kitimat.

(ii) Petroleum Refining:

The development of an oil terminal will result in a ready availability of crude petroleum in Kitimat. This will provide some stimulus to the development of refining capacity in Kitimat. Any refinery capacity would be designed to meet the demand in Northwestern British Columbia. This local market is, however, very small and any refinery would be small and as a result experience high costs. It is unreasonable to expect a facility larger than the small 7,500 barrel per day facilities that currently exist in Kamloops and Prince George. The cost per gallon of such a facility would be some fifty percent about the costs of Vancouver area refineries with capacities of 35,000-40,000 barrels per day. If petroleum were available in Kitimat at favourable prices, it seems likely that a small refinery producing light petroleum products using a very simple distillation process and reselling its topped crude into the pipeline could be profitable. The investment would, however, probably appear marginal and the local impact small. The labour force of such a refinery would amount to between 50 and 75 men.

(iii) Other Industries:

Various resource processing industries have been suggested as possible candidates for future location in the Kitimat area. Improved port facilities and the presence of a petroleum refinery would increase the relative attractiveness of the area. It would be unwise, however, to anticipate much expansion of industrial activity in Kitimat as a result. Prince Rupert will probably remain a preferred location for facilities for the exporting and processing of resources. The development of deep water facilities at Ridley Island with adjacent areas suitable for backup and manufacturing facilities; the CNR's plans to upgrade the rail connections to Prince Rupert and their reluctance to upgrade the rail spur to Kitimat; and the higher rail rates between Kitimat and interior points all suggest that Prince Rupert possesses locational advantages that are sufficiently great as not to be offset by any advantages that Kitimat will derive from port development. Furthermore, the near term prospects for world supply and price for most of the industries that might locate in Kitimat appear to be such that net expansion of processing facilities will not be profitable investments.

Footnotes

1. See Kitimat Pipeline Ltd. Economic Evaluation, p. and Canadian Coast Guard, TERMPOL Assessment of Kitimat, pp. 9-38 to 9-41.

2. Craig, David, "Assessing the Impact of a New Firm on a Small-scale Regional Economy: An Alternative to the Economic base Model, Plan-Canada, 1976.

3. p. 85.

II. Evaluation of the Gains from Increased Production and Employment

Evaluation of the long-run gains from both direct and induced increases in output and employment associated with port development involves the same sorts of considerations as does an evaluation of the short-run impacts. In particular it is necessary to consider the alternative uses of the factors employed in the project-induced expansion. The alternative output of the employed factors is the opportunity cost of the industrial expansion and must be deducted from the value of the induced output to assess net gain. It is important to keep in mind that industrial development in the Kitimat area may imply foregone activity elsewhere. The labour employed and the capital used might otherwise be employed elsewhere in the economy. The process of identifying the alternative uses of resources is often difficult, but the task can be usefully approached by considering the recipients of the income from the industrial expansion and what would they be likely to do in the absence of the project.

A. Some Examples:

a) Industry locating in Kitimat rather than Prince Rupert

Central to determining the net impact of increased production is consideration of the foregone opportunities that the development implies. The concept can be quickly illustrated by an example that is relevant to development for Northwestern British Columbia. Suppose that the port improvements in Kitimat had sufficient effect to overcome the disadvantages that Kitimat would otherwise have faced in comparison to Prince Rupert as a site for a copper smelter, for example. First consider the situation where with the port improvement the costs and profitability of the smelter would be the same in Kitimat as they had been in Prince Rupert. Assume as well, that the capital, labour force and other inputs for the smelter's operation

would be imported into the region by paying incomes equivalent to what those inputs would have earned elsewhere regardless of whether the development occurred in Prince Rupert or Kitimat. Also assume that since the employment is only a small portion of total employment in Canada, the prices of inputs would not be affected by the industrial expansion in Northwest B.C. Finally also assume, to make this first situation as simple as possible, that the smelter does not effect other local prices, or costs or incomes by its presence or absence. In this situation it is clear that while the industry's location will make a difference to the local communities in terms of population size, land use etc., there will be no net gain to Northwestern B.C. as a whole if port development results in the smelter being located at Kitimat rather than Prince Rupert. All that will be altered is the location of the project. The labour that has been attracted to the project will earn the same income at either site, the same will be true of capital, and other inputs from outside the region. They are assumed to be indifferent about specific location. Since we have assumed that the project will not effect local prices or incomes by its presence or absence there will be no effects outside the project itself. Notice that although a considerable increase in local output and employment has resulted from the port development this cannot be considered a net gain to the economy. Prince Rupert will have lost an exactly equivalent amount of output and employment. Alternatively we can look at the incomes of individuals with and without the smelter located at Kitimat and observe that no one is better or worse off with either of the alternative location decisions.

Let us now relax some of the assumptions that lie behind the conclusion we have reached and see how the conclusion is affected. First, let us assume that with the project there is a net savings in costs from locating

at Kitimat rather than Prince Rupert, but maintain the assumptions that inputs are imported to the region and that the project has no external effect on the local economy. In this case there will be a net gain because the lower cost of the project at Kitimat represents a saving in resources for the economy. It is appropriate to consider the size of the gain and to consider who will receive the net increase in income. The intuitive response that the net gain will equal the cost savings associated with the Kitimat location is correct. That savings equals the value of resources released to the rest of the economy for other uses. Now consider the distribution of the gain by considering who will gain or lose. The imported labour and other inputs will not be better or worse off as a result of the locational decision. These factors are attracted by the payment of the income sufficient to attract them; they will be as well off in alternative employment in Prince Rupert or elsewhere in the economy. To be sure the savings associated with the Kitimat location may imply that fewer imported factors of production are employed in Northwest B.C. But since these factors are attracted by paying just the amount to induce them to come to Northwestern B.C. (their "transfer cost") there is no loss to these factors. Although it is possible that the gains of lower costs will be passed on to consumers in the form of lower prices, it seems more appropriate in this case to assume that the selling price of the output of any industry that would locate at Kitimat is set by the world market. This will almost certainly be true of the primary products that will form the basis of an industrial development. In this situation since the savings associated with a Kitimat location will not accrue to the imported inputs they must accrue elsewhere. Possibly they will accrue to the firm in the form of extra profits. Alternately the extra income may accrue to the specific mineral deposit providing raw material

--e.g. copper, ore--or to a site rental. Regardless of whether the income accrues to the firm, the mineral deposit, or a location rent; the income is a return in excess of the payment needed to induce the firm, minerals or location into production and is thus an "economic rent". These "economic rents" could be taxed for the public benefit without effecting the resource allocation and the production of the project, but if taxes exceed the "rents" firms will not locate.

In this case there is a net gain. It is, however, much smaller than the value of the output of the project or even the sum of wages and profits. Most of the payment to factors of production do not represent gains. The amount of the net gain is limited to the cost savings that arise from an oil port in Kitimat. These gains will accrue as a "rent" to the specific mineral deposit, to a specific location, to the firm or will be taxed away.

We can now consider a still more complex situation and relax the assumption that there is no "external" impact on the local economy. For expositional purposes it seems easiest to relax the assumption partially first. Assume now that most factors are imported for the project but that any unemployed labour in the local market is employed in the project. We will still assume that there is no other effect on local prices or incomes. Thus if there is unemployment in the Kitimat area and not in Prince Rupert and the project induces the decision to locate in Kitimat there will be a net social gain equal to the income of the unemployed that are hired by the project. Conversely, of course, if there is unemployment in Prince Rupert and not in Kitimat, the decision to locate will have a social cost since the opportunity cost of the resources in Kitimat will equal their wages--they would have earned that much otherwise--while the opportunity cost of the unemployed in Prince Rupert is zero.

The situation where there is unemployed labour illustrates some of the issues associated with the evaluation of social gain when there are "externalities" from a project. First, the basic characteristic of externalities is that there are social costs and benefits that are not reflected in the costs and benefits that are considered by an individual firm in making its decisions. Consequently, there may be a greater social gain than the private gain that induces the decision by the firm; or there may be a smaller social gain or a social loss while the internal decision of the firm indicates a profit. In a small community external effects may be substantial but they are likely to be both positive and negative and must be analyzed with care before any conclusion is drawn.

To return to the decision to locate a smelter in Kitimat rather than Prince Rupert, let us now consider the situation where there are other externalities present. The project may effect the local economy in various ways. The location of the new industry may alter prices and incomes in the community where it locates. The most obvious impact will be on local rents and the sales volume and profits of local businesses. These incomes will increase in the community where the industry locates and are a gain for that community. From the larger focus, however, these sources of income will be reduced in the community that does not get the project. In the case of Kitimat and Prince Rupert these two effects would be off-setting. The location of the project may also effect the local labour market and the local wage. There are at least two plausible effects--one will drive wages up and the other will drive wages down. Consider first the situation where wages are driven up because higher wages are necessary to induce a larger labour force to locate in Northeastern B.C. In this case there will be some gain to the existing labour force since workers already in the location will receive higher wages. Since these workers were prepared to live in the local area

at lower wages, the higher income is in excess of their transfer cost and are a form of economic rent. The other possibility is that the current high wages in Northwest B.C. are paid because it is necessary to compensate people for the isolation and the absence of amenities in the region. It is likely that as the region grows the isolation will be reduced and amenities will become available at lower cost as the local markets become large enough to accommodate more varied service industries. If the effect of the project is to increase the local economy so that lower wages now provide the same level of satisfaction for the labour force then wages will decline and the profits of firms increase. In this case the labour force will be no worse off with the lower wages and there will be a net gain to other factors. In both these cases, however, in making a larger judgement one must consider the effect of alternative uses of the resources. In our smelter example it seems clear that the gains to Kitimat would be approximately equalled by losses to Prince Rupert.

Other externalities may effect the nature of the community without altering prices. These effects are even harder to assess. A smelter would fairly certainly increase the level of industrial pollution locally--a loss locally but probably offset by the absence of a similar loss elsewhere. To the extent the project alters the nature of the community there will be a mixed impact on the existing population. Some would gain from the increased amenities of a larger community. However, others would lose from a loss of amenities associated with small population and a wilderness setting. Many long-time Kitimat residents already bemone the loss of fishing and hunting close to town. They complain of the change in the nature of the town since the building of the Eurocan mill. The net impact of these changes will be hard to evaluate. The gains and losses are likely to be distributed to different groups further accentuating the analytical difficulty.

b) New Industry in Northwestern British Columbia

We have considered the net impact of a decision to locate a smelter in Kitimat rather than Prince Rupert that was induced by the improvement of Kitimat's competitive position as a result of the development of the oil port. Not very surprisingly the net impact was found to be very modest since all that was involved was the choice of locations that were only a few hundred kilometers apart. Interestingly, however, most of the analysis and conclusions remain true when we consider the net impact of the location of a new industry in the region as a result of the port improvement at Kitimat. We can proceed to consider the impact of a new industry along the same lines we have developed. The key issue in identifying gains is one of considering opportunity costs of resources used in the industrial production. Again it is useful to consider who gains and who loses.

First let us consider the situation where Kitimat's costs are reduced until they are equal to the costs of a similar project elsewhere in Canada. Further assume that all the inputs are imported into the region and the project has no external effects on local prices, incomes or amenities. In this case there is no net gain. Workers in the new industry come from elsewhere and they were induced to come by sufficiently attractive wage offers to induce them to move. They are no worse off by moving but also very little better off since the firm will not pay higher wages than are necessary to attract labour. Similarly capital and other factors of production will receive the income they could have received in other occupations.

If the project lowers the cost of industrial production below the cost elsewhere in Canada there will be a net gain. Here again the situation is identical to that already discussed. There will be no net gain to the

imported inputs but there will be rents that will be captured by the resource, landlords or firms, or that may be taxed away. The size of these rents will be no greater than the cost savings to the industry that resulted from the port development.

There may be greater gains if there are externalities. Consider unemployed labour first. If the project employs local unemployed labour there is a net gain. The same would be true if the workers who migrated to the region would otherwise be unemployed. Similarly there may be gains from higher local wages or from a reduction in the wage premium paid to overcome isolation if these are effected by industrial expansion. In addition the effect of development on the local quality of life must be considered and assessed. There is likely to be both the costs and benefits of increased community size and increased industrial activity.

B. Conclusion:

This rather abstract discussion of the net gains form industrial expansion should now be related to the specific conditions in Kitimat. Certainly it appears appropriate to assume that much of the labour force will have to be recruited from outside the region. The labour force at Alcan has overwhelmingly been recruited from various industrial labour markets in Canada and elsewhere--sometimes at considerable expense to the company. There is no large local pool of industrial labour from which any new industry would recruit workers. Similarly any capital invested in industrial expansion in the local area would have the option of investment elsewhere. This would be particularly true if the investment were to come from a large national or multinational resource-based corporation. These companies have alternative investments available within their own corporate structure. It would also be

true in other cases since financial markets provide the necessary intermediation among investments.

There is often strong emphasis on industrial investment to create employment. There is now significant unemployment in the Kitimat-Stekine Regional District, British Columbia, and Canada as a whole. If the long-run effect of industrial expansion in Kitimat were to reduce unemployment below what it would otherwise be, then the wages paid to otherwise unemployed workers would be a net gain from the industrial expansion. However, despite widespread local unemployment, the strongest evidence regarding the market for industrial labour in Northwestern B.C. suggests that the labour force for industrial development would not be drawn from the unemployed. Unemployment in the region is concentrated in the Terrace area. But at the same time that there is unemployment in Terrace, industrial employers in Kitimat are forced to carry out continuing and expensive recruitment to maintain their labour force. The turnover and recruitment problems that are common throughout northern B.C. and shared by Alcan and Eurocan in Kitimat, indicate that there is no body of unemployed who would take jobs if they were available. If this is the case there will be little gain from the employment of otherwise unemployed labour.

There may be modest gains from some of the other externalities of any industrial development. If wages rise some long-term residents will experience higher wages. If wages fall because a small premium has to be paid to induce workers to live in Kitimat there will be some increase in rents and profits accruing to existing residents. Offsetting this would be the nuisance effects of any development and a decline in wilderness amenities.

The conclusion of this consideration of the sources of gain associated with any induced development must be that the possible gains are very

limited. Most of the value of expanded industrial output will go to meet the opportunity costs of the factors of production that have had to be attracted to the area. To the extent that the port development lowers costs there may be an increase in profits, resource rents, location rents or taxes. These rents, however, cannot exceed the savings generated by port development and these are certainly small. External effects of the project might generate additional gains. There seems little likelihood that industrial development in Kitimat will draw on unemployed labour. Other externalities are potentially both positive and negative and are not likely to be large on balance.

Finally a few words should be said about Governmental development strategy for the Northeast of B.C. The economic justification for government intervention is to gain the benefits of positive externalities and to prevent negative externalities. The most important externalities in Northwest B.C. appear to be associated with small community size and the labour market problems associated with the resulting isolation. There appears to be a widespread feeling that there are external benefits that accrue as a community expands to a population of about 50,000. To the extent that this is true it provides a rationale for concentrating expansion in the Northwest in a single community. At present Prince Rupert, Terrace, and Kitimat each have populations between 10,000 and 20,000. Prince Rupert is the largest and the most likely candidate for supported expansion. To the extent this is the case one would expect there to be little support for expansion in Kitimat in the wake of the development of an oil port.

III. Comparison of Locational Characteristics of Kitimat and Prince Rupert

Most of the possible impact of an oil port development on Kitimat would arise from other industries being induced to locate in the area. This location decision will involve a comparison of Kitimat with other possible sites. If, even with the changes that the oil port brings, Kitimat appears to be an unfavorable location it is safe to conclude that the overall impact of port development will be small.

There are the two principal potential ports on the Northwest coast of British Columbia--Kitimat and Prince Rupert. Their potential can be compared in detail with reference to several factors. In the following discussion we will compare the two ports in terms of marine location and access, land access, harbour and back-up facilities and potential for large scale industrial development. Finally we will consider the implications of the existence of agglomeration economies for development in Kitimat and Prince Rupert.

A. Marine Location

One of the principal incentives to port development in Northwestern B.C. arises because Prince Rupert is 450 miles closer to Japanese ports than is Vancouver. This represents a savings of over 24 hours in ocean voyages to Japan and involves a cost savings that has been estimated to be about 30 cents per ton on coal shipments.[1]

A closer examination of Kitimat's location reveals that the ocean transport savings from Kitimat will be substantially less than the savings from Prince Rupert because of the long access channels that have to be negotiated in using Kitimat. Vessels approaching Kitimat via the great

circle route from Japan pass north of the Queen Charlotte Islands. Entering through Dixon Entrance they obtain a pilot at the Tripple Island boarding station outside Prince Rupert. From here they face additional steaming time of more than twelve hours through the approaches to Douglas Channel, in Douglas Channel and in Kitimat Arm before reaching Kitimat. Some time savings may be possible if, as a result of the development of an oil port at Kitimat, facilities are developed to allow shipping to enter Douglas via Caamano Sound. The savings are modest, however. The Canadian Coast Guard has calculated the time from Browning Entrance (South of Triple Island) to Kitimat for an oil tanker at 14.5 hours and from Caamano Sound to Kitimat at 11.5 hours.[2]

The economics of the operation of modern bulk carriers places a considerable premium on rapid turnaround. Kitimat's location some ninety miles from open ocean and over 110 miles from the nearest proven pilot boarding area at Browning Entrance puts the port at a disadvantage in competition with Prince Rupert, since Prince Rupert has more direct access to open ocean. If the development of an oil port provides access to Kitimat via CaamanoSound the situation will be somewhat more favorable for Kitimat. It must be kept in mind, however, that the presence of large tankers in Douglas Channel and other environmentally sensitive areas will undoubtedly place restrictions on other shipping. The result will be an increase in delays for shipping visiting Kitimat.

B. Land Access

Kitimat provides a shorter land access to the interior than Prince Rupert; Terrace to tidewater at Kitimat is some 38.5 miles and 94 miles at Prince Rupert. This distance advantage would seem to suggest that land access favors Kitimat. That is not however the case. The rail connection

to Kitimat consists of a CN spur line that is not designed to carry heavy traffic while the connection to Prince Rupert is the northern main line of the CNR.

The spur line to Kitimat involves substantial grades, sharp curves and a weight restriction of 220,000 lbs. per car (against main line 263,000 lbs.). The bridge over the Skeena at Terrace has an elevation of about 250 feet. The route then must rise to an elevation in excess of 500 feet at the bench south of Lakelse Lake before decending to sea level at Kitimat. The total elevation changes are not excessive but the grades on the existing line are considerable. The bench south of Lakelse Lake involves grades of 1.5 percent in both directions. In addition the line has numerous sharp curves which lead to a 15 M.P.H. speed limit. In contrast, the steepest grade on the entire northern mainline of the CNR is 0.7 percent and from Terrace the line follows the grade of the Skeena to Prince Rupert, descending some 250 feet in some ninety miles. One and a half percent grades are not impossible for railroad operation--the CPR mainline has a grade of 2.2 percent at Beavermouth between Golden and Revelstoke--but they are expensive in both traction requirement and maintenance expenditure. For example, the CPR must use ten 3,000 h.p. locomotives on its steepest grades to move a 13,000 ton train; in contrast, four locomotives can move a similar train over the entire CNR route. Under the circumstances it is not surprising that the CNR will not quote lower freight rates to Kitimat than to Prince Rupert.

Kitimat's development as an important port would require a major rebuilding of the rail connection with Terrace. So long as excess capacity exists on the existing rail route to Prince Rupert it is hard to justify this kind of expenditure on improved rail connection to Kitimat. With

excess capacity on the main line an improved line to Kitimat would be a good investment only if the total cost of operation--the operating costs plus capital costs--were less than the operating costs on the line to Prince Rupert. This condition will not hold in the near future since the main line has considerable excess capacity (and is currently being up-graded), the grades to Kitimat will inevitably exceed those on the main line, and the capital costs of improved connections with Kitimat will be considerable.

It seems fair to conclude that Kitimat cannot expect to gain any advantage from its shorter distance to tidewater. This would remain true even if substantial improvements were made to the rail connection to Kitimat. In recent correspondence Canadian National Railway indicated: "It can be said in general that there would be very little difference in rates from Alberta and B.C. to either Kitimat or Prince Rupert. In essence, we are saying that rates would not be the determinant of final port location." The attitude of the railway toward improvement of the rail link to Kitimat may also usefully be cited:

> "Any contemplated large movement of traffic would require a major investment to remove the curvature and gradient restrictions to speed and throughput. In a study done a few years ago it was determined that a sustained level of traffic of some 20 million tons per year would be required to justify the capital cost of gradient change. It is only natural, therefore, that CN's priority is to support Prince Rupert development as a major cargo dock, bulk terminal complex. This is because Prince Rupert is served by the recently improved Skeena Subdivision which has practically a level gradient."[3]

C. Port Facilities

Kitimat is at a disadvantage in comparison to Prince Rupert in connection with existing port facilities. Prince Rupert also appears to be in a more favorable position than Kitimat with regard to further development. Prince Rupert already possesses considerable public dock

development and additional facilities are in the advanced planning stage. In contrast Kitimat has only the private facilities of Alcan and Eurocan. There are topographical problems associated with both Prince Rupert and Kitimat but, at least as far as direct port facilities are concerned these problems appear to be greater in the case of Kitimat since most of the potential port area is already controlled by Alcan.

The first disadvantage that Kitimat faces in port development is the absence of any suitable anchorage for vessels in excess of 30,000 dead-weight tons. The situation may be characterized by quoting from the Swan Wooster Master Plan for the Port of Kitimat:[4]

> "Only minimal areas exist for anchorage at the head of Kitimat Arm since the water depths exceed 400 ft. South of the toe of the delta. On the leading edge of the delta a width of 1000 ft. exists between the 10 and 40 fathom lines where ships up to 30,000 DWT can be anchored under suitable conditions. An alternative anchorage location, for ships up to this size, is available on the west side of Douglas Channel approximately 30 miles south of the port area in Kitkiata Inlet. For ships larger than 30,000 DWT the only anchorage areas available are in Principe Channel or Estevan Sound approximately 80 miles from the Kitimat Port."

In contrast, designated and published anchorages exist in and adjacent to Prince Rupert harbor.

Prince Rupert also possesses a considerable advantage over Kitimat in the form of existing terminal facilities. This situation will not be altered by the development of a special purpose oil in Kitimat. In particular the just completed Fairview Terminal in Price Rupert has a wharf length of 427 m. with a depth alongside of 13.7 m., 4,583 sq. m. of sheds and 185,700 sg. m. of open storage area. This National Harbours Board facility has just been constructed and is currently operating at only a fraction of its capacity. It is capable of handling bulk cargo, containers and forest products. Its bulk capacity has been planned to be

sufficient for expected mineral shipments--except Northeastern B.C. coal --that can be foreseen for the next decade or more. In addition, Prince Rupert appears to be firmly established as the northern port for the export of B.C. coal. Several planning studies have been carried out and Neptune Terminals has obtained an option on 150 acres for the construction of a bulk loading facility for coal exports on Ridley Island. This planned facility will be sufficient to handle an annual throughput of both 10 million tons of coal and approximately 2 million tons of other bulk exports. It therefore appears that Prince Rupert already possesses or is about to acquire facilities that are more than sufficient to meet the export needs of the primary producting industries of northern B.C. in the foreseeable future.

Any extensive port development in Kitimat would be hampered by a potential scarcity of water and backup area. The head of Kitimat Arm presents total width of about 2.7 kilometers in which port development might possibly take place. Much of this area is unavailable however. Much of the area consists of the delta of the Kitimat River and the entrance to Minette Bay. Only the most easterly 1200 m. currently used by Alcan and the existing Eurocan terminal is definitely available for port development. All of the water and onshore lots in this area are either owned by Alcan, or owned or leased until 1990 by Eurocan. Swan Wooster in their Master Plan Study for the Port of Kitimat[5] have suggested that development could be extended into the tidal delta region west of the existing Eurocan terminal at least 500 m. and perhaps as much as 900 m. but development of this area was rejected on environmental grounds at the time the Eurocan terminal was built. Development along the sides of Kitimat Arm are unlikely except in the area currently proposed for the oil terminal. The steepness of the shore-line and the unstable nature of the marine clays of the region preclude much lateral development.

Just as waterfront space is constrained by the existing width of Kitimat Arm, the existing land ownership and the environmental considerations associated with the Kitimat estuary and Minette Bay, so too is the development of satisfactory backup facilities. Swan Wooster has proposed the creation of a backup storage area to the west of the existing Eurocan terminal. This area would consist of some 35 hectares of intertidal estuary that would be filled from material dredged to create a general cargo and ferry terminal to the west of the Eurocan terminal and such additional fill as would be necessary. In addition there is a proposed additional backup area about 1.5 km from the proposed berthing area that if filled and diked could provide an additional 200 hectares for port related development. This land is currently owned by Alcan.

From this brief description it seems evident that development of additional marine facilities in Kitimat will involve either encroaching onto the Kitimat River estuary or the use of property currently belonging to Alcan. It is difficult to judge Alcan's attitude to port development. It is clear, however, that the company has a very large commitment to Kitimat and its Kemano hydroelectric development. Alcan's large commitment to the Kemano power project and the importance of electricity in aluminum smelting gives sites in Kitimat a value that is not shared by industries that have neither aluminum smelting's electricity need nor Alcan's capital commitment at Kemano. This special locational feature for Alcan seems to suggest that the company is unlikely to jeopardize the possibility of expansion of its facilities in Kitimat, or even of their complete rebuilding by surrendering its reserves. The land that Alcan possess adjacent to its existing smelter is more valuable to the company than it is to any potential alternative user. Alternative users will be unprepared to offer Alcan enough to obtain the land. This is not, however, to dismiss the possibility that

Alcan might be prepared to make some land and water lots available for port development as Swan Wooster suggests or that the backup area north of the Eurocan terminal might not also be available, since neither of these appears indispensible to Alcan's maintaining its options to expand and possibly rebuild in Kitimat. Nonetheless the space constraints appear to be considerable in Kitimat harbor.

In contrast to Kitimat where the narrow topography of the fiord limits the area available for port development and where existing facilities and environmentally sensitive areas are, at least potentially, in conflict with port development, Prince Rupert appears to possess a number of alternatives for expansion. Most of Ridley Island appears to be available for port related activities close to port facilities. The same also appears to be true with regard to the proposed industrial areas on both the east and west sides of Kaien Island. These sites, are, of course, in addition to the existing excess capacity at Fairview and the proposed bulk terminal at the north end of Ridley Island. The excess capacity of Prince Rupert and the greater possibilities of expansion of port related activities seem certain to make Prince Rupert a preferred port location.

D. Industrial Areas

Prince Rupert is not without its topographical limitations. For actual port facilities Prince Rupert benefits from not being located at the head of a relatively narrow steep sided fiord. Prince Rupert, on the other hand, suffers from the absence of flat land suitable for the development of a heavy industry that requires extensive area. There are some 2500 unoccupied acres of designated industrial sites in Prince Rupert of which 1,000 acres are currently serviced. Prince Rupert does, however, lack any area of relatively flat land large enough to accommodate a large industrial development that requires an area in excess of 1,200 acres. Flat land of this acreage is available only in Port Simpson, some 20 km north of

Prince Rupert and currently without either road or rail access.

In contrast, the Kitimat Valley to Terrace contains a considerable amount of relatively flat land potentially suitable for industrial development. The District of Kitimat Planning Department has identified four potential sites between Kitimat and Terrace. These are the 2000 acre Thunderbird site just south of Terrace, the 8150 acre Dubois Site about 20 km north of Kitimat, the 3200 acre Wedeene Site immediately north of the District of Kitimat boundary and the 1500 acre Northern site just inside the District boundary.

Kitimat will be a preferred location to Prince Rupert only for developments requiring large tracts of industrial land. If there is going to be significant induced development from oil port development in the Kitimat area it is going to be associated with the creation of a large industrial complex. The only industries that might be seriously considered would be a steel mill or a copper smelter. Both have been suggested for the area and both would probably require some degree of subsidization if they are to become a reality. It is not necessary for our task to fully explore the issue of whether these industries are likely to be promoted or not. Our task is limited to assessing the impact of an oil port on other development.

It seems most likely that an oil port will have an adverse effect on the possible location of a major heavy industry in or near Kitimat. The terminal facilities and tank farm requirements of the oil port will preempt port facilities that would be valuable to major industrial development. The Social Impact Report, B.C.-NKK Steel Mill Study Preliminary Draft,[6] indicates that port facilities for ships up to 250,000 dwt. would be required for a steel mill development. The proposed berthing sites for Kitimat coincide with the proposed sites for the oil terminal. The Swan Wooser Master Plan for Kitimat suggests that bulk loading facilities

could be developed in a dredged harbour between the existing Alcan berth and the existing Eurocan Wharf. This area is, however, owned by Alcan and Alcan can be expected to be jealous in protecting its investment in the Kitimat area. In any case the dredged bulk basin can only be a more expensive alternative than the original site on the east side of Kitimat Arm. In addition the tank farm for the oil port may well locate on the Northern Industrial Site that has been suggested as the possible location for a steel mill.

Footnotes

1. Ministry of Transport, Pacific Rim Access Project, Stage 1, Revised Report, Ottawa, November 1975, p. 23.

2. TERMPOL, pp. 5-101 and 5-102.

3. Letter from Allan A. Menard, Assistant Manager, Public Relations Canadian National Railway, December 1977.

4. Pp. 28-29.

5. Pp. 74-90.

6. British Columbia, Department of Economic Development, Social Impact Report, B.C.-NKK Steel Mill Study, Preliminary Draft, Phase II, June 1976, p. 6.

IV. Consideration of Some Industries that Might Locate in Kitimat

In assessing the likely impact of an oil port it is appropriate to consider the likelihood of the establishment of certain industries in the Kitimat area. Detailed consideration of the situation of a large number of industries would take us too far afield but a brief examination of three widely mentioned candidates for industrial development in Northwestern B.C. is appropriate. Our main interest is not, of course, whether industrial development is likely in the future, but rather whether the development of an oil port in Kitimat will change the prospects of any possible industries. Within this framework, however, it is certainly possible to find that there will be substantial cost changes associated with the port but that the prospects for industrial development are so poor (or so good) as to make the changes associated with the port irrelevant for practical purposes. In the following pages we will briefly explore the economics of investment decisions associated with (1) an oil refinery, (2) a copper smelter, and (3) a steel mill.

A. Oil Refining

The development of an oil terminal will result in a ready availability of crude petroleum in Kitimat. This will provide some potential stimulus to petroleum using industries. The most direct stimulus will be to petroleum refining for the local market in Northwestern B.C. There are, however, substantial economies of scale in petroleum refining, and the market for refined products in Northwestern B.C. is severely limited. According to the B.C. Energy Commission, the 1976 consumption of light petroleum products was 3600 barrels per calendar day, by 1996 it will increase to 6000 barrels per day.[1] Refinery operation cost appears to decline sharply until

a crude capacity of about 50,000 barrels a day is reached. The unit cost of a 50,000 barrel per day operation is only about 80% of the cost of a 20,000 barrel a day operation and the unit cost of a 20,000 barrel a day operation is only about 80% of a 10,000 barrel a day operation.[2] New investment in refineries in the United States tends to be in refineries with a capacity of about 100,000 barrels a day (for example the ARCO Cherry Point refinery designed for Alaskan crude has a capacity of about 100,000 barrels a day). A refinery to serve Northwest B.C. would be at the very lower end of the scale of practical refineries and certainly no larger than the 7700 barrel per day facilities at Kamloops and Prince George. The unit costs of such a refinery would probably be about fifty percent above the costs at the Vancouver area refineries with capacities between 35 and 40 thousand barrels per day. The price of refined products in Kitimat appears to be about three cents per gallon higher than in Vancouver presumably to cover transportation costs. This differential appears to be between ten and fifteen percent of the refinery costs of gasoline production and consequently a conventional refinery in Kitimat would not appear to be unlikely unless the crude for the process were available at a savings over the price of crude in Vancouver.

It is not, however, appropriate to dismiss the possibility of a limited refinery operation in Kitimat. Much of the disadvantage of small size can be avoided if the refinery is confined to the very basic topping and desalting process that usually serves as the first stage of refinery operation. This is basically a fractional distillation process that yields various light distillates that can be used in gasoline and a heavy residual oil that becomes the feedstock for cracking and reforming processes that are used to

convert most of the crude to various valuable light distillates. The basic atmospheric distillation process (topping) is almost never found alone because it yields only about 5 percent valuable light distillates and the residual can only be sold as low priced fuel oil. In Kitimat, however, the situation may differ somewhat. It is possible to set up a profitable topping process if the residual can be recombined with the crude oil and sold at favourable prices to be used in interior refineries. There are some rumors that at least one oil company is making preliminary investigations into this type of process. It should be appreciated that the project would probably be of marginal profitability and as a result would lower fuel prices in Northwestern B.C. little, if at all. In addition there would be only a few jobs associated with such a refinery. The best estimate probably lies between 50 and 75.

There seems to be reason to think that a simple refinery might accompany the development of an oil port. The decision will probably be determined by the price of crude, and the possibility of returning residuals from the topping process to the pipeline under favourable conditions. If a refinery is constructed it will be small and relatively simple. It will have little impact on the price of petroleum products in Northwestern B.C. In addition it will employ relatively few workers.

B. Copper Refining and Smelting

A world scale copper smelting facility in Northwestern B.C. would have a large impact on the local economy. Such a facility would employ a labour force of two or three thousand people. In addition, the presence of a large copper refinery would probably attract other associated industries, particularly those involved in the utilization of sulpher by-products of the refining process.

Exploration of the prospects of a copper smelter in detail would take us too far from our primary goal. Here we will consider the likely impact that port development in Kitimat may have on the prospects of smelter development and briefly consider the current world market for copper to see if the prospect of a smelter in the immediate future may be regarded as worthy of serious consideration. Our conclusions are negative. The effect of port development on profitability of a smelter operation will certainly be very small relative to other considerations in an investment decision. Furthermore, these small effects are likely to reduce, rather than enhance the expected profits from such an undertaking. In addition any realistic examination of the current state of the world copper market must lead to the conclusion that development of the copper reserves in northwestern British Columbia is unlikely in the immediate future. Without such a development a copper smelter will not be built in the region.

Any impact of oil port development on the profitability of a smelter in the Kitimat area would arise from port improvement. As we have already indicated this effect will be small. The actual harbour facilities will be of use only to the oil port and any positive spill-over effects will come from improvements in the navigation to and within the Douglas Channel. These effects are likely to be small on other port users since any benefits from improved navigational aids will have to be balanced against the likely restrictions on vessel movements that will be associated with the presence of very large crude carriers.

The oil port development will also effect any other development in the area to the extent that facilities for handling of oil preempt premium locations within the region. This is likely to have some potential negative effect. The proposed oil berths will occupy the premium site for

berths capable of handling large bulk carriers of any type, thus denying the site to ships associated with a smelter development. In addition, a tank farm in the harbour back-up area would also remove some valuable land that is in fixed supply in Kitimat.

On balance the effect of the oil port on the economics of locating a smelter in Kitimat will be very small. Some potential positive effects from navigational improvements and some negative effects from the utilization of limited water and land area in the port are both likely to occur. Each is likely to be small relative to the location decision and the effects will be at least partially offsetting.

Even if the port development were to have a substantial effect on the Kitimat region, it remains unlikely that any copper smelter would be induced to the region in the near future because the world copper market is currently in a very depressed condition. The London Metal Exchange price of copper has generally remained below 70 cents (U.S.) per pound since the collapse of the record prices of early 1974. In the interim, there has been considerable expansion of copper production, particularly in the major third world producers (Zambia, Zaire, Peru and Chile which together produce nearly 40% of the non-communist world's output. The general informed opinion is that expansion production using the copper reserves in the Southern Interior of B.C. will become possible if the price increases to between 80 and 90 cents. The northern reserves will require higher prices. These reserves are located along the Stikene in a region currently without adequate transportation and in a region where any transportation development will be very expensive because of difficult terrain and isolation from labour and supplies.[3]

Any world scale copper smelter in northwestern B.C. will require that the reserves in the northern parts of the province be developed. Without

output from mines in these areas there is not the supply of ore for a smelter. These mines will only become attractive if copper prices approach U.S. $1.00 per pound. That prospect does not seem reasonable within this decade, and perhaps not in the next. World stocks of copper increased enormously after the high prices of the early 1970's and have been between a quarter and a third of annual consumption for the last few years. This is considered to be more than twice normal levels, and these large stocks continue to exert downward pressure on prices. Production, particularly in the under-developed countries continues to increase. This may well reflect the cost structure of these producers that are estimated at about 50 cents a pound in Chile and the Philippines and between 65 and 70 cents a pound in Zambia and Zaire.[4] If the copper reserves of Northwest British Columbia are to become profitable world demand must increase so as to utilize the capacity of low cost producers in the underdeveloped countries and also absorb the lower cost output of the southern interior of B.C. The short term prospects are not encouraging. In the southern interior, Craigmont mines has, in its year end report, reclassified a portion of its Merritt orebody as uneconomical and is expecting to close early in 1979. Other mines are expected to cutback production. Thus a copper smelter in Kitimat as a result of an oil port development cannot be considered likely in the near future.

C. Iron and Steel

The construction of a steel mill in Northern B.C. in cooperation with Japanese steel makers has been a project that has been considered at some length. It's impact on any local community would be considerable.[5] Development of an oil port at Kitimat might marginally effect any decision regarding this project if it were to make a large difference in cost for

the project. This will certainly not be the case. The port will effect a steel mill in Kitimat in the same way it would effect a copper smelter. There would be some potential advantage to the project arising from navigational improvements that would be offset by the costs arising from the oilport's use of premium berthing locations and harbour backup areas. On balance the result would likely be slightly unfavorable to the steel mill, and it would certainly not make enough of a difference to effect the economic and political decisions that would lie behind a decision to proceed with the project.

Footnotes

1. Data supplied by B.C. Energy Commission.
2. W. L. Nelson, Guide to Refinery Costs, pp. 9 and 94.
3. See the Vancouver Province, February 19, 1976, pp. 21 and 23.
4. "Canadian Metals Hard Grind," The (London) Economist, October 22, 1977, p. 841.
5. See B.C. Department of Economic Development, Social Impact Report B.C. NKK Steel Mill Study, Preliminary Draft, June 1976.

V. Opportunity Cost, Social Benefit, and Private Decisions

We have already argued at some length that any acceptable assessment of development in the Kitimat-Stikene region must consider the effect of attracting factors of production to the region on production elsewhere in the economy. This foregone use of resources is the real cost of the project to the economy. In considering the overall effect of development in remote areas like northwestern B.C. it is also necessary to consider the subjective cost of living and working in isolated areas as part of the real cost of expansion. The most useful way to estimate the opportunity cost of a project is to consider the payments that are necessary to attract and retain the various factors of production. The opportunity cost of labour is thus the wage necessary to attract and retain the labour force.

A. Opportunity Cost of Capital

The opportunity cost of capital is probably the easiest to consider. Any development in Kitimat would draw on the capital resources of the Canadian capital market and probably on outside markets as well. In order to attract capital to the region a project will have to pay a return that is at least as high as the return that could be expected on projects of similar risk elsewhere in Canada--and to a large extent in the rest of the world. The opportunity cost of capital to Kitimat is the going rate of return; at that rate large amounts can be attracted while little or none can be attracted at lower returns.

B. Opportunity Costs of Labour

The opportunity costs of labour are somewhat more complex, but the situation is not significantly dissimilar to the case of capital. The

mobility behavior of the labour force and the general state of the local labour market provide important clues to the opportunity cost of labour --the wage necessary to attract and retain a labour force. The very existence of a labour force, and in this case its continued recruitment, assures us that wages are covering the opportunity cost of labour. Wages in the resources industries and in Northern communities tend to be higher than elsewhere in Canada. It is possible that wages exceed the opportunity cost of labour--as we have suggested might well be the case in the construction phase of the pipeline. However, the local labour market and the mobility behavior of the industrial labour force give us information as to whether this is likely to be the case. When an employee quits we may infer that his perceptions of his opportunities elsewhere are such that he expects to benefit from his decision. If workers without local industrial employment perceived the wages being offered as above that needed to attract them to the industry we would expect to find a pool of workers at all times ready to bid for industrial jobs when they become available. In fact we would expect to see the type of anticipatory unemployment that occurred during the construction of the Alaska pipeline and which we expect will occur in Northern B.C. during the period of pipeline construction.

We have considerable information about the industrial labour force in the Kitimat area from the experience of the Alcan smelter.[1] In the four years from 1969 to 1972 the average turnover rate was 29 percent of the labour force. The level of turnover appears to follow the general employment picture. Thus in 1971, when the unemployment rate among men aged 25 to 54 was above 4 percent--its highest level since the early sixties, turnover was only 16% of the labour force. In the much more favourable labour market conditions of 1973 the turnover rate rose to an annual rate of 62%.

Presumably the high turnover in 1973 reflected somewhat restricted turnover behavior in the relatively poor labour markets between 1970 and 1972. The turnover behavior of the labour force at Alcan appears to be clearly associated with the marital status of the employee and his length of service. The highest turnover rates are among employees with less than a years employment but substantial turnover occurs among longer term employees as well. It seems clear from these data that at least half the labour force at Alcan's Kitimat smelter feel that the wage, working conditions and living conditions associated with their job to be no better than they could do elsewhere. They left to go elsewhere. Presumably a significant portion of those who stayed do not perceive themselves doing much better in Kitimat than they could do elsewhere.

Alcan's recruiting procedures also indicate that wages, working conditions, and living conditions in Kitimat do not exceed most workers' perceptions of their alternative earnings. There is practically no unemployment in Kitimat as would be the case if workers were waiting for smelter jobs. To be sure there is substantial unemployment in Terrace but personnel officials and others in Kitimat and Terrace indicate that these people do not take smelter jobs when they are offered. They are not unemployed awaiting a smelter job. Instead of tapping a pool of eager job applicants, Alcan recruits nation-wide at considerable expense to the firm. At times immigration officials have even allowed recruitment from outside of Canada when recruitment within Canada failed to provide sufficient workers.

While there are those who are committed to Kitimat and to employment in the smelter and who would remain in Kitimat at somewhat lower wages, they make up a minority of the present population. Just over forty percent of Alcan's labour force in 1973 were married and had five years or more

experience in the smelter. These are the committed residents. It seems unlikely, however, that anything like a similar proportion of an enlarged labour force would have the same commitment to Kitimat. In view of the continued tight labour market for smelter workers in Kitimat and the turnover rates from that work force, it appears appropriate to conclude that the wages paid to any expanded labour force in the area would not significantly exceed the opportunity cost of the labour force.

For the social benefits of the wages paid as a result of expanded activity to exceed their opportunity cost either some local workers would have to receive higher wages or the work force would have to include individuals who would otherwise have been unemployed. There seems to be only limited scope for raising wages of existing residents. Most local jobs already pay relatively high wages--in order to attract and retain workers. Expansion of the labour force could result in an increase in the local wage rate to attract new workers, but it could also result in a fall in the local wage rate as the community grew in size and more social amenities became available. The effect of expansion on local wages is unpredictable even as to direction, but its magnitude is likely to be small.

Is industrial expansion in Northwestern B.C. likely to draw on unemployed labour? It seems relatively unlikely. The local unemployed have demonstrated an unwillingness to accept industrial jobs when Alcan has been hiring. If expansion were to occur in a period of considerable national unemployment some unemployed workers from the rest of Canada might be induced to migrate and to settle in northwestern B.C. and the migration of workers who were previously employed would create vacancies elsewhere that might be filled by the unemployed. However, as is argued at greater length in Part VI below, it is unlikely that industrial expansion in northwestern B.C. could be justified and supported on the grounds of reducing the rate of unemployment over the long run.

C. Opportunity Cost, Private Decisions and Possible Gains

We have argued above that in Northwest B.C. the market prices at which private firms can obtain capital and labour are excellent indicators of their social opportunity costs. An implication of this argument is that any project that has a significant social return will appear profitable to firms and conversely that profitable projects will probably have a social return. There can be little question that there are no significant investments in the Kitimat-Terrace area that would currently generate significant private profit. If there were firms would presumably be interested in exploiting the opportunity. At present even the most optimistic local planner is not prepared to argue that there are privately profitable major potential investments in the area.

The current absence of profitable investments implies that the maximum social benefits from an oil port and pipeline would be approximately equal to the profits to individual projects that were generated by the project. These profits would occur because the port lowered costs. The discussion in Part V above indicates these savings will be very small. In fact it is as likely that the use of premium harbour areas for the oilport will increase costs of other developments in the region as it is that the improvement of navigation and the availability of oil will lower costs.

Footnotes

1. Aluminum Company of Canada, Abridged Report the the Task Force on Hourly Employee Turnover, April 1974.

VI. The Employment Impact of Induced Development in Kitimat

In our consideration of the possible impact of any induced investment and associated industrial development arising from the oil port development we have emphasized that the opportunity cost of the resources used in expansion must be carefully considered. In general our conclusion has been that most of the factor incomes generated by a project in the Kitimat area will represent the payments necessary to attract factors of production to the project--that is to say the opportunity cost of the factors--and as a result the net gains will be modest. The only important exception to this conclusion arises if the project attracts unemployed labour--or creates vacancies elsewhere that are filled by unemployed labour. Since relatively high rates of unemployment have characterized the Canadian economy over the past few years and because much attention has been directed to policies to reduce unemployment it seems appropriate here to consider how any development at Kitimat might effect either local or national unemployment.

It is useful to consider three types of unemployment. The first occurs because of cyclical deficiencies in aggregate demand. This effects employment throughout the economy in a fairly general manner. This is the "Keynesian unemployment" resulting from fluctuations in aggregate demand. The second type of unemployment may be referred to as structural unemployment. This arises from long-run trends in the economy in a number of ways. In Canada, for example, there is particular concern about the structural unemployment problems in the Atlantic Provinces and in parts of Quebec that arise from geographically immobile population located in areas where industrial investment and expansion appears unattractive to investors. A third type of unemployment may also usefully be identified and termed frictional unemployment.

In a growing economy, adjustments are continuously occurring as the economy adapts to technological change and growing incomes. On the supply side of the labour markets young people, and increasingly, married women are entering the market looking for new jobs and various long-time job holders are considering changing jobs. On the demand side of the labour market there are inevitable fluctuations in demand that result from changing tastes of consumers, changing technology, foreign competition and the opening of new businesses and the closing of old ones. The Economic Council of Canada[1] estimate "of the approximately 13 million total participants in the labour force at one time or another during 1975, as many as 5 million, or possibly more, changed jobs with or without a bout of unemployment, entered, reentered, left the labour force, or became unemployed."

A. Frictional Unemployment

It is possible to consider the effect of a development in Northwestern B.C. on each of these types of unemployment. The frictional unemployment that is associated with ongoing processes of adjustment in a healthy economy is of relatively little concern although there is a possible saving of real resources if the adjustment is made to operate more efficiently. Industrial development in relatively remote communities such as those that characterize northern B.C. are likely, however, to have the opposite effect. These locations are characterized by high labour turnover rates when compared with the rest of the economy. Furthermore, since the communities are relatively isolated, an individual changing jobs will almost certainly be unemployed for a longer time while moving and searching for a job than would be the case if he were employed in a larger and more diversified industrial center.

B. Cyclical Unemployment

Modern market economies experience fluctuations in aggregate demand and associated periods of unemployment that alternate with periods of full employment and inflationary pressure. During periods of cyclical unemployment, the opportunity cost of labour approaches zero if increased employment opportunities lead to a reduction of unemployment. When considering a long-term change in the economy, such as would be involved in industrial expansion in Northwestern British Columbia if an oil port expanded industry there, it is important to realize, however, that in this case the opportunity cost of the labour is only temporarily zero. It seems certain that in the absence of industrial development in a particular region the economy would again attain full employment. At that point the labour attains a positive opportunity cost: the industrial expansion can no longer be regarded as creating jobs and reducing unemployment. Thus industrial expansion in Northwestern B.C. is likely to have some positive effect in reducing unemployment at times when there is considerable cyclical unemployment in Canada, but it is inappropriate to consider this a long term effect.

As a short-run means of reducing cyclical unemployment, industrial expansion in Northwestern B.C. is likely to be relatively inefficient. When unemployment results from insufficient aggregate demand, the appropriate counter-cyclical policy will direct demand into those sectors of the economy where the initial short-fall of demand occurs. Industrial expansion around Kitimat will not have these characteristics. This will not be a process of restoring demand to existing industries and reemploying temporarily idle labour but rather the establishment of industry in a new area. Most of the potential labour force will have to relocate to the region. This will reduce the effectiveness of expansion in reducing unemployment; the most

effective policy would lead to re-employment of workers in old jobs and in their existing locals. The movement of workers to take up jobs in Northwestern B.C. will be relatively expensive to workers. If a potential job holder expects to be reemployed soon in his present location, he will find the opportunities possible in a remote location relatively unattractive. In general it appears that inter-regional migration in Canada declines during periods of high unemployment.[2] High unemployment increases the uncertainty about job market conditions in general and most workers feel that the increased uncertainty makes the prospect of accepting the costs of moving unattractive. Thus, in general, it seems clear that the creation of jobs in the Kitimat-Stikene Region, while it would have some positive effect on national unemployment in periods of high unemployment, could not reasonably be supported primarily as a method of reducing cyclical unemployment.

C. Structural Unemployment

Structural unemployment presents a somewhat different policy issue than do either frictional or cyclical unemployment. In the case of structural unemployment certain localities or groups in society experience high rates of unemployment because of their skills, location preferences or some other characteristic is poorly matched to the location desires of firms. The result is local high rates of unemployment concentrated in specific regions, industries and occupations.

Three principal possible categories of structural unemployment can be identified in Canada. The Atlantic Provinces and parts of Quebec experience unemployment about twice the level of the rest of Canada. In addition young people experience twice or more the unemployment rate of other Canadians. Finally, although unemployment rates for women are lower than they are for men these rates have risen considerably in the past decade.

In fact the increase in the average rate of unemployment from around four percent in the mid-sixties to around six percent in the mid-seventies appears to have been the joint effect of an increasing proportion of the labour force under twenty-five and an increasing rate of unemployment of women. There has been little trend in the rate of unemployment among men aged 25 to 54.

The structural characteristics of unemployment may well justify the creation of jobs that employ workers who live in areas of high unemployment or who are young. The creation of such jobs may in fact confer extra benefits on society because the labour force has very low opportunity cost or because the creation of jobs for these members of the labour force contributes to some widely held ends of social justice, regional equity and income distribution. However, these considerations are of little relevance for projects in Northwestern British Columbia. The areas of persistent unemployment are in extreme Eastern Canada. The persistent unemployment in the Atlantic areas is due to the reluctance of the residents of those areas to leave their homes in search for jobs. Consequently the creation of jobs in British Columbia is irrelevant as a possible solution.

The rising unemployment rate among women will also not be eased by development in northwestern B.C. One of the most obvious peculiarities of resource communities in the North is the predominance of jobs for men and the dearth of jobs for women. The participation rate for women in these communities is lower than in the rest of Canada. Women who might have jobs if they lived in the South may not be counted as unemployed, but they have often left the job market in frustration because no jobs are available.

The persistent unemployment of youth appears to be somewhat different. There is no rising trend here. Rather the unemployment is associated with

preliminary job search, the establishment of careers, and the acquisition of experience and skill. To be sure the unemployment of youth increases even more sharply than general unemployment in weak markets as marginal jobs are eliminated and new hiring is postponed. Employment policies could probably be conceived that would ease the job market entry of the young by increasing the opportunities to obtain a variety of skills and experience. In addition, policies directed at the cyclical problems of young workers would have much to recommend them. Nonetheless, much of the unemployment of young workers reflects their search behaviour in the market. At the early stage of their working life it is appropriate for them to explore different employment options and to acquire a variety of skills before settling into a more stable employment pattern as they develop careers and form families. This behavior by young workers reflects rational choice on their part and it seems unlikely that any policy will eliminate the differential unemployment experience of the young and established workers.

The criterion that should govern the assessment of job creation to relieve the unemployment problem of young workers are similar to those discussed in other contexts and here again the job creation effect of any projects in Northwestern B.C. do not seem to provide any strong argument in favor of development beyond those that would govern private decisions. Job creation to benefit young workers should be located near the principal centres of population. Since high turnover can reasonably be expected by these workers there will be greatest social benefit by creating jobs near alternative jobs. To the extent that the problem of young worker unemployment is largely a cyclical problem, comments already made about cyclical unemployment are relevant. Jobs in northwestern B.C. are unlikely to meet the criterion for reducing youth unemployment. As we have already indicated any industry in the area would be relatively isolated. Few

alternative jobs would be available in the local region. In addition, if the experience of Alcan is a reliable indicator, there will be limited opportunities for career advancement in the primary processing industries that are the likely candidates for location in the Kitimat-Stikene district.

The unsuitability of employment opportunities in this region for reducing the unemployment and turnover of young workers may be illustrated by Alcan's experience with young workers. The annual turnover rate of workers under 20 between 1969 and 1972 averaged about three-quarters and for those aged between 20 and 25 was nearly two-thirds. In the relatively tight labor market of 1973 the turnover rates for these two age groups increased to over 100% for teenagers and was even somewhat higher for those in their early twenties. In both cases the turnover rate was significantly higher for single workers than it was for those who were married. This evidence appears to indicate that employment in northern resource industries is not regarded by young workers as a suitable long-term alternative and increasing jobs in these regions would not ease the unemployment problems of young workers.

The preceding discussion has presented the reasons why we feel that no particular weight should be given to the job creation aspects of expansion that might occur as a result of port development in Kitimat. The location of any industry implies that the effects on unemployment will be very modest. The isolated location will certainly not be attractive to the structurally unemployed workers of Atlantic Canada who are reluctant to leave their homes. Nor is the creation of jobs in Northwestern B.C. a suitable policy to alleviate cyclical unemployment. In this case aggregate demand should be channeled into the existing industries with excess capacity. Finally, development in the region does not ease the entry of young people into stable jobs, again because of the isolated locations involved.

D. Unemployment in Terrace

The conclusion that there is little advantage to be gained from job creation in the Kitimat area may appear somewhat inappropriate in light of the fact that Northwestern B.C. has experienced higher levels of unemployment than the rest of Canada in recent years. As we discussed in section C above, however, we feel that the industrial labour market is largely independent of the labour market for the forest and related industries. That conclusion derives from examination of the recent labour market history of Terrace and Kitimat. There has been high rates of unemployment in Terrace for several years. Despite this apparent excess supply of labour, the industrial employers in Kitimat have had to undertake expensive recruitment outside the local area to maintain their labour forces. Alcan alone hires several hundred people annually. (Between 1969 and 1973 the average hirings per year were 582). This experience can only reasonably be interpreted as implying that either the industrial jobs available require skills that are not available in the local labour force or that at least some of the local labour force prefers uncertain employment and periods of unemployment to steadier employment in industrial jobs. In any event, the present existence of a supply of jobs locally that exceeds the local unemployment strongly suggests that the creation of additional similar industrial jobs will not significantly reduce local unemployment.

Footnotes

1. The Economic Council of Canada, People and Jobs: A Study of the Canadian Labour Market, Ottawa, 1976, p. 81.
2. Aluminum Company of Canada, Abridged Report of the Task Force on Hourly Employee Turnover, p. 43.

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