COST-BENEFIT ANALYSIS
OF LABOR MARKET PROGRAMS

Applied to a temporary program
in northern Sweden

Henry Ohlsson

Umeå Economic Studies No. 182
UNIVERSITY OF UMEÅ 1988
COST-BENEFIT ANALYSIS OF LABOR MARKET PROGRAMS
- applied to a temporary program in northern Sweden
Abstract

The study's objective is to evaluate the relief works and special projects that were in effect during the period 1983-1986 due to the labor force reduction of almost 2,000 persons at the LKAB Mining Company in 1983. These reductions caused the Swedish Parliament to set up a special labor market policy organization, the Malmfältsdelegation, which besides initiating relief works and special projects also functioned as an employment exchange, an employability assessment center, and a training organizer.

The study has three main chapters. In the first of these the welfare implications of public production in a disequilibrium model are analyzed. The background to this is that the traditional cost-benefit rules are not very well suited to this particular evaluation problem. The object of the chapter is to derive rules within the context of a model that, whilst simple, resembles in essential points the real world situation within which the Malmfältsdelegation had to work. The delegation's relief works and special projects are represented, in the model, by production in public firms.

The second main chapter is a descriptive account of the Malmfältsdelegation's relief works and special projects. The variables discussed are costs, subsidies, temporary employment, and permanent employment. In this chapter the distribution of these variables is accounted for according to type of subsidy-receiver, location of the projects, branch, and occupational groups. Furthermore, the plans are compared with the outcomes.

The actual evaluation can be found in the final main chapter. By way of introduction, there is a discussion of what the labor market situation in Malmfälten would have been like in the absence of the temporary organization. With this as a reference, the actual incomes of the former LKAB-employees are compared with the incomes they would have had in two hypothetical alternative courses of events. The first of these implies that no extra labor market policy measures had been taken and the other is based on the assumption that the former LKAB-employees had been offered labor market services to the same extent as other job-seekers in the inland area of northern Sweden. An analysis of the welfare effects of the Malmfältsdelegation's relief works and special projects completes this chapter. This analysis is based on the cost-benefit rules presented in the first main chapter.

The principle conclusions of the study are that labor market policy measures may give positive income and welfare effects in a region facing a situation similar to that faced by Malmfälten during the first half of the eighties. However, the Malmfältsdelegation's measures have not been more effective than those of the regular labor market policy organization.

Keywords

cost-benefit analysis, disequilibrium, job-creation, labor market programs, quantity constraints, regional, relief works, structural crises, Sweden, welfare economics.

Distribution and author's address

Department of Economics, University of Umeå, S-901 87 Umeå.

ISSN: 0348-1018
ISBN: 91-7174-351-0

Place of publication: Umeå
Year of publication: 1988
COST-BENEFIT ANALYSIS OF LABOR MARKET PROGRAMS

Applied to a temporary program in northern Sweden

Henry Ohlsson

Umeå Economic Studies No. 182
UNIVERSITY OF UMEÅ 1988
The study's objective is to evaluate the relief works and special projects that were in effect during the period 1983-1986 due to the labor force reduction of almost 2,000 persons at the LKAB Mining Company in 1983. These reductions caused the Swedish Parliament to set up a special labor market policy organization, the Malmfältsdelegation, which besides initiating relief works and special projects also functioned as an employment exchange, an employability assessment center, and a training organizer.

The study has three main chapters. In the first of these the welfare implications of public production in a disequilibrium model are analyzed. The background to this is that the traditional cost-benefit rules are not very well suited to this particular evaluation problem. The object of the chapter is to derive rules within the context of a model that, whilst simple, resembles in essential points the real world situation within which the Malmfältsdelegation had to work. The delegation's relief works and special projects are represented, in the model, by production in public firms.

The second main chapter is a descriptive account of the Malmfältsdelegation's relief works and special projects. The variables discussed are costs, subsidies, temporary employment, and permanent employment. In this chapter the distribution of these variables is accounted for according to type of subsidy-receiver, location of the projects, branch, and occupational groups. Furthermore, the plans are compared with the outcomes.

The actual evaluation can be found in the final main chapter. By way of introduction, there is a discussion of what the labor market situation in Malmfälten would have been like in the absence of the temporary organization. With this as a reference, the actual incomes of the former LKAB-employees are compared with the incomes they would have had in two hypothetical alternative courses of events. The first of these implies that no extra labor market policy measures had been taken and the other is based on the assumption that the former LKAB-employees had been offered labor market services to the same extent as other job-seekers in the inland area of northern Sweden. An analysis of the welfare effects of the Malmfältsdelegation's relief works and special projects completes this chapter. This analysis is based on the cost-benefit rules presented in the first main chapter.

The principle conclusions of the study are that labor market policy measures may give positive income and welfare effects in a region facing a situation similar to that faced by Malmfälten during the first half of the eighties. However, the Malmfältsdelegation's measures have not been more effective than those of the regular market labor policy organization.
PREFACE

This study is a result of my work during the period 1984-1986 in the research project "A cost-benefit analysis of the special measures for supernumerary labor in the LKAB Mining Company". The research project was financed by the Swedish National Employment Board.

I owe the greatest debt to Professor Karl-Gustaf Löfgren. He has always been a creative and inspiring project leader. But more importantly, this study could not have been written without his continuous encouragement. He has always found time to read and discuss the (many) previous versions of the text. Without this opportunity the remaining errors, which are, of course, my responsibility, would have been many more.

In the research project I have had the privilege of collaborating with Research Assistant Lars Engström. It has been both stimulating and fun to work with Lars. Professor Per-Olov Johansson has willingly read previous versions of chapter 2. I hope it is clear that the cost-benefit rules discussed in that chapter draw heavily on his research. The unselfish assistance of Senior Administrative Officer Roger Jacobsson was invaluable in the preparation of the data base which is the basis for chapters 3 and 4.

The subject of this study is the Malmfältsdelegation. The staff of the delegation has, throughout the project, been very helpful. I would like, in particular, to mention Ulf Westerberg, Anders Larsson, Brit-Marie Andersson, and Roland Rova.

Professor Tönu Puu and Professor Ake E. Andersson have contributed important comments and suggestions during the process of combining scattered previous work to form this study. Associate Professor Lars Ivarsson has been an interested and stimulating supervisor while I took the literature courses in the PhD-program.

I would also like to thank my colleagues at the Department of Economics for forming a social organization of which it is a pleasure to be a part. Eva Cederblad, Inga-Marie Nilsson, and Lisbeth Segerlund have provided invaluable word-processing assistance. Finally, Chris Hudson has had the difficult task of transforming my "Swenglish" into English.

Thank you!

Umeå, November 1986

Henry Ohlsson
This second edition is a result of my continued work during 1987 in the research project "A cost-benefit analysis of the special measures for super numerary labor in the LKAB Mining Company". As before the research project was financed by the Swedish National Employment Board.

Professor Karl-Gustaf Löfgren has continued to inspire and encourage. Indefatigably, he has reserved precious time to read, comment, and discuss the drafts of this text. His enthusiasm has been a necessary condition for the completion of this study. The task of fulfilling the sufficiency conditions has, of course, been mine. The remaining errors are also my responsibility.

I have had the privilege of collaborating with Lars Engström, now at the Ministry of Finance, and Olle Westerlund in the research project. Apart from the stimulating discussions we have had concerning the overall problem of how to evaluate this labor market program, both Lars and Olle have taken a concrete part in the work presented here.

The first edition of this study constituted my licentiate study. Professor Eskil Wadensjö was the opponent at the public seminar. He contributed many important comments and suggestions, which I have tried to incorporate in this second edition. Jørn Stæge also read the first edition closely. He too has given important comments and suggestions.

Roger Axelsson, Per-Olov Johansson, Åsa Löfström, Jørn Stæge, Olle Westerlund, and Lars Westin have read this second edition. They all have suggested improvements for which I am grateful.

The main changes and extensions compared with the first edition are:

Chapter 2. The theoretical model used for the derivation of cost-benefit rules has been changed in two important ways. Firstly, it is now intertemporal which, among other things, allows investment to be treated endogenously. The one employed in the first edition was a single period model. Secondly, the combination of regimes is different. In the first edition it was assumed that the program region suffered from Keynesian unemployment while the rest of the country experienced repressed inflation. The assumption of Keynesian unemployment in the program region is kept. However, firms and households in the rest of the country are now assumed to be unconstrained.

In addition the method for deriving the rules has been changed. Indirect utility functions and profit functions are now used to derive aggregate monetary measures of welfare change. This is a faster and more compact method compared with the one used in the first edition.
Chapter 3. The descriptive accounts of the plans concerning job-creating measures and the outcomes of these have been updated as many projects have been added and many accounted for since the first edition was written. Two extensions have been made. First, the outcomes of projects aiming at creating permanent employment are reported. It has been possible through a telephone interview survey to give an account of the results of this important variable. This information is analyzed by econometric methods.

Second, the projects decided before and after July 1985, respectively, are compared. The operation of the special labor market program has been governed by two parliamentary decisions with partly different intentions. It is of interest to find out whether and to what extent the intentions have been fulfilled in practice.

Chapter 4. The data and the calculations reported in this chapter have also been updated. The modifications of the theoretical model give rise to slightly different cost-benefit rules. Consequently, the rules used in the empirical applications are slightly different compared with the first edition.

The fact that some of the projects have led to the creation of permanent jobs has, as a result of the information obtained in the telephone survey, been given a much more explicit treatment.

There are more acknowledgements to be made. These are as important as those made above. Eva Cederblad and Ingrid-Marie Nilsson have, in their usual cheerful way, once again provided invaluable word-processing assistance. Finally, the burden of transforming my efforts to write in English into actual English has once more fallen on Chris Hudson.

Thank you!

Umeå, April 1988

Henry Ohlsson
1 INTRODUCTION

During the last decade Sweden has experienced deep structural crises in many industries. The shipbuilding, steel, and textile industries were among the branches most seriously hit. However, the production of primary products also suffered. During the first years, rather than call for and take part in structural change, the Government engaged in extensive subsidization programs. This was politically controversial only in the sense that the opposition demanded more subsidies. The underlying hypothesis for these policies was that the poor industrial performance was due more to the recession than to the industrial structure. Hence, it was a question of "passing the winter" until the next boom came.

However, the boom never came, at least not for some Swedish industries. It was commonly realized that the supposed business cycle problem for these industries was, in reality, a structural problem. Hence, it was also apparent that subsidies were not, at least in the long run, the desirable policy. On the firm level this meant closures in some cases and labor force reductions in others. Unfortunately, many of these closures and reductions concerned firms located in places with a one-sided local labor market. These firms were often the only big private employer. For many persons industrial change thus meant migration, retraining, and unemployment.

In order to moderate the problems that individuals experienced, the labor market policy was strengthened. However, in some cases when many had to leave their jobs it was decided to set up temporary special organizations instead of using the regular organization. The basic belief behind this was of course that a special organization could get better results than the regular.

This study is about one of these special organizations, the Malmfälts-delegation, which has been in operation in northern Sweden during the period 1983-1986. The object of the study is to determine whether this special organization has indeed produced better results.
1.1 Background

In the middle of the seventies the production of steel in Western Europe started to decrease. For the LKAB Mining Company, a large state-owned mining company in northern Sweden, the contracting market, combined with decreasing market shares, meant that the production capacity could not be fully utilized. The management, however, chose not to reduce the labor force as the difficulties were considered to be temporary. During the period 1979-1982 the company received SEK 4 000 million from its owner, the state, to make it possible to continue the operation.

The expected recovery did not come and the company's estimations of the future prospects were therefore changed in the beginning of the eighties. In the middle of 1982 LKAB gave notice to the County Employment Board in Norrbotten of a coming reduction of the labor force by slightly more than 800 employees. During 1982 the demand for iron ore further decreased and this forced a new forecast of the future market for iron ore. An additional 1 100 employees were now considered to be redundant. This can be compared to the average number employed by LKAB 1982 which was 6 200 persons.

After the change in government 1982, the new Government started to prepare a bill with the objective of strengthening employment and production in Norrbotten. One of the proposals in the bill was the creation of a special organization with the aim of facilitating the finding of new jobs for the supernumerary LKAB-employees. The organization, Malmfältsdelegationen (The Ore Mines District Delegation), was supposed to function from 1 July 1983 i.e. the point of time at which the first employees to have been given notice were due to leave LKAB.

However, the employees who had been given notice started to leave LKAB before the organization started its work. At the start about 1 000 persons had already left the company. The primary reason for this was the agreement between the company and the trade unions concerning allowances in connection with "voluntary" redundancies. Older (manual) workers and salaried employees could get different types of
early retirement pensions. From May 1983 LKAB started to pay a severance pay of SEK 60 000 to the workers who quit at their own request. In the case of the salaried employees an agreement was made concerning similar allowances to these for voluntary redundancy. It is also worth noting that the persons who voluntarily left LKAB during the fall 1982 and the spring 1983 got a lower severance pay.

In the case of the (manual) workers the severance pay did not lead to any differences compared to what would have happened in a normal labor force reduction process. Apart from the older workers, who, to a large extent, accepted early retirement, it was primarily the younger workers who left LKAB. However, in the case of the salaried employees, the actual process differed from a normal labor force reduction process. Among these it was primarily the older employees who left the company. A possible interpretation is that salaried employees over 50 years old felt an obligation to accept early retirement/severance pay. Salaried employees aged 58 years or older received a relatively good financial compensation, whilst, in many cases, those under 58 years only received a low pension.

In total about 1 800 employees left LKAB. The labor force reductions were geographically distributed in the following way. At the mines located in the municipality of Kiruna, 1 100 out of 3 100 left the Kiruna mine while almost all 400 employed left the Svappavaara mine (located about 40 kilometers from the Kiruna mine) as the production there stopped. In the municipality of Gällivare, 300 employees out of 1 600 left the Malmberget mine.

Among those who left LKAB there were 200 women and 1 600 men. These comprised 400 salaried employees and 1 400 (manual) workers.

The Malmbåtarföreningen was granted SEK 309 million by the Swedish Parliament, corresponding to SEK 170 000 per redundant employee. Of this sum SEK 14.5 million was intended for labor market training, while SEK 262 million was allocated to job-creating measures in the form of relief works and special projects. The remaining funds were intended for administration and follow-up studies.
The Malmfältsdelegation (Mfd) organizationally functioned as a county employment board with two employment exchanges, one in Kiruna and the other in Svappavaara. Furthermore, the Malmfältsdelegation had employment office clerks placed in the regular employment exchanges in Gällivare and Pajala. At the same time the regular employment exchanges in Kiruna and Gällivare were strengthened by extra personnel. These employees, who were paid from the appropriation to the delegation, had the task of participating in the service provided for other job seekers.

Figure 1.1 is a map of the county of Norrbotten where the program municipalities, Kiruna and Gällivare, are indicated. The two program municipalities together constitute an area sometimes referred to as Malmfälten. In addition two other municipalities, Pajala and Övertorneå, are also marked out. As mentioned above Mfd was active in Pajala. This was because many of those who had to leave LKAB originally came from the eastern parts of the county. A significant number of these former LKAB-employees immediately moved back when they left the company. Hence there was a need for employment services not only in the program municipalities. For example, some of the Mfd projects were located in Pajala and Övertorneå - see Chapter 3.

In Chapter 4 the labor market situation in the program municipalities is related to the situation in a comparison region. This region consists of municipalities in Norrbotten and Västerbotten, the county to the south of Norrbotten.

The competence of Mfd was wider than the competence of the regular County Employment Boards. For example, the Malmfältsdelegation had the opportunity to subsidize special projects and to award subsidies higher than the regular subsidies for relief works. Moreover, when buying training, it was possible for the delegation to freely choose training arrangers. The Malmfältsdelegation was also able to grant training allowances for one year's university studies. Participants in training received a training premium of, at most, SEK 5 000 if they completed the training. At the special employment exchanges in Kiruna and Svappavaara, there were categories of personnel normally only
The program municipalities

Municipalities included in the comparison region

The other municipalities

Figure 1.1 The county of Norrbotten with the municipalities of Kiruna, Gällivare, Pajala, and Övertorneå indicated.
Table 1.1 The labor market situation for the former LKAB-employees 30 June 1985.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of persons</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed on the open market:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thereof outside the original home municipality</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>thereof reemployed</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>&quot;new business&quot;</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>wage-subsidized employment</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>other within the original home municipality</td>
<td>420</td>
<td></td>
</tr>
<tr>
<td>In labor market policy measures:</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>thereof in training</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>in relief work/special projects</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Unemployed:</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>thereof awaiting early retirement pension</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Left the labor force</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1 780</td>
<td>100</td>
</tr>
</tbody>
</table>


employed at employability assessment centers. These differences meant that the former LKAB-employees could get a more wide-ranging service from the Malmfältsdelegation's employment exchanges than from the regular employment exchanges.

Table 1.1 shows the labor market-situation for the former LKAB-employees in June 1985, i.e. about two years after the time when most had left LKAB. According to the table, half of the former LKAB-employees had a new job. The relative share in training was 9 %, while 5 % were employed in relief works and special projects. Of the unemployed, mainly older workers and salaried employees, most awaited early retirement pension. It is noteworthy that slightly more than 200 had been reemployed by LKAB. This is partly due to the fact that LKAB reopened the pelleting plant in Svappavaara.
Table 1.2 The labor market situation for the former LKAB-employees during the period July 1983 - June 1985.

<table>
<thead>
<tr>
<th></th>
<th>Number of months</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed on the open market</td>
<td>11 000</td>
<td>25</td>
</tr>
<tr>
<td>In labor market policy measures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thereof in training</td>
<td>9 000</td>
<td>21</td>
</tr>
<tr>
<td>in relief work/special projects</td>
<td>5 600</td>
<td></td>
</tr>
<tr>
<td>thereof in training</td>
<td>3 400</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>12 000</td>
<td>28</td>
</tr>
<tr>
<td>Residual:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>including the time outside the labor force as well as quits after July 1983</td>
<td>11 000</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>43 000</td>
<td>100</td>
</tr>
</tbody>
</table>

Sources: The Malmfältsdelegation and the County Employment Board in Norrbotten.

The labor market-situation for the former LKAB-employees during the period July 1983 - June 1985 is summarized in Table 1.2. The persons who left LKAB have spent equivalent time as employed on the open market, as employed in labor market policy measures, as unemployed, and in a residual group. LKAB-employees who obtained early retirement pension account for most of the months of the residual group.

It became clear at an early stage that not all the delegation's funds would be spent by the end of the first two-year period. Therefore a discussion was initiated concerning the possible continuation of the work, in one form or the other. As is clear from table 1.3 the net expenditure during the first two fiscal years amounted to SEK 140 million. This, however, did not mean that SEK 170 million remained as there were many subsidies which, although agreed, had not been paid. In July 1985 there were SEK 64 million of the originally granted SEK 309 million available for further measures.
Table 1.3 The expenditure of the Malmfältsdelegation.

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Granted SEK million</th>
<th>Net expenditure SEK million</th>
<th>Appropriation to the next year SEK million</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983/84</td>
<td>309.0</td>
<td>57.2</td>
<td>251.8</td>
</tr>
<tr>
<td>1984/85</td>
<td>83.7</td>
<td></td>
<td>168.1</td>
</tr>
<tr>
<td>1985/86</td>
<td>104.9</td>
<td></td>
<td>63.2</td>
</tr>
<tr>
<td>1986/87</td>
<td>45.1</td>
<td></td>
<td>18.1</td>
</tr>
</tbody>
</table>

Source: The National Audit Bureau.

In the 1985 Budget Bill it was proposed that the remaining funds should be used to continue the operation in the program region. The Minister of Labor wrote:

"Considering the great importance the so called malmfältsdelegation has and has had to help those made redundant at LKAB and to initiate and take care of development projects, I propose a new organization, with a partly new composition and direction, to be set up from 1 July 1985. This new organization should, as at present, be a part of the National Labor Market Administration. It should consist of a director, an administrative officer and at most two clerical officers. The operation should concentrate on efforts to strengthen and broaden trade and industry in the malmfält region in line with what has been suggested in the malmfält report. The new delegation should not, as previously, be firmly bound to LKAB and its former employees. An important part of the work should, also in the future, however naturally be to create lasting jobs for the persons who have worked earlier within LKAB. The operation should be set up directly under the County Employment Board in the county of Norrbotten and function at longest from 1 July 1985 to 30 June 1987". 1

Furthermore, it was proposed that the extra personnel at the employment exchanges in Kiruna and Gällivare should be kept during two additional fiscal years. According to the official document placing the appropriation at the disposal of the National Labor Market Administration the grant could also be used for relief works.

---

The new delegation was actively engaged in labor market policy for 18 months, that is to the end of 1986. The period thereafter has been devoted to following them up, controlling accounted projects, and paying subsidies. The County Employment Board in Norrbotten is responsible for managing this. The projects should be accounted for before the end of 1987.

The conditional loans are also managed by the County Employment Board. Interest and amortization payments are reinvested in the region.

The new delegation did not function as an employment exchange. Hence, the former LKAB-employees had to go to the regular exchanges for labor market services from July 1985. As a result of this, it is not possible to get separate labor market statistics for this group from July 1985 and onwards. The only available information comes from the questionnaire surveys done as part of the evaluation project. Table 1.4 summarizes the labor market-situation in October 1986 according to the latest survey. It should be stressed that the results of the surveys not are comparable with the delegation's statistics. The latter gives the labor market situation according to the formal definitions used by a public authority while the former tells something about how persons (subjectively) regard their own labor market situation. Hence one can not compare Table 1.1 and Table 1.4 and draw the conclusion that the employment on the open market was the same in June 1985 and October 1986.

Questionnaires were sent to 1 530 out of 1 820 former employees. The difference is explained firstly by the fact that no questionnaires were sent to persons aged 65 years or older. Secondly, some former employees have died and, finally, it was not possible to obtain the addresses of those who had moved out of the country. In total, 1 210 questionnaires - 80 % of those sent out - were returned. When preparing Table 1.4, it has been assumed that the labor market situation for the 1 210 is representative for all persons younger than 65 years.
Table 1.4 The labor market situation for the former LKAB-employees October 1986.

<table>
<thead>
<tr>
<th>Number of persons</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed on the open market</td>
<td>890</td>
</tr>
<tr>
<td>In labor market policy measures</td>
<td>80</td>
</tr>
<tr>
<td>thereof in training</td>
<td>10</td>
</tr>
<tr>
<td>in relief work</td>
<td>70</td>
</tr>
<tr>
<td>Unemployed</td>
<td>140</td>
</tr>
<tr>
<td>Left the labor force</td>
<td>590</td>
</tr>
<tr>
<td>thereof students</td>
<td>60</td>
</tr>
<tr>
<td>retired</td>
<td>480</td>
</tr>
<tr>
<td>others</td>
<td>50</td>
</tr>
<tr>
<td>Deceased/</td>
<td>120</td>
</tr>
<tr>
<td>Moved abroad</td>
<td>1 820</td>
</tr>
</tbody>
</table>

Source: Estimates based on the 1986 survey.

According to the surveys the number of persons employed on the open market has increased during the period March 1984 - October 1986. Moreover, the number of unemployed was halved from March 1984 to March 1985. Since then this number has been constant. The number of persons in labor market policy measures has gradually decreased since 1984, while the number of retired has increased.

As a result of the Swedish Parliament's decision to establish a special organization, instead of allocating extra resources through the regular authorities, the former LKAB-employees became subjects of a social experiment. The question is: Can a temporary organization with wider competence do more for persons who are victims of industrial changes, than the regular authorities? This problem, and many other similar issues, formed one of the reasons for the allocation of funds for an evaluation of the Malmfältsdelegation.
A group at the Department of Economics, University of Umeå with Professor Karl-Gustaf Löfgren as project leader, was given the assignment of evaluating the effects of the delegation's work. This evaluation was presented in Engström & Ohlsson (1985). The report is summarized in Engström & Ohlsson (1986).

Apart from our report, the organizational experiences are discussed in Ramström & Pihlgren (1985). Ramström (1987) has attempted to describe these in a more generally accessible form. Moreover, the Malmfälts-delegation has summarized its experiences in two reports. The first of these, Malmfältsdelegationen (1985), covers the first two years while the other, Malmfältsdelegationen (1987) concerns the final period.

As a result of the decision taken in Parliament in 1985, funds were also allocated for an evaluation of the program. The evaluation, which was supposed to be a direct continuation of the earlier work, was to be given to the Ministry of Labor before the end of 1987.

In March 1986 the Department of Economics, University of Umeå, was once again selected, this time to make an additional evaluation of the effects of the delegation's work. This evaluation was reported in Ohlsson & Westerlund (1987).
1.2 This Study

The primary focus of this study is the relief works and special projects of the Malmfältsdelegation. However, when studying these it is, at times, impossible to avoid touching on the effects of the delegation's other activities. The problems I would like to address in the study are the following:

a) Where and when have the relief works and special projects been in operation and by whom and for whom have they been run? In order to obtain a good basis for further analysis it is necessary to have a descriptive account of this.

b) Have the relief works and special projects raised the incomes of the former LKAB-employees?

c) Have the relief works and special projects given rise to an increase in welfare?

The methods used to solve these problems are of both theoretical and empirical character. In order to solve the first problem a data base has been established. Answering the question of what would have happened if the Malmfältsdelegation had not been set up is critical when dealing with the remaining two problems. With regard to this question the method has been to specify different hypothetical alternative courses of events. This makes it possible to test the sensitivity of the results for the specification of the course of events without the delegation.

The third problem, which I regard as the main one, has to be solved by using some kind of cost-benefit analysis. Because of the characteristics of this particular problem, for example the comparatively high unemployment in Norrbotten, I have chosen not to use the standard cost-benefit rules directly.
Instead the following route has been selected. Firstly, a simple model is set up which captures the basic economic relationships in the environment within which the Malmfältsdelegation has had to work. In the model the delegation is represented by a public sector that can produce goods, employ labor, and raise taxes to balance its budget. Secondly, the welfare implications of changes in public production and employment in the model are studied. The welfare effects are summarized in a number of cost-benefit rules. The theoretical model is presented and the cost-benefit rules are derived in Chapter 2. Thirdly, the rules from the model are confronted with the empirical data from the data base.

Chapter 3 contains a descriptive account of the structure of the relief works and special projects. Furthermore, the actual outcomes are compared with the plans. A comparison is also made of the projects decided before and after July 1985. This chapter originally appeared, in Swedish, as one of the chapters in the evaluation report.

The cost-benefit analysis is the subject of Chapter 4. The first section discusses the possible alternative courses of events in a situation where the Malmfältsdelegation does not exist. Comparisons are made with the actual course of events. This is followed by an income analysis. The final section deals with the welfare analysis. The operationalization of the cost-benefit rules derived in chapter 2 as well as the application and the results are discussed in this section. A previous version of this chapter was included in the evaluation reports.

Finally, the main conclusions of the study are summarized in Chapter 5. The chapter also contains some suggestions on the directions of future research in this field.

Appendix I contains a discussion of price changes in general equilibrium systems. A list of the variables included in the data base is given in Appendix II. As a study of labor market policy involves using many specific terms, a list of terms is provided in Appendix III. This includes a number of Swedish terms together with their English translations.
DERIVATION OF THE RELEVANT COST-BENEFIT RULES

As mentioned in the previous chapter, the Malmfältsdelegation was granted SEK 262 million for job-creating measures such as relief works and special projects. These jobs were created in direct public production and publicly subsidized private production. Output consisted of pure public goods and mixed goods as well as pure private goods. Among the latter it is possible to find production intended for export markets and production intended for the home market. The production of pure public goods and mixed goods included production that had a positive impact on the production possibilities of the private sector and production that had a direct positive effect on household utility.

Some of the projects only affected production and employment during the program period. Other projects were intended to be permanent, thus affecting production and employment both during and after the program period. There were also investment projects that implied increased employment during the program period while the production effects came later.

The object of this chapter is to derive the relevant cost-benefit rules for the evaluation of these relief works and special projects. These rules are then used in the empirical analysis in Chapter 4. The idea is firstly to formulate an intertemporal general equilibrium model that, despite its simplicity, captures the important aspects of the economic environment in which the delegation has had to work.

---

1 The term "public" may cause confusion as it is used in two different senses. When talking about "public production", "public employment", etc. I refer to the actions of a decision making unit which is empowered, by some kind of legal right, to tax other decision making units. When producing goods the public sector does not necessarily maximize profits. The decision making unit "the public sector" can be related to the decision making units "private firms" and "households". On the other hand, when talking about "public goods" the term "public" has a different meaning. In this case the term "public" does not refer to the producer, but instead to certain characteristics of a good, commonly summarized as being non-rival and non-excludable. The opposite is a "private good" which is rival and excludable.
Secondly, this model is used to derive the welfare implications of changes in production and employment in public firms. The activities of these public firms in the model are intended to correspond to the Malmöfältsdelegation's job-creating measures in reality.

It should be stressed that the method chosen in this study is not the only possible one. The literature on welfare economics is considerable and growing rapidly. Samuelson (1954) is the seminal work on the normative theory of public expenditure. In that paper the optimal allocation of resources in the presence of collective consumption goods is characterized. The analysis is extended to producer goods and factors of production in Kaizuka (1965) and Sandmo (1972). In, for example, Boadway (1975) cost-benefit rules for increased public production of private goods in a general equilibrium model are discussed.

There are, however, some aspects of the economic situation in Sweden during this period that make conventional cost-benefit analysis less suitable. Northern Sweden suffers from unemployment to a much greater extent than the rest of the country. Moreover, the level of economic activity is, in general, lower in northern Sweden. These differences have persisted regardless of the business cycle. During the period since 1982 Sweden has experienced increases in economic growth, industrial production, and investments. Unemployment has decreased. Simultaneously, the time it has taken to fill job vacancies has, on average, increased. Nonetheless, the economic problems in northern Sweden have remained.

In order to be able to deal with the evaluation of a labor market program in this economic environment I have, instead of using standard partial cost-benefit rules which do not take all the interdependencies in the economy into account, preferred to start from a model built for this particular problem. The shaping of a model is of course dependent on the conscious (and unconscious) wishes of the model-builder. Among the conscious wishes are that

2 In Drèze & Stern (1987) a unified treatment of the techniques of cost-benefit analysis is presented.
- the model should be of a general equilibrium character i.e. that the whole, and not only parts of the economy should be taken into consideration;

- the model should consist of more than one geographical region;

- the model should be able to describe a situation where the households experience involuntary unemployment;

- the model should be intertemporal i.e. consideration should be taken to more than a single time period.

Therefore, I have selected to analyze a model with two regions. A regionalized model also permits an examination of a situation when a region receives transfers to finance labor market measures from another region. In Johansson (1981) a single-period regionalized disequilibrium model is used to study the effects of (conventional) fiscal policy and trade policy. The model used here is similar. However, here public production of private and public goods are introduced and the analysis is concentrated on welfare effects.

There has been a growing interest in analyzing the welfare effects of changes in production and employment within the disequilibrium framework. Drèze (1982) and Johansson (1982a) are examples where public production of private goods is considered. The cost-benefit effects of increased provision of public goods, in a model that is not regionalized, are discussed in Johansson (1982b).

---

3 The original work on general disequilibrium models is Barro & Grossman (1971) where ideas first presented in Patinkin (1956) and Clower (1965) are synthetized to a short-run disequilibrium model.

4 A single-period version of this model is analyzed in Ohlsson (1987) and in the first edition of this study.
Recently Johansson & Löfqren (1987b) have derived cost-benefit rules in an intertemporal disequilibrium model. Their model is similar to the one in Neary & Stiglitz (1983). The main differences, compared with single-period models, are that private investment can be made endogenous and that expectations can be explicitly treated.

The selection of a regionalized version of the Johansson & Löfgren model makes it possible to meet the requirements set out above. First of all, an unemployment situation can be modelled. Secondly, the selected model makes possible a discussion of the interactions between the program region and the rest of the country as well as the interactions between different periods. And finally, this general (dis)equilibrium model captures the indirect spill-over effects as well as the direct (partial) effects.

Within the conventional macroeconomic tradition it is common to assume that public expenditure only affects aggregate demand for goods and not household utility and/or production possibilities. In other words, increased public expenditure is assumed to result in an increased utilization of the economy's resources without any accompanying benefits. This assumption was first questioned by Bailey (1962). One of the directions of research has been to consider productive public expenditure within the framework of disequilibrium. In Grossman & Lucas (1974) the effects of public expenditure which increase the production possibilities of firms are considered. However, public expenditure which directly affects household utility has also been discussed in the literature. The Bailey approach has, of course, not

5 A "price" that has to be paid to attain these requirements is that it becomes necessary for some prices to be fixed, at least in the short run.

6 See also Barro & Grossman (1976) and Negishi (1979).

7 See, for example, Baltensperger (1977), Possen & Slutsky (1980), and Koskela (1982).
only been used in the disequilibrium literature, see Johansson (1986) for a review of the literature on the macroeconomic effects of productive public expenditure.\textsuperscript{8}

When evaluating the Malmöfält's delegation's relief works and special projects, it is important to emphasize the productive aspect of the expenditure on the delegation's activities. Therefore the specification of model follows the productive public expenditure tradition. Hence, when dealing with public goods these are assumed to affect either household utility or production possibilities.

There are two regions in the model, South and North. The latter region should be regarded as representing Norrbotten, while the former represents the rest of the country. In the model each region has one representative household. The households supply labor and demand goods. There are two private firms in each region, one producing region specific non-traded goods and the other traded goods. It is assumed that the market for southern non-traded goods and the labor market in South always clear through price adjustments. The southern household can, in the short run, buy northern non-traded goods without limit.\textsuperscript{9} The firm producing tradeables and the household can always sell and buy tradeables at fixed foreign currency prices.

The exchange rate for this small open economy is assumed to be fixed. Moreover, by assuming perfect capital mobility and a single international traded bond, the domestic interest rate will be fixed at the foreign level.

The agents are assumed to have rational expectations. In the context of this model rational expectations should be interpreted as implying that the agents correctly foresee any changes in prices and quantities in the future.

\textsuperscript{8} There also exist textbooks which take this approach to public expenditure. See, for example, Barro (1984).

\textsuperscript{9} An alternative term for southern and northern non-traded goods is interregional goods.
At the same time, North is assumed to be depressed in the short run. This region is, during the first period, characterized by Keynesian unemployment in the sense that the labor market and the market for northern non-traded goods are both in excess supply due to fixed prices. However, the regime in North is mixed as the northern household does not face any constraints on its purchases of southern non-traded goods and traded goods. Moreover, the northern firm producing tradeables does not perceive any constraints. Thus the model-situation for this firm resembles that of the LKAB Mining Company and other export firms in Norrbotten. It is assumed that consistent trading on the northern market for non-tradeables in the short run is obtained through a process of quantity adjustments. In the long run (in later periods) prices adjust as to clear these markets.

This combination of regimes is, of course, not the only one possible. It has been selected bearing in mind the actual situation during the relevant period. In Karlsson (1988) a macroeconomic disequilibrium model of the Swedish business sector is estimated for the period 1970-84. Unfortunately, these estimations only cover the first five quarters of the program period and no distinction is made between traded and non-traded goods.

During this period the most likely regime (with probabilities ranging from 57% to 98% for the different quarters), according to the estimations, is classical unemployment. In this regime, with excess demand on the goods market and excess supply on the labor market, producers do not perceive any constraints. However, the estimated effective excess demand on the goods market is close to zero.

Given this, and the fact that the characterization of the labor market between excess demand or excess supply is sensitive to the model specification, I regard my assumption that agents in South are unconstrained, as not being inconsistent with Karlsson's estimations. The terminology is from Malinvaud (1977).
most questionable implication of my assumption is nevertheless that the southern household is assumed to be unconstrained on the labor market.

It is of course possible to model South as being in the classical unemployment regime during the first period. This would, among other things, imply that both households would perceive constraints on their purchases of southern non-traded goods. Hence, some kind of rationing scheme would have to be specified. The cost-benefit rules would, with this alternative specification, not include some of the indirect welfare effects appearing in the rules discussed in this chapter. This, in turn, is caused by the fact that changes in the supply of a rationed good (in this case southern non-traded goods) will only have an income effect on the demand for other goods.

There is no migration included in the model, while the northern household is assumed to demand southern non-traded goods and vice versa. The assumption of immobile labor is in contrast to Boadway & Flatters (1981) where regional employment policy is analyzed in a two-region model in which migration is the equilibrating phenomenon.\(^1\)

It should be noted that one of the Mfd's aims was to avoid the former LKAB-employees moving. This ambition was also fulfilled. However, this is not a sufficient argument in favor of the chosen specification of the theoretical model. The reason is that many former LKAB-employees may have moved in a situation where Mfd had not been started. This is discussed further in section 4.1.1.

In the theoretical model the public sector produces three types of private goods; southern non-traded goods, northern non-traded goods, and traded goods. The public firms are located in the depressed North. As mentioned above, changes in the production of these firms represent the delegation's works and special projects. As the special labor market program is temporary, the analysis is concentrated on the short-run effects of increased public production.

---

\(^1\) This model has its roots in Harris & Todaro (1970).
A model specification including production and employment subsidies to private firms is an alternative to the specification chosen in this study. However, the welfare implications are the same and the assumption of direct public production simplifies the calculations and the exposition.

Three publically produced public goods are also introduced, one public good affecting the utility of the northern household and two public goods affecting northern tradeables- and non-tradeables-production respectively. Traditionally, pure public goods are defined as goods that have the property of joint use or non-rivalness, the use of one household or firm does not detract the benefits simultaneously accruing to other households/firms. Moreover, it is not possible, or too costly, to exclude any household or firm from the use of the public good. Due to these properties, public goods are often provided by the public sector free of charge.

In what sense are the goods produced by the public sector in this model public goods? First of all, the three goods have to be regarded as local public goods as the household and the firms in South are assumed to be unaffected by the provision. This does not constitute a serious empirical problem as most of the public goods produced as a result of the job-creating measures of the Malmfältsdelegation primarily affect households and firms in Norrbotten. Secondly, as there is only one representative household in North, the property of non-rivalness has no meaning in the context of the model. The specification of representative firms has the same implication. In this sense the model does not represent reality so well. Thirdly, the assumption that there are two different goods affecting each firm respectively implies, on the other hand, that there exist public goods with no effect on non-tradeables-production and tradeables-production respectively.

---

12 Note that the northern firms are assumed to be unaffected by the provision of the public good affecting household utility.
Hence, the essential feature of what is called public goods in this chapter is that these goods are supplied free of charge by the public sector. In general this can be motivated by the fact that the public sector, for some reason, either cannot or does not want to charge the user. In the latter case the good will have to be regarded as a merit good rather than as a public good. The object of setting up the Malmfältsdelegation was primarily to create employment but one of the consequences of this was that the volume of goods supplied free of charge was increased.

The chapter is structured in the following way. In section 2.1 the basic model is presented. The cost-benefit rules applicable when public production of private goods is increased are discussed in section 2.2. The introduction of public goods makes it necessary to modify the model. In section 2.3 the modifications are presented. The cost-benefit rules applicable when public production of public goods is increased are treated in section 2.4. The cost-benefit rules are dependent on the type of tax used to balance the public budget. Two possibilities are considered; lump-sum taxes on the southern household and the northern household, respectively. A model formulation, with increased public production in North and increased taxation in South, mirrors the creation of the Malmfältsdelegation which has implied a financial transfer to Norrbotten from the rest of the country. The results are summarized in section 2.5 where some concluding remarks are also made.
2.1 The Model

2.1.1 The Unconstrained South

The representative household in South - denoted by superscript s - demands four commodities: a good produced in the own region \(X^{ss}\), a good produced in the other region \(X^{sn}\), a traded good \(X^{st}\), and (the present value of) end of second period wealth \(M^S\). It also supplies labor \(L^S\). The utility function, which is assumed to be strongly quasi-concave and twice continuously differentiable, is

\[ u^S = u^S(X^S, L^S, M^S, \theta^S) \]  

(1)

where \(\theta^S\) is a vector of expectations of prices beyond the second period.\(^{13}\) The reason why the utility function is assumed to be strongly quasi-concave will be made clear below.

The demand for end of second period wealth is included to take into account the wish to save in order to be able to consume in future periods. \(X^S = (X^{ss}, X^{sn}, X^{st}, X^{st})\) is a vector of demand for goods period 1 and period 2, and \(L^S = (L_1^S, L_2^S)\) is a vector of supplies of labor.

The intertemporal budget constraint of the household is

\[ M_0^S + T^S + \pi^S + \omega L^S - pX^S - M^S = 0 \]  

(2)

where \(M_0^S\) = initial stock of wealth, yielding the international interest rate, held by the household; \(T^S = (T_1^S, T_2^S)\) is a vector of net present value lump-sum transfers from the public sector (if the household pays lump-sum taxes \(T^S\) is negative); \(\pi^S = (\pi_1^S + \pi_2^S, \pi_1^S + \pi_2^S)\)

\(^{13}\) See Johansson & Löfgren (1987b). This is one way of dealing with the problem of incorporating intertemporal considerations developed by Neary & Stiglitz (1983). An alternative method to introduce expectations can be found in Muellbauer & Portes (1978).
is a vector of present value profits generated in the private firm producing traded goods and in the private firm producing non-traded goods in South respectively; \( p = (p^1, p^2, p^n, p^n, p^n, p^t, p^t) \) is a vector of present value goods prices; and \( w^S = (w^S_1, w^S_2) \) is a vector of present value nominal wages in South.\(^{14}\)

Note that desired amounts of both borrowing and lending can be made at the (international) interest rate. This implies, among other things, that it becomes less important in which period profits are distributed. I assume that profits in private firms as well as public sector surpluses (deficits) are distributed to (levied on) the household in the period in which they are generated. Also note that, interest payments do not enter the budget constraint as all terms in the constraint are present values. This can be illustrated in the following way. Suppose that the stock demand for end of second period wealth equals the initial stock of wealth in the sense that the flow demand is zero. Then end of second period wealth will be \((1+r)^2 M^S_0\), where \( r \) is the interest rate. The present value of end of second period wealth will thus simply be \( M^S_0 \).

Maximization of (1) subject to (2) give rise to the following behavioral functions.

\[
X^S = X^S(M^S_0 + T^S + \pi^S, p, w^S, \theta^S) \\
I^S = I^S(M^S_0 + T^S + \pi^S, p, w^S, \theta^S) \\
M^S = M^S(M^S_0 + T^S + \pi^S, p, w^S, \theta^S)
\] (3)

Behavioral functions are continuously differentiable with respect to price and income arguments if, and only if, the bordered Hessian matrix associated with a strictly quasi-concave utility function is

---

\(^{14}\) The notation denoting transposed vectors have been suppressed.
non-singular. This is the case if, and only if, the utility function is strongly quasi-concave.\textsuperscript{15}

The first argument in the behavioral functions is an income term, while the following two arguments contain both an income and a substitution effect. It is worth pointing out that profits as specified above, are assumed to be distributed within each region.

The indirect utility function of the southern household is

$$V^S = V^S(M^S_0 + \Gamma^S + \pi^S, P, W^S, \theta^S)$$  \hspace{1cm} (4)

This function has all the standard properties.\textsuperscript{16} The partial derivative with respect to the first argument is

$$\frac{\partial V^S(\cdot)}{\partial (M^S_0 + \Gamma^S + \pi^S)} = \lambda^S$$

where $\lambda^S$ is the southern household's marginal utility of exogenous income. The partial derivative with respect to the second argument is

$$\frac{\partial V^S(\cdot)}{\partial P^i_j} = -\lambda^S \lambda^S_i^S \lambda^S_i^i (\cdot)$$

The property (Roy's identity) that one can obtain the demand function for a certain good in a certain period by differentiating the indirect utility function with respect to the corresponding price and dividing by the marginal utility of exogenous income, is of great importance for the subsequent discussion as it simplifies the analysis.

\textsuperscript{15} See Johansson (1987), Chapter 2 and Barten & Böhm (1982), pp. 405-406.

\textsuperscript{16} See Varian (1984), pp. 121-122.
There are two profit-maximizing representative private firms in South, one producing non-traded goods and the other producing traded goods. These firms maximize the present value of cash flows. The present value of cash flows (or net worth) is

\[
\pi^i = p^i(y^{si} - I^{si}) - w^i I^{si} + \phi^i(I^{si}_2, \Theta^{si}) \quad i = s \text{ and } t \tag{5}
\]

where \( y^{si} \) is a vector of gross production, \( I^{si} \) is a vector of investments, and \( I^{si}_2 \) is a vector of employment. The present value of cash flows in periods beyond the second are contained in \( \phi^i(\cdot) \). These flows are functions of second period investments and expectations of future prices \( \Theta^{si} \).

The present value of cash flows is maximized subject to the production technology constraints.

\[
y^{si}_1 = F^{si}(I^{si}_1) \tag{6}
\]

\[
y^{si}_2 = H^{si}(I^{si}_2, I^{si}_1) \quad i = s \text{ and } t
\]

These production functions are assumed to be twice continuously differentiable and strongly concave. By substituting the behavioral functions resulting from the maximizations problems of the firms into (5), the profit functions can be obtained.\(^{17}\) These functions are

\[
\pi^{si} = \pi^{si}(p^i, w^i, \Theta^{si}) \quad i = s \text{ and } t \tag{7}
\]

\(^{17}\) Some of the properties of the investment function are discussed in Appendix I.
This function has all the standard properties. The partial derivative with respect to the first argument is

\[ \frac{\partial \pi_s}{\partial p_j} = y_{s1}(\ast) - I_{s1}(\ast) = x_{s1}(\ast) \quad \text{for } i = s \text{ and } t \]

where \( x_{s1} \) is the net supply of southern good \( i \) in period \( j \). Furthermore, the partial derivative with respect to the second argument is

\[ \frac{\partial \pi_s}{\partial w_j} = -1_{s1}(\ast) \quad \text{for } i = s \text{ and } t \]

These properties (Hotelling's lemma) simplify the analysis in the same way as Roy's identity. Here the behavioral functions of the firms can be obtained by differentiation of the profit functions.

### 2.1.2 The Depressed North

The representative household in North also demands the three goods and money and supplies labor. This utility function is also assumed to be strongly quasi-concave and twice continuously differentiable. Moreover, it is assumed to have the property that labor is additively separable from the other arguments. The northern household perceives a constraint on first period employment. Hence, the household maximizes (1) subject to (2), where the superscript \( s \) is replaced by the superscript \( n \), and the perceived constraint

---

\( t^n_1 = t^n_1 \) \hspace{1cm} (8)

where \( t^n_1 \) = the perceived restriction on employment. The resulting behavioral functions are

\[
\begin{align*}
\lambda^n & = \lambda^n(M^n_0 + t^n + \pi^n + w^n_1 t^n_1, p, w^n_2, \Theta^n) \\
M^n & = M^n(M^n_0 + t^n + \pi^n + w^n_1 t^n_1, p, w^n_2, \Theta^n) \hspace{1cm} (9)
\end{align*}
\]

Because of the perceived constraint on first period employment, first period labor income instead of first period wage appears as an argument in the behavioral functions. Changes in labor income give rise to income effects but no substitution effects. The indirect utility function is

\[
\begin{align*}
\nu^n & = \nu^n(M^n_0 + t^n + \pi^n + w^n_1 t^n_1, p, w^n, t^n_1, \Theta^n) \\
\end{align*}
\]

(10)

The partial derivative with respect to first period employment is

\[
\frac{\partial \nu^n(\cdot)}{\partial t^n_1} = \lambda w^n_1 + u^n_L
\]

where \( u^n_L = \frac{\partial u^n}{\partial L} \) = the marginal disutility of work effort.\(^{19}\) By dividing this with the marginal utility of exogenous income, one obtains a monetary value of the marginal disutility of work effort. This measure is sometimes referred to as the (marginal) supply price of labor. However, the synonymous term virtual price of labor can also be found in the literature.\(^{20}\)

---

\(^{19}\) Note that \( u^n_L \) here is evaluated at the utility maximizing levels of all nonconstrained behavioral functions.

\(^{20}\) See Cuddington et al. (1984) and Neary & Roberts (1980).
The profit-maximizing firm producing non-traded goods in North is assumed to have a strongly concave and twice continuously differentiable production function. This firm perceives a restriction on its sales of goods during the first period.

\[ x_{1}^{n} = x_{1}^{n} \]  \hspace{1cm} (11)

where \( x_{1}^{n} \) = perceived restrictions on sales. Maximization of profits subject to technology constraints corresponding to (6) and the sales constraint (11) yields the profit function

\[ \pi^{nn} = \pi^{nn}(p^{n}, w^{n}, x_{1}^{n}, \sigma^{nn}) \]  \hspace{1cm} (12)

Let \( p^{n}_{1} \) symbolize the virtual price of the northern non-traded good in the first period. This price is defined in the following way. Suppose we ask the question: At what price would the firm, if unconstrained, voluntarily choose to supply a quantity corresponding to \( x_{1}^{n} \) and at the same time demand labor and invest to the same extent as in the constrained situation? This (hypothetical) price is the virtual price. The profit function (12) can alternatively be written

\[ \pi^{nn} = \pi^{nn}(p^{n}_{1}, p^{n}_{2}, w^{n}, \sigma^{nn}) + (p^{n}_{1} - p^{n}_{1}) x_{1}^{n} \]  \hspace{1cm} (13)

As the firm is rationed, \( p^{n}_{1} < p^{n} \). The partial derivative of the profit function with respect to first period sales is

\[ \frac{\partial \pi^{nn}\left(\cdot\right)}{\partial x_{1}^{n}} = p^{n}_{1} - p^{n}_{1} \]

The profit maximizing firm producing traded goods is also assumed to have strongly concave and twice continuously differentiable production functions. This firm, however, does not perceive any constraints. Hence the profit function is analogous to those of the southern firms.

\[ \pi^{nt} = \pi^{nt}(p^{t}, w^{t}, \sigma^{nt}) \]  \hspace{1cm} (14)

2.1.3 The Public Sector

The public sector has two functions in this model. It controls the production activities of public firms and it chooses the tax system. The public sector can produce the two non-traded goods and traded goods in public firms according to the production functions

\[ y_{1}^{i} = F_{1}^{i}(l_{1}^{i}) \]

\[ y_{2}^{i} = H_{2}^{i}(l_{2}^{i}, l_{1}^{i}) \quad i = s, n \text{ and } t \]

where \( y_{t}^{i} \) = output in period \( t \) and \( l_{t}^{i} \) = employment in period \( t \) in public production of good \( i \). The superscript \( i \) refer to public production of southern non-traded goods, northern non-traded goods, and traded goods respectively. The possible differences in the welfare implications of the public production of these goods will be illustrated. It is assumed that the public firms are located in North. As the Malmfältselektion is the subject of the empirical analysis there is no need here to study the public production in South. The public sector's overall budget constraint is

\[ \gamma^{s} + \gamma^{n} = p(y^{q} - I^{q}) - \omega^{n} l^{q} + \phi^{q}(I_{2}^{q}, \theta^{q}) \]

where the cash flows from public production beyond period 2 are contained in a function of second period investments and expectations of future prices. The public sector is assumed to control the tax system by each period choosing to balance the budget by making lump-sum transactions with one of the households. There are two basic reasons why a specification with lump-sum transactions has been used in preference to specifications using other types of taxes. Firstly, this gives the minimum welfare cost of financing public production. Secondly, there is no empirical data available to enable an analysis of more complicated tax schemes. Thirdly, given that public revenue is raised by taxes on constrained labor supply, these taxes would function as lump-sum taxes - see below.
2.1.4  Short-Run Equilibrium Conditions - period 1

As the exchange rate is assumed to be fixed the balance of payments of this economy will not normally be in equilibrium. Trade deficits/surpluses will give rise to decumulation/accumulation of wealth. The short-run equilibrium conditions are

\[ x_{ss} + x_{1} = x_{1}^{ss} + x_{1}^{ns} \]  
the market for southern non-traded goods (17a)

\[ x_{nn} + x_{1} = x_{1}^{sn} + x_{1}^{nn} \]  
the market for northern non-traded goods (18a)

\[ L_{1}^{s} = l_{1}^{ss} + l_{1}^{st} \]  
the labor market in South (19a)

\[ L_{1}^{n} = l_{1}^{nn} + l_{1}^{nt} + l_{1}^{g} \]  
the labor market in North (20a)

If these equilibrium conditions are met then the value of the flow demand for wealth will exactly match the value of the surplus on the trade balance.

These equilibrium conditions may be given a closer examination in order to illustrate how the model works. Let us start with the market for southern non-traded goods. The net supply of the private firm \( x_{1}^{ss} \) is determined by prices and wages. Public supply \( x_{1}^{qs} \) is set by the public sector. The demand of the two households depends on exogenous income, prices, and wages. Hence (17a), when substituted by the relevant behavioral functions discussed in section 2.1.1 and section 2.1.2, can be written as

\[ x_{1}^{ss}(p, w, \varnothing, \varnothing^{ss}) + x_{1}^{qs} = x_{1}^{ss}(M_{0}^{s} + \tau^{s} + \pi^{s}, p, w^{s}, \varnothing^{s}) + \]

\[ + x_{1}^{ns}(M_{0}^{n} + \tau^{n} + \pi^{n} + w_{1}^{n} l_{1}^{n}, p, w_{2}^{n}, \varnothing^{n}) \]  
(17b)
The households' demand for northern non-traded goods is determined by each household's exogenous income, prices, and wages. Public supply \((x^n_1)\) is set by the public sector. The private firm perceives a sales constraint, hence it will supply the quantity demanded that is not satisfied by the public firm. The equilibrium condition, when substituted by the relevant behavioral functions, is

\[
x^n_1 + x^n_1 = x^n(M^n_0 + I^n + \pi^n, p, w^n, \sigma^n) + x^n(M^n_0 + I^n + \pi^n + w^n m^n_1, p, w^n_2, \sigma^n) \tag{18b}
\]

After substitution by the relevant behavioral functions, the equilibrium condition on the southern labor market can be written as

\[
L^s(M^s_0 + I^s + \pi^s, p, w^s, \sigma^s) = L^{st}(p, w, \sigma^{st}) + L^n(p^n, w^n, \sigma^n) \tag{19b}
\]

Finally, the labor market in North is considered. The demand for labor by the private firm \((L^n_1)\) depends on prices and wages but also the perceived sales constraint \((x^n_1)\), while the demand for labor by export firms \((L^n_1)\) is governed solely by the prices and wages. The public sector determines public employment. As the household perceives an employment constraint, it supplies all the labor demanded. Substitution yields

\[
L^n_1 = L^{nn}(p^n, w^n, x^n_1, \sigma^{nn}) + L^{nt}(p^n, w^n, \sigma^{nt}) + L^n_1 \tag{20b}
\]

By substitution it is possible to reduce the system of equations to a system that consists of three equations, the equilibrium conditions for the markets for non-traded goods (17b) and (18b) and the labor market in South (19b). This is done by using the definitions of profit functions and the northern labor market equilibrium condition.
However, the short-run equilibrium conditions cannot be solved independently. The model is specified in a way that it is necessary to solve all equilibrium conditions simultaneously. The "link" between the first period and later periods are the expectations of future prices and wages. As the agents are assumed to correctly foresee any changes in prices in the future, these future prices cannot be taken as given when solving the short-run equilibrium conditions. Instead we have an intertemporal system in which all prices, wages, and the quantity of first period northern non-traded goods are simultaneously determined.

The solution of this simultaneous system depends on the fixed first period price of northern non-tradeables \( p_1^n \), the fixed first-period northern wage \( w_1^n \), the tax system and, finally, public production, public investment, and public employment. Note that once the tax system is chosen the public budget constraint provides a direct link between taxes on one hand and public production, investment, and employment on the other. Hence, the intertemporal system is determined by public production. Once the equilibrium values are known, first period northern employment can be determined. A discussion of some of the intertemporal system's properties can be found in Appendix I.
2.2 Welfare Consequences of Public Production of Private Goods

In this section a monetary measure of welfare change for small increases in public production will be derived. In order to do this I start by differentiating the indirect utility functions with respect to exogenous income, prices, and wages. Assuming that the changes are so small that the marginal utility of exogenous income ($\lambda^s$ and $\lambda^n$ respectively) can be treated as a constant, a monetary measure of utility change can be obtained by dividing by $\lambda^i$, $i = s, n$. The subsequent monetary welfare measure for the household in South is

$$dW^s = dv^s/\lambda^s = dt^s + d\pi^s - \lambda^s dp + L^s dw^s$$ (21a)

The corresponding measure for the northern household is

$$dW^n = dv^n/\lambda^n = dt^n + d\pi^n + (w^n_1 - w^n_1) dt^n - \lambda^n dp + L^n dw^n$$ (22a)

where $w^n_1 = u^n_1/\lambda^n = virtual$ price of first period labor. Note that $p^n_1$ and $w^n_1$ are assumed to be fixed. Moreover, as indicated above, this economy is assumed to be a price taker on world markets. The objective of this analysis is not to study the effects of price changes on world markets, the simplifying assumption is made that prices of traded goods are constant. Differentiation of the profit functions and substitution yields the following measure for the southern household

$$dW^n = dt^{st} - l^{st} dw^s + x^{ss} dp^s - \lambda^s dp + L^s dw^s =$$

$$= dt^s + x^{ss} dp^s - \lambda^s dp$$ (21b)

The wage terms net out as the southern labor market is assumed to be in equilibrium in all periods, compare (19). The measure for the northern household is
\[ dw^n = d\Gamma^n - 1^n dw^n + x^n dp^n - 1^n dw^n + (p^n - p^n_1)dx^n_1 + \\
    + (w^n_1 - w^n_1_1) d\Gamma^n_1 - x^n dp + L^n dw^n \]
\[ = d\Gamma^n + 1^n dw^n + (p^n - p^n_1)dx^n_1 + (w^n_1 - w^n_1_1) d\Gamma^n_1 + x^n dp^n - x^n dp \] (22b)

Here the equilibrium condition for the northern labor market has been used. 22 Note that this condition is that \( L^n = l^n + 1^n_1 + l^n_1 \), which simplifies (22b).

Unfortunately it is not possible to derive an aggregate monetary measure of welfare change directly. As there are two households in this model such a measure must, in one way or another, involve some kind of inter-household utility comparison. 23

In this study I have chosen to use the potential Pareto improvement criterion to determine whether public projects are desirable or not. This criterion implies that in a situation in which one of the households gains from a certain project while the other looses, a project will be regarded as desirable if the gaining household hypothetically can completely compensate the loosing household by a costless lump-sum transfer of money and still gain. 24 The monetary measures of welfare changes, (21) and (22), were derived under the assumption that the changes were so small that the respective marginal utility of exogenous income could be treated as a constant. This is important as the potential Pareto improvement criterion here will be interpreted as determining whether the sum of (21) and (22) is positive or not. The

22 An alternative approach to derive monetary measures of welfare change is to start by differentiating the (direct) utility function. Then the first order conditions from utility maximization are substituted, see for example Harberger (1971).

23 For a recent treatment of these problems see Boadway & Bruce (1984).

24 The compensation principle was originally formulated by Kaldor (1939) and Hicks (1939).
consequences for the respective household of the different projects will not be discussed, the analysis is concentrated on the aggregate effects. The aggregate monetary measure of welfare change is

\[ dW = dW^S + dW^N = \]

\[ = dI^S + dI^N + l^qdw^n + (p^n_1 - \hat{p}^n_1)dx^n_1 + (w^n_1 - \hat{w}^n_1)dI^n_1 + \]

\[ + x^Sdp^S + x^Ndp^n - (x^S + x^n)dp = \]

\[ = dI^S + dI^N - x^Ndp + l^qdw^n + (p^n_1 - \hat{p}^n_1)dx^n_1 + (w^n_1 - \hat{w}^n_1)dI^n_1 \quad (23a) \]

The equilibrium conditions for non-traded goods have been used when deriving (23a). As the quantities supplied by the public firms correspond to the net demand of the private sector, (23a) can be simplified in the above way. Differentiating and substituting the public budget constraint, the measure (23b) is obtained.

\[ dW = pdx^q - wd1^q + (p^n_1 - \hat{p}^n_1)dx^n_1 + (w^n_1 - \hat{w}^n_1)dI^n_1 \quad (23b) \]

Note that the measure includes direct effects as well as indirect spill-over effects on northern markets during the first period. Suppose that the first period public supply of traded goods \( x^n_1 \) is increased. Obviously, public employment \( l^q_1 \) and/or investment \( I^q_1 \) will change but these changes will also ultimately affect other quantities appearing in the measure. If the differential (23b) is positive then a project is desirable in the above defined sense. It should be stressed that (23b) is a criterion that tells us whether a certain project can potentially improve social welfare. Whether or not

---

25 Note that while the possible welfare effects of compensating transfers, made in order to transform potential Pareto improvements to actual Pareto improvements, are ignored, the welfare effects of financing projects are, as previously stated, included in the analysis.
social welfare actually improves depends on how the changes are distributed between the households and on whether compensation is actually paid to a possibly losing household.

According to (23b) changes in public production should be evaluated by (the present value of) the market prices while changes in public employment should be evaluated by (the present value of) the market wages. But, in addition, the changes in quantities traded on markets with fixed prices have to be considered. These changes should be evaluated by the difference between market and virtual price (wage).

The policy-induced indirect changes in these aggregate quantities can be derived by making use of the equilibrium conditions. It is however important to stress that the outcome of the whole exercise depends on the assumptions made concerning how the public sector balances its budget. It turns out that the spill-over effects are more extensive when the budget is balanced by lump-sum transactions with the southern household. The reason for this can be explained in the following way. Increased public production in North which is financed in South can be viewed as two separate public decisions, the first is to increase public production while the second is to make a transfer from South to North. When the budget is balanced in South instead of North the spill-over effects of the transfer are added to the spill-over effects of public production.

The property that the sum of the first two terms of (23b) can be interpreted as the present value of a project is important for the empirical analysis. In Chapter 4 the present values of the different projects are important when determining the cost-benefit results.

Suppose that prices were flexible so that all markets cleared through price adjustments, what would the aggregate monetary measure of welfare change, corresponding to (23b), be? The last two terms would be zero, since virtual and market prices coincide, hence projects would be regarded as desirable if they were profitable at market prices and wages.
In general, (23b) could be employed when evaluating any project, regardless of which type of good the production increase concerns and regardless of in which period the production is increased. An interesting aspect of this is that if a project during the second period, when no quantity constraints are present, is evaluated solely by market prices and wages then the effects during the first period are neglected. This evaluation would be time consistent but inoptimal.26

The objective of the analysis in this chapter is to derive explicit cost-benefit rules to be used in the empirical analysis in Chapter 4. In order to obtain exact rules the changes in quantities traded on markets with fixed prices will have to be calculated. The analysis here only concerns changes in public production during the first period. Each type of good is discussed separately and rules are derived for both ways of balancing the public budget.

2.2.1 The Public Budget Balanced in the Depressed North

First, consider increased public production of the non-traded northern good during the first period \( (dx^n_{11} > 0) \). Differentiation of the equilibrium condition of the northern non-traded goods market yields

\[
\frac{dx^n_{11}}{dx^n_{11}} = - \left( 1 - (X^n_{11} + f) \frac{p^n_1}{1 - (X^n_{11} + f) [p^n_1 + \frac{\partial q^n_1}{\partial x^n_{11}}]} \right) > -1
\]

\[
\frac{dx^n_{14}}{dx^n_{11}} < 0
\]

where \( X^n_{11} \) = the partial derivative of the northern household's demand function for first period non-traded goods with respect to exogenous income, \( f \) = the (indirect) effects on the demand for first period northern non-traded goods due to changes in prices on other markets, which in turn are induced by changes in the northern household's exogenous income, and \( \frac{\partial q^n_1}{\partial x^n_{11}} \) = the partial derivative of the northern household's demand function for first period non-traded goods with respect to exogenous income. In other words, the sum of \( X^n_{11} \) and

---

26 This was first noted by Johansson & Löfgren (1987b), p. 40.
f gives the total effects, direct and indirect through price changes on other markets, of changes in the exogenous income of the northern household. Consequently, the unit of both $x_{11}^{nn}$ and $f$ is the quantity of first period northern non-traded goods per unit of exogenous income. The calculation of the above derivative is discussed in more detail in Appendix I.

Increased public production of this good will crowd out private production. This crowding out is, however, not complete. The reason for this is that the private firm will increase investment if the sales constraint becomes stricter. Thus the monetary measure of welfare change is

$$dW = p^*_1 dx_{11}^{gn} - \nu^*_1 dl_{11}^{gn} +$$

$$+ (p^*_1 + p^*_1 I_{1x} - smc_{1}^{nn}(1 + I_{1x}^{n}) ) k (p^*_1(x_{11}^{nn} + f) - 1) dx_{11}^{gn} +$$

$$+ (p^*_1 - smc_{1}^{nn}) [I_{1p}^{n} dp_{2}^{n} + I_{1w}^{n} dw_{2}^{n}]$$

(24)

where $smc_{1}^{nn} = \nu_{1l}/F_{1L}^{nn}$ = shadow marginal cost for increased private production of first period northern non-traded goods, $F_{1L}^{nn} =$ the marginal product of labor, $k = 1/(1 - (x_{11}^{nn} + f)(p^*_1 + p^*_1 I_{1x}^{n}))$, $I_{1p}^{n} = \delta I_{1p}^{n}/\delta p_{2}^{n}$, and $I_{1w}^{n} = \delta I_{1w}^{n}/\delta w_{2}^{n}$. The goods market multiplier $k$ is assumed to be greater than unity. The marginal propensities to consume goods and save always sum to one. Assuming all goods to be normal, the marginal propensity of the northern household to consume first period northern non-traded goods $p_{11}^{nn}$ is less than unity. As $p^*_1 > (p^*_1 + p^*_1 I_{1x}^{n})$, and although $x_{11}^{nn} < (x_{11}^{nn} + f)$, the assumption that $k > 1$ is not unreasonable.

27 The corresponding single period one region monetary measure was first derived by Johansson (1982), p. 129. It is in this context worth noting that crowding out is complete in the single period model.
The first two terms in (24) capture the direct welfare effects of increased public production and employment. The third term has to do with the direct effects and the investment effects of changes in the sales constraint. This is the welfare effect due to crowding out. Changes in production of first period northern non-traded goods are evaluated by the difference between marginal willingness to pay for these goods and the corresponding shadow marginal cost. The term is negative as the first bracket, the above mentioned difference, is positive while the second is negative.\textsuperscript{28}

The introduction of endogenous investment is the crucial factor, affecting the extent of crowding out compared with a model with exogenous investment and all prices fixed. Crowding out will be complete, even if flexible prices are introduced, as long as private investment is unaffected by changes in the sales constraint.

The last term in (24) is, on the contrary, positive since the price changes have a positive effect on first period investment.\textsuperscript{29} Changes in investment are evaluated by the difference between the virtual price of first period northern non-traded goods and the shadow marginal cost of production.

Compared with the measure derived in a model with exogenous investment and all prices fixed, the second term is different and the third term is new. These differences are due to the introduction of endogenous investment and flexible prices. Suppose that the flexible prices remain unchanged although public production is increased. Then the third term is zero. Furthermore, if private investment is fixed, then this will result in complete crowding out. Hence (24) will be reduced to the measure below, which corresponds to the single period measure.

\textsuperscript{28} Note that \( p_1^n > p_1^n = w_1^n \frac{1}{F_1^{nn}} > w_1^n \frac{1}{F_1^{nn}}. \)

\textsuperscript{29} See Appendix I.
\[ dW = \frac{\partial}{\partial t} \left[ \frac{1}{F^g_{nL}} - \frac{1}{F^{nn}_{L}} \right] \]

where \( F^g_{nL} \) is the marginal product of labor in the public firm. Welfare will be affected only if the marginal products of labor differ. In order to improve welfare the public firm will have to be more efficient than the private firm. This implies that employment will have to be reduced for welfare to improve! If production is characterized by productive efficiency so that the marginal products are equal then welfare is unaffected.

Increased public production of traded goods \((dx^q_{t} > 0)\) will increase the income in North. Differentiation of the equilibrium condition for the first period market for northern non-traded goods gives

\[ \frac{dx^q_{t}}{dx^q_{t}} = k(x^{nn}_{t1} + f)p^t_{1} > 0 \]

The above derivative is positive since the increase in income will raise the demand for northern non-traded goods. The monetary measure of welfare change is

\[ dW = p^n_{1}dx^q_{t} - w^n_{1}dl^q_{t} + \]

\[ + \left[ p^n_{1} + p^n_{1x} - \text{smc}_{1}^{nn}(1 + I^n_{1x}) \right] k(x^{nn}_{t1} + f)p^t_{1}dx^q_{t} + \]

\[ + (\text{smc}_{1}^{nn})(I^n_{1p}dp^n_{2} + I^n_{1w}dw^n_{2}) \quad (25) \]

The first two terms in (25) capture the direct welfare effects of increased public production. The third term captures the spill-over effects on the market for first period northern non-traded goods. This term is positive since the quantity traded on this market will, in contrast to the previous case, increase. Instead of (negative) crowding out-effects there will be (positive) multiplier effects.
The last term is positive since prices will rise. Hence, it is possible that a negative direct welfare effect may be outweighed by the spill-over and investment effects. In other words, a positive outcome of an evaluation of increased public production by the marginal willingness to pay and of increased public employment by the virtual price of labor is a sufficient, but not necessary condition for welfare improvement in this case.

If prices and investment do not change, (25) reduces to the single period fix price measure

$$dW = p_1^n dx_1^n - w_1^n dt_1^n + (p_1^n - scm_{11}^n) k x_{11}^n t_1^n dx_1^n$$

Turning to increased public production of first period southern non-traded goods ($dx_1^{ns} > 0$), the reader may wonder why this is relevant for the present evaluation study. One reason is that some of the delegation's job-creating measures have been undertaken outside Norrbotten. A further reason is that some of the relief works and development projects have had the production of new types of products or the introduction of new production technologies in Malmfälten as their objective. In order to give special attention to these attempts, a different cost-benefit rule is needed than for the traditional production in Malmfälten.

The analysis of this case is more complicated. The two types of changes in public production discussed above concerned markets where prices did not change. Here the public supply of a good with a flexible price increases. This will cause new effects in addition to those, due to changes in exogenous income, discussed earlier.

Differentiation of the equilibrium condition for first period northern non-traded goods now yields

$$30$$ The first two terms in (25), and (24), correspond to the partial cost-benefit rule.
\[
\frac{dx^0}{dx_1} = k[(x_{11}^n + f)p_1^s - f_1^s]
\]

where \( f_1^s \) = the price effect of increased public production of first period southern non-traded goods on the demand for first period northern non-traded goods. The unit of \( f_1^s \) is quantity of first period northern non-traded goods per unit of publicly produced first period southern non-traded goods.

The impact of increased production of first period southern non-traded goods on the market for first period northern non-traded goods can be separated into two effects. On one hand northern exogenous income will be directly affected, on the other the market for first period southern non-traded goods will be directly affected by increased supply.

The consequence of this latter effect is that of reducing the demand for first period northern non-traded goods. Increased public production will drive down the price of the southern good. As the southern and northern goods are substitutes, this will shift demand from northern goods to southern goods. Still it is not unreasonable to assume that this effect may be outweighed by increased demand due to increased income and higher prices on other goods. The sign of this derivative is thus assumed to be non-negative.

As the derivative is assumed to be positive, (positive) multiplier effects will emerge. The monetary measure of welfare change is

\[
dW = p_1^s dx_1^q s - w_1^q d l^q s + \]

\[
+ [(p_1^s + \beta_1^s x) - smc_1^{nn} (1 + I_1^n)] k [(x_{11}^n + f)p_1^s - f_1^s] dx_1^q s + \]

\[
+ (p_1^s - smc_1^{nn})(I_1^p dp_2^n + I_1^w dw_2^n) \] (26)
The measure (26) is similar to the earlier measures. The main difference compared with (25) is the appearance of $f^s_1$. If the price changes are so extremely small that they can be disregarded, then the welfare effects of increased public production of first period southern non-traded goods will be the same as the effects of increased public production of first period traded goods.

Finally, it is worth noting that all the results reported when the public budget is balanced in North are also valid when the budget, during the first period, is instead balanced by an endogenous labor tax in North. In general lump-sum taxes are non-distortionary. The reason why a labor tax in North during the first period is non-distortionary is that the northern household is rationed on the labor market. When this is the case, a tax on labor, as lump-sum taxes, will only have an income effect on the behavioral functions of the household in North. Taxes which also create substitution effects are distortionary, i.e. welfare will decrease more than when an equivalent sum is raised by lump-sum taxes or, in this model, a labor tax in North during the first period.

2.2.2 The Public Budget Balanced in South

When discussing the welfare effects of financing public production and employment in North by taxes in South, the exposition is simplified if the effects of financing are separated from the effects of production. Hence this subsection concentrates on the welfare effects of a transfer from the southern household to the northern household. For both households this transfer, affecting the disposable incomes, is assumed to be of lump-sum character.

---

31 See Neary & Roberts (1980), p. 34, and Cuddington et al. (1984), p. 184. This result is related to the theory of optimal taxation, for an introduction to the literature on this theory, see Sandmo (1976).
By combining the results obtained in this subsection with the cost-benefit rules discussed in the previous subsection, it is possible to obtain the total welfare effect of production in North and financing in South. Suppose the public budget is balanced in North but the public sector at the same time transfers from South to North so as to neutralize the effects on the northern household. Then the total welfare effects can be obtained by adding the welfare effects of the transfer to the cost-benefit rules derived in the previous subsection. The monetary measure of welfare change due to a transfer is

\[ dW = \left[ p^n_1 + p^n_1 x_1^n - smc^{1n}_n \left( 1 + I^n_1 \right) \right] k(\chi_{11}^{nn} - \chi_{11}^{sn} + f - f^*) dS + \]

\[ + (p^n_1 - smc^{1n}_n) (I^n_1 dp^n_2 + I^n_1 dw^n_2) \]

where \( S = \) transfer from South to North and \( f^* = \) the (indirect) price effects on the demand for northern non-traded goods due to changes in southern exogenous income. Unfortunately, it is not possible to sign (27). A transfer from South to North will contribute directly to improved welfare as long as the decreasing southern demand for first period northern non-traded goods is compensated by increased northern demand. But in addition there will also appear (indirect) effects due to price changes on other markets. The decrease in southern disposable income will tend to lower prices while the increase in North works in the opposite direction.

According to the above discussion, adding the welfare effects of the transfer to the monetary measures (24), (25), and (26) respectively will give the monetary measures when the public budget is balanced in South instead of North.

Suppose that the price changes are so extremely small that they can be disregarded, how would then a transfer from South to North, financing job-creating measures, affect welfare? If prices stay approximately the same, the indirect price effects on the market for first period
northern non-traded goods and investment are, of course, zero. The consequence of this is that the monetary measure (27) reduces to

\[ dW = [p^n_1 + p^n_{1x} - smc^{nn}_1 (1 + i^n_{1x})] k(x^{nn}_{11} - x^{sn}_{11}) dS \]

This measure is positive as long as the marginal propensity to consume first period northern non-traded goods is higher for the northern household than for the southern.
2.3 Modifications of the Model to Include Public Goods

As the agents in South are assumed to be unaffected by the provision of public goods, the model presented in section 2.1 does not need any modifications of the parts concerning the unconstrained region, South. It is possible that South will have to finance the provision of public goods in North but this fact does not make it necessary to alter the model as taxes are included in the original model. However, the specifications concerning the northern region need some additions. Moreover the specification of the public sector is different in this section. This section is organized so that the extensions regarding North are discussed first. Then the public sector is dealt with.

The Household in North

The only difference, compared with the specification in section 2.1 is that the utility function has the quantity of public goods directly affecting the household \(z^U\) as a new argument. Hence the strongly quasi-concave and twice continuously differentiable utility function is

\[
u^u = u^n(x^n, L^n, M^n, z^U, \theta^n) \tag{28}
\]

where \(z^U\) = quantity of public goods, supplied free of charge. Maximization of the utility function, subject to the budget constraint and the constraint on the first period northern labor market, results in the following behavioral functions:

\[
\begin{align*}
X^n &= X^n(M^n_0 + r^n + \pi^n + w^n_1, L^n, M^n_1, \rho, w^n_2, z^n, \theta^n) \\
M^n &= M^n(M^n_0 + r^n + \pi^n + w^n_1, L^n, M^n_1, \rho, w^n_2, z^n, \theta^n) \tag{29}
\end{align*}
\]
The first argument has an income effect on demand, while the two price arguments give rise to both income and substitution effects. The fourth argument may cause substitution effects.\(^\text{32}\)

Note that the household can not freely choose the desired quantity of the public good, as the quantity is determined by the public sector. If the good has a positive impact on household utility, then the demand for this good, if it is supplied free of charge, is infinite.

The indirect utility function is

\[
v^n = v^n(\mu^n + \pi^n + \pi^n, p, \omega^n, \Omega^n, z^n, \Theta^n)
\]

The partial derivative with respect to the supply of public goods

\[
\frac{\partial v^n}{\partial z^n} = u^n_z
\]

where \(u^n_z = \frac{\partial v^n}{\partial z^n} = \) the marginal utility of public goods. By dividing this with the marginal utility of exogenous income it is possible to get a monetary value of the marginal utility of public goods.

The Private Firm Producing Traded Goods in North

The public sector is assumed to influence the production possibilities of the northern firm producing traded goods by the supply of the public good \(z^t\). Given the supply of \(z^t\) the firm supplies goods and demands labor, the only variable input in the short run, so as to maximize profits. The strongly concave and twice continuously differentiable first period production function can be written as

---

\(^{32}\) Koskela (1982), p. 303, defines public goods as net complements (substitutes) to a particular private good if the partial derivative of the behavioral function with respect to \(z^u\) is positive (negative).
\[ \gamma_1 = F_1(z_{1t}^n, z_{1t}^n) \]  

where \( z_{1t}^n \) = quantity of public goods affecting the production possibilities of the traded goods firm during the first period, supplied free of charge.

The analogy between public goods and rationed goods is also valid in this case. To the firm, the supply of public goods is a rationed input. The profit function can be written

\[ \pi_t = \pi_t(p, w, p,\theta, z_{1t}^n) + p z_{1t}^n \]  

where \( z_{1t}^n \) = a vector of virtual prices of public goods. These prices can be interpreted as the firm's marginal willingness to pay for public goods.

The Private Firm Producing Non-Traded Goods in North

The public sector can also affect the production possibilities of the non-traded goods-producing firm in North. However an important difference is that this firm, contrary to the northern firm producing traded goods, perceives a sales constraint during the first period. Hence first period production and employment depend on the effective demand. The first period production function can be written as

\[ \gamma_{1n} = \gamma_{1n}^n(z_{1n}^n, z_{1n}^n) \]  

where \( z_{1n}^n \) = quantity of public goods affecting the production possibilities of the non-traded good firm during the first period, supplied free of charge. The profit function of this firm is

\[ \pi_{1n} = \pi_{1n}(p_1, p_2, w, p_{z1n}, \theta_{1n}) + (p_1 - p_1^n)x_1^n + p_{z1n}z_{1n}^n \]
where $p_{nt}^*$ = a vector of virtual prices of public goods. As above, these prices can be interpreted as the firm's marginal willingness to pay for public goods.

The Public Sector

The public sector controls the supply of public goods; $z^u$, $z^t$, and $z^{nt}$. These goods are assumed to be produced with labor as the only (variable) input in the short run.\(^{33}\) Hence, the first period production functions can be written as

$$z^i_1 = f^i_1(l^q_1)$$  \(i = u, t, nt\)  \(35\)

where $l^q_1$ = aggregate public employment. As the public goods are supplied free of charge, the cost of labor will have to be financed by taxes. Throughout the chapter I assume that the budget is balanced by lump-sum transactions. The budget constraint of the public sector is

$$f^u + f^t = -w^q$$  \(36\)

As the sum of the lump-sum transfers is negative if public employment is non-zero the transfers will in fact be lump-sum taxes. The public sector is assumed to control the tax system by choosing to tax one of the households.

\(^{33}\) This is, of course, not the only possible specification. For example, Grossman & Lucas (1974) assume that public goods are produced with private goods as inputs. The specification with labor as the only input corresponds to Baltensperger (1977) and Koskela (1982). In Johansson (1982b) both labor and private goods are assumed to be inputs.
Welfare Consequences of Public Production of Public Goods

An increase in the supply of public goods will satisfy the potential Pareto improvement criterion if the following differential is positive.\(^\text{34}\)

\[
dW = -w^n_dZ + p^n_dZ u + p^n_dZ t + p^n_dZ nt + \\
+ (p^n_1 - p^n_1)dX_1 + (w^n_1 - w^n_1)dY_1
\]

(37)

where \(p^n_z = u^n_z/\lambda^n = \) marginal willingness to pay for public goods directly affecting household utility in North.

Compared with the corresponding monetary measure, (23), for private goods, three new terms appear. These are the changes in the supply of the three public goods evaluated by the respective virtual price. Otherwise the measure includes the familiar terms containing the direct welfare effects and the spill-over effects on the northern first period non-traded goods and labor markets.

If all prices were flexible, so that no markets cleared through quantity adjustments, then the last two terms in (37) would be zero. A project would be regarded as desirable if the marginal willingness to pay for the increased supply of public goods exceeded the costs of production at market prices and wages.

As the objective of the analysis is to derive explicit cost-benefit rules to be used in the empirical analysis a more exact rule than (37) is needed. Hence each type of public good will be discussed separately.

---

34 It is important to stress that this measure is based on an inter-household utility comparison.
2.4.1 The Public Budget Balanced in the Depressed North

First, consider increased supply of public goods directly affecting household utility during the first period \((dz_1^u > 0)\). Differentiation of the equilibrium condition for first period northern non-traded goods gives

\[
\frac{dx_1^{u_n}}{dz_1^u} = k(x_{1z_1} + r_{1z}^u)
\]

where \(x_{1z_1} = \frac{\partial x_1^{u_n}}{\partial z_1^u}\) and \(r_{1z}^u = \) the (indirect) price effects on the demand for first period northern non-traded goods. When the supply of \(z_1^u\) is increased the monetary measure of welfare change is

\[
dW = p_1^{n} dz_1^u - w_1^{n} dq_1 + \frac{\partial r_{1z}^u}{\partial z_1^u} + (p_1^{n} + \frac{\partial r_{1z}^u}{\partial z_1^u} - smc_{1z_1}^{u_n}(1 + r_{1z_1}^{n})k(x_{1z_1} + r_{1z}^u)dz_1^u + \frac{\partial r_{1z}^u}{\partial z_1^u})[1_p dp_2 + 1_w dw_2]
\]

If private goods and public goods are independent, in the sense that \(x_{1z_1} = 0\), then there will be no indirect effects, hence increased supply and the corresponding increase in public employment can be evaluated by the virtual price of public goods and the wage rate. However, if public goods and non-traded goods (as well as leisure after the first period) are (net) substitutes \((x_{1z_1}^{u_n} < 0)\), then increased supply of public goods will lower the demand for non-traded goods. This will have a negative direct effect on the demand for first period

---

35 The single period version of this monetary measure is derived by Johansson (1982b), p. 12.

36 Note that it follows from differentiation of the household's budget constraint that \(p(\partial x_1^{u_n}/\partial z_1^u) + (\partial m_1^u/\partial z_1^u) - w_1^n(\partial l_1^n/\partial z_1^u) = 0\).
northern non-traded goods. But, in addition, the demand for goods with flexible prices will decrease, thus also reducing the prices of these goods. This, in turn, will reduce the demand for first period non-traded goods. These two effects will give rise to a negative multiplicative process on the market for first period northern non-traded goods. Hence, even if the marginal willingness to pay for public goods exceeds the cost of production it is not certain that welfare will improve. On the other hand, if public goods and non-traded goods are (net) complements the prices on the non-traded goods markets will increase, thus contributing to an improvement in welfare.

An important empirical issue is to determine the effects of increases in the provision of public goods on the demand for private goods. Furthermore, if there is initially a considerable supply of public goods, one would suspect that the marginal willingness to pay would be lower and the probability of extensive negative effects on the market for home goods greater than in an initial situation with less public goods. Hence, it is of interest for the evaluation to analyze the size of the public sector in northern Sweden.

Now let us assume that the public sector increases the supply of the public good that has a positive impact on the production of first period northern non-traded goods \((d z_{n} > 0)\). The first-order conditions for profit maximization of the firm producing non-traded goods can be rearranged to yield

\[
\phi_{1} = \partial_{H} f_{L} = \partial_{H} f_{L} = \partial_{z} (F^{n} / F^{n})
\]

where \(F^{n}\) are the partial derivatives of the first period production function with respect to labor and public goods respectively and \(H^{n}\) is the partial derivative of the second period production function with respect to first period investment.

An analysis of the equilibrium condition for the first period northern non-traded goods market reveals that the quantity traded is unaffected by the provision of public goods. The reason for this is that the
respective household's exogenous income is unaffected. Hence, the flexible prices will also remain unchanged and so will investment. Taking this into account, differentiating the first period production function, results in

$$dL^1_{nn} = - \frac{F^nn}{F^nn} \frac{z}{L} dz^nt$$

The monetary measure of welfare change reduces to

$$dW = - \hat{w}^n_1 (dL^0 + dL^nn) \quad (39)$$

Given the virtual price for labor $\hat{w}^n_1$ is positive, welfare will improve if and only if aggregate employment in North is reduced. The demand for non-traded goods remains unchanged. Hence, the private firm will respond to the increased supply of public goods by reducing its labor force. Therefore, the monetary measure of welfare change (39) can also be written as

$$dW = - \hat{w}^n_1 \left( \frac{1}{F^q} - \frac{z}{F^nn} \right) dz^nt \quad (40)$$

In this subcase welfare will improve if and only if

$$\frac{F^nn}{z} F^q \frac{q}{L} > \frac{F^nn}{L} \quad (41)$$

If (41) holds, employment will decrease and welfare will improve. The right hand side of this equality is the marginal product of labor when directly employed in non-traded goods-production. The left hand side can be interpreted as the indirect marginal product of labor when labor is employed producing public goods improving the production possibilities of the northern firm producing non-traded goods. An

---

alternative interpretation of (41) is simply that welfare will improve if labor is used more efficiently. If (41) holds as an equality the provision of public goods is optimal in the sense that $dW/dz_{1}^{nt} = 0$.

In this situation it is not possible to increase welfare by reallocating labor from direct non-traded goods-production to public goods production or vice versa. Hence, if the provision of public goods is optimal then this is equivalent to productive efficiency. This implies that if the supply of public goods is initially below its optimal level then an increase will improve welfare.

The empirical issue then is to determine whether or not the provision of public goods in northern Sweden is below the optimal level as this determines the sign of welfare change if the supply of public goods is increased.

Finally, we consider the subcase which gives the most complicated measures, increased public production of public goods affecting the firm producing traded goods in North ($dz_{1}^{t} > 0$). The first-order conditions for profit maximization of this firm can be rearranged to yield

$$w_{1}^{n} = p_{1}^{t}H_{1}^{nt} = p_{1}^{t}F_{1}^{nt} = p_{1}^{t}(F_{1}^{nt}/z)$$

Differentiation of the first period equilibrium condition for the northern non-traded goods market yields

$$\frac{dx_{1}^{nt}}{dx_{1}} = k(x_{11}^{nn} + f)p_{1}^{t} > 0$$

where the fact that $p_{1}^{t}dx_{1}^{nt} = p_{1}^{t}(F_{1}^{nt}d_{1}^{nt} + f_{1}^{nt}dz_{1}^{t}) = w_{1}^{nt}d_{1}^{nt} + p_{1}^{t}dz_{1}^{t}$ has been used.

---

38 This is the same optimality condition as when prices are flexible, see for example Sandmo (1972), p. 153. See also Kaizuka (1965) and Meade (1952).
Using these results, some manipulations give the following monetary measure of welfare change.39

\[ \frac{dW}{nt} = - \frac{\partial}{\partial t} \frac{1}{w_1} dL_1^0 + \]

\[ + \left( p_1^n + p_1^{n1q} - smc_{1n}(1 + I_{1n}^n) \right) \left( \frac{k}{p_1^1} (x_{1n}^0 + f) dL_1^1 + \right) \]

\[ + \frac{1}{w_1^n} \left( p_1^n - smc_{1n} \right) \left[ I_{1p}^n dp_2^n + I_{1w}^n dw_2^n \right] \]

(42)

The second and third terms are new compared with the other measures. A sufficient, but not necessary condition, for the supply of traded goods to increase when the provision of public goods is increased is that public goods and labor are technical complements. However, the supply may also increase if the two inputs are technical substitutes. Hence, the assumption that \( \frac{x_{1q}^0}{x_1^1} > 0 \) is not unreasonable.

The change in employment in the firm producing traded goods can be expressed in terms of the supply of the good and the provision of public goods. Doing this, and using the first order conditions, makes it possible to rearrange (42) to get

\[ \frac{dW}{nt} = - \frac{1}{w_1^n} \left( \frac{f_1^n}{L_1^q} - \frac{f_1^n}{L_1^L} \right) dL_1^t + \]

\[ + \left( 1 - \frac{w_1^n}{w_1^n} \right) \left( p_1^n + p_1^{n1q} - smc_{1n}(1 + I_{1n}^n) \right) \left( \frac{k}{p_1^1} (x_{1n}^0 + f) dL_1^1 + \right) \]

\[ + \left( p_1^n - smc_{1n} \right) \left[ I_{1p}^n dp_2^n + I_{1w}^n dw_2^n \right] \]

(43)

The second term in (43) is positive. Increased supply of this public good has a positive impact on the supply of the export good. Although increased production, for a given level of public goods, yields zero profits when calculated at market prices, there will be a positive direct effect as the shadow wage rate is lower than the market wage rate, \( \bar{w}^n_1 < w^n_1 \).

Increased export production will also increase income in North. Hence the demand for and the production of first period northern non-traded goods increases. This is accentuated by the fact that the flexible prices will rise. The third term is also positive due to this.

The first term in (43) is of ambiguous sign. It will have a positive impact on welfare if

\[ F_{ntf_q} > F_{ntL} \]

(44)

The condition (44), which is analogous to (41), can be interpreted as an additional unit of labor employed in the production of public goods has to increase tradeables production more than an additional unit of labor directly employed in the firm producing tradeables. This is the same productive efficiency condition as in the previous subcase.

Note, however, that it is not necessary for the provision of public goods initially to be below its optimal level for welfare to improve in this case. It is possible that a negative impact of the first term (supply of public goods initially above the optimal level) can be outweighed by the positive impact of increased production of traded goods. Also, even if tradeables production initially is characterized by productive efficiency in the sense that (44) holds as an equality, increased provision of public goods will improve welfare due to the positive income effects.
In addition, in order to determine whether the provision of public goods in northern Sweden is above or below the optimal level, it is necessary, in empirical work (contrary to the previous subcase, increased production of public goods affecting non-traded goods production), to have knowledge of the impact of public goods on the value of export production and, furthermore, of the values that households attach to increased production on one hand and increased work on the other.

As when the production of private goods is increased all results reported when the public budget is balanced by $T^n$ are also valid when the budget is balanced by a first period endogenous labor tax in North instead. The reason for this result is that changes in the tax will only have an income effect on the behavioral functions of the household in North.

2.4.2 The Public Budget Balanced in the Overheated South

In section 2.2.2 the additional welfare terms for increased public production of private goods when the budget was balanced in South were discussed. With regard to increased production of public goods, a switch of financing from North to South will give rise to identical additional terms. Hence, all three monetary measures (38), (40), and (43) will be supplemented by the terms previously discussed in section 2.2.2.
2.5 Summary and Concluding Remarks

The object of this chapter has been to derive cost-benefit rules in a regionalized intertemporal disequilibrium model. These rules are to be used in the empirical analysis in Chapter 4. The welfare implications of the model, which consists of a depressed region and an unconstrained region, depend on the public sector decisions concerning which good to increase the production of and which region the public budget is balanced in.

In this model increased public production generates three types of welfare effects, see Table 2.1. The direct welfare effects are due to the increases in public production and public employment. These changes should be evaluated by the marginal willingness to pay for goods and the virtual price of labor respectively.

However, increased public production and employment will also give rise to indirect spill-over effects. These effects are due either to any possible changes in incomes that are disposable for consumption of unrationed commodities or to the fact that the provision of public goods directly affecting household utility may influence the demand for private goods. This in turn will cause the flexible prices to change thus also contributing to spill-over effects. The spill-over effects are of two types. The first effect is due to the fact that the demand for first period non-traded goods produced in North may change. This possible change will affect private production and employment in North.

The second indirect welfare effect has to do with northern private investment in the production of non-traded goods. As prices may change, so may investment.

If the public budget is balanced in the depressed program region some interesting special cases emerge. One of these is the situation of crowding out. Increased public production of the first period non-traded good privately produced in North crowds out private production.
Apart from the direct welfare effect there will be an indirect welfare effect on the market for first period northern non-traded goods associated with an increase in public production of traded goods. This multiplier effect will have a positive impact on welfare.

It is also possible to find a special case in which there are no indirect welfare effects and where an evaluation of increased public production and employment solely using the marginal willingness to pay for goods and the virtual price of labor is sufficient. This is the case when public production of public goods affecting household utility is increased provided that the household regards private and public goods as independent.

If income is transferred from the unconstrained region to finance public production in the depressed region this will give rise to additional effects compared with a situation in which public production is financed locally in North. The transfer affects flexible prices, thus affecting welfare. The quantity traded on the first period market for northern non-traded goods will hence also be affected by the transfer.

What are the main conclusions, useful for the evaluation of the Malmfälsdelegation's relief works and special projects, that can be drawn from this chapter? In my opinion the results point out five very important aspects to be borne in mind for empirical work.

First of all, the situation on the market where publically produced private goods are sold is of vital importance. Is the production sold on a world market or on a home market? Moreover it is important to determine whether the market clears through price or quantity adjustments and, in the latter case, whether the market is characterized by excess supply or excess demand. The importance of this information comes from the fact that the welfare implications are dependent on the market situation. As discussed earlier in the chapter, production of goods traded and priced on world markets may give rise to positive multiplier effects while production of non-traded goods may crowd out private production thus causing a negative indirect welfare effect. Therefore it is necessary to classify the subprograms aiming at production of private goods in groups according to the characteristics of the markets where the output is sold.
Table 2.1 The Cost-Benefit Rules.

Private Goods

traded goods

\[ dW = p^n_1 dx_{11} - w^n_1 dl_{11} + \]
\[ + [p^n_1 + p^n_{11x} - \text{smc}^{nn}_1(1 + I^n_{11x})] k(x^n_{11} + f)p^n_1 dx_{11} + \]
\[ + (p^n_1 - \text{smc}^{nn}_1)(I^n_{1p} dp^n_2 + I^n_{1w} dw^n_2) \]  
(25)

southern non-traded goods

\[ dW = p^n_s dx_{11} - w^n_1 dl_{11} + \]
\[ + [p^n_1 + p^n_{11x} - \text{smc}^{nn}_1(1 + I^n_{11x})] k [(x^n_{11} + f)p^n_1 - f^s_1] dx_{11} + \]
\[ + (p^n_1 - \text{smc}^{nn}_1)(I^n_{1p} dp^n_2 + I^n_{1w} dw^n_2) \]  
(26)

northern non-traded goods

\[ dW = p^n_1 dx_{11} - w^n_1 dl_{11} + \]
\[ + (p^n_1 + p^n_{11x} - \text{smc}^{nn}_1(1 + I^n_{11x})] k(p^n_1(x^n_{11} + f) - 1) dx_{11} + \]
\[ + (p^n_1 - \text{smc}^{nn}_1)[I^n_{1p} dp^n_2 + I^n_{1w} dw^n_2] \]  
(24)
Public Goods

affecting household utility

\[ dW = p_1^n dz_1^n - w_1^n dI_1 + \]

\[ + (p_1^n + p_1^n 1^n_1x - smc_1^{nn}(1 + I_1^n) k(x_1^{nn} + f^{zu}) dz_1^n + \]

\[ + (p_1^n - smc_1^{nn})[1^n_1 dp^n_2 + 1^n_1 dw^n_2] \]  

(38)

affecting production of traded goods

\[ dW = - \omega_1^n \left( \frac{f^n}{l} - \frac{z^n}{l} \right) dz_1^n + \]

\[ + [1 - \omega_1^n + \omega_1^n p_1^n + p_1^n (1 + I_1^n) k(x_1^{nn} + f)] p_1^n dx_1^n + \]

\[ + (p_1^n - smc_1^{nn})[1^n_1 dp^n_2 + 1^n_1 dw^n_2] \]  

(43)

affecting production of non-traded goods

\[ dW = - \omega_1^n \left( \frac{f^{nn}}{l} - \frac{z^{nn}}{l} \right) dz_1^{nt} \]

(40)

Public Budget Balanced in South Instead of North

the following terms will have to be added to the rules given above

\[ dW = [p_1^n + p_1^n p_1^n - smc_1^{nn}(1 + I_1^n)] k(x_1^{nn} - x_1^{sn} + f - f*) dS + \]

\[ + (p_1^n - smc_1^{nn})(1^n_1 dp^n_2 + 1^n_1 dw^n_2) \]  

(27)
Secondly, it is of vital importance to determine which agents in the economy benefit from increases in the provision of public goods. The importance of this comes from the fact that the welfare implications are dependent on who is the receiver. Therefore it is necessary to classify the subprograms aimed at the production of public goods according to whether households or firms are the receivers.

Thirdly, when the public goods are received by firms it is necessary to determine whether the increased supply of public goods enables the firms to reduce their labor input more than the amount of labor needed in public production. If this is the case welfare improves as the economy, on an aggregate level, will work more efficiently. On the other hand, if the supply of public goods initially is above its optimal level the increased supply will have a negative impact on welfare.

Fourthly, when the public goods are received by households it is necessary to know whether they act as if public goods and private goods are substitutes, independent, or complements. A large-scale increase in the provision of public goods may considerably reduce the demand for private goods if the households regard public and private goods as substitutes.

Finally, this analysis shows that the welfare results are dependent on the means by which the public sector chooses to balance its budget. Hence, it is necessary in empirical work to study the possible effects of the financing of the program. Does a tax increase of SEK 309 million give income effects that cannot be ignored? Moreover, can any possible excess burden due to the financing of the program be disregarded? In my opinion the results of this chapter show that the answers to these questions need an empirical foundation. It is not possible to give the answers a priori. In the evaluation of the delegation's relief works and special projects, reported in Chapter 4, the income effects are discussed. Unfortunately, neither the model specification nor the data permit an analysis of possible excess burden.
This chapter deals with the job-creating measures of the Malmfälts-delegation (Mfd). In 1983 the Swedish Parliament granted SEK 262 million for relief work and special projects. The grant was intended for:

1. relief works according to the labor market law and according to the directions and the instructions issued by the National Labor Market Board which normally apply within the municipalities of Kiruna and Gällivare,

2. relief works outside the municipalities of Kiruna and Gällivare to which the supernumeraries of LKAB are assigned,

3. work within special projects of a principally development character that can be expected to lead to permanent employment or to the start of new businesses. In the case of projects that are intended to start new businesses; development funds, banks, or other bodies with good knowledge of the line of business concerned shall be consulted. Projects shall not be allowed to intrude upon the areas of concern of existing economic activities to such an extent that employment for other groups outside the responsibility of the delegation is hindered.\(^\text{1}\)

The resolution passed in Parliament in 1985 meant a change in the direction of the measures. In the official document placing the appropriation at the disposal of the National Labor Market Administration it is written that:

"The funds remaining on 30 June 1985 from the funds available for job creating measures by the old organization af/ami-LKAB may be transferred to the Malmfältsdelegation and should, in the first place, be used to initiate and take care of development projects. The funds may also be used for relief work which accords to the labor market law and with the directions and the instructions issued by the National Labor Market Board normally applying to the Kiruna and Gällivare employment exchange districts and to these municipalities."\(^\text{2}\)

---

1 My translation of parts of the text in Statsliggaren (The register of appropriations) 1983/84 X/A p. 78.

It is clear that development projects are put in the foreground in this decision. In the 1983 decision, relief works and development projects are placed side by side whereas, according to the 1985 decision, relief works were to be secondary consideration.

The first step in the evaluation has been to establish a data base. The data base contains information on all relief works and special projects (rw/sp). The original information comes from the Mfd files concerning relief work and special projects. The motive for this time-consuming method of work is that the subsidies to rw/sp have represented such a big share of the budget of Mfd. Therefore I have regarded it as being vital to have access to a comprehensive material.

The data base is presented in more detail in section 3.1 which also contains a descriptive presentation of the rw/sp of the delegation. The central quantitative variables discussed are costs, subsidies, and employment. A large part of the section is devoted to providing the answers to questions of the type: Where have the projects been pursued? How many persons been involved in the job-creating measures at different points of time? What has been produced by the projects? Which types of work have the assigned unemployed performed? The description begins with an account of total costs, total subsidies and total employment. Subsequently, these aggregate variables are broken down according to different distributional characteristics such as the location of the project, the length of time of employment, etc.

A problem with this evaluation is that only slightly less than two thirds of the projects are finally accounted for. This means that the discussion in section 3.1 cannot be based on what has actually happened according to the final accounts. Instead, this descriptive part has to be based on preliminary/planned values of the studied variables. This can be a considerable problem. The actual costs of, and the actual numbers employed in, the projects are of the greatest interest. A condition necessary for the analysis in section 3.1, in order to give a reasonably correct description of reality, is that the plans have been pursued. The National Audit Bureau, in a study of relief works in six counties, found that the actual employment of
assigned unemployed was considerably lower than the planned employment. Moreover, it was found that the opposite applied for non-assigned labor.

In section 3.2 a comparison of the plans for and the outcome of the projects finally accounted for can be found. This comparison has two purposes. Firstly, it gives an indication of the extent to which the results in section 3.1 can be assumed to describe the actual outcome of the projects of the Malmfältsdelegation. Secondly, it is of course of interest whether the results of the National Audit Bureau are also valid for these projects.

The fact that the delegation's operation has been governed by two parliamentary decisions with partly different directions is the starting point for section 3.3. Here a comparison is made of the projects approved before and after July 1985 can be found. The differences with regard to the distribution of costs, according to the nature of expenditure, and the balance between relief work and special projects are some examples of interesting comparisons.

---

3 See for example Riksrevisionsverket (The National Audit Bureau) (1984) p. 54. This is one of the two available reports from Riksrevisionsverket on relief works. The other is Riksrevisionsverket (1975).
3.1 The Plans

The data base contains information about 469 projects. Of these 305 were approved during the period 1 July 1983 - 30 June 1985, while the remaining 164 projects were decided after this date. It has not been possible to obtain complete information for some projects. The number of projects not included for this reason in the computations below are continuously indicated in parenthesis.

The preliminary costs for the projects amount to SEK 557 million. The principle for these cost-computations has been to seek to estimate the net costs for the projects. The preliminary subsidies sum to SEK 265 million. This means that slightly less than 50 % of the preliminary costs have been covered by subsidies. In addition, the conditional loans granted by the Malmfältsdelegation have to be taken into consideration. These amount to SEK 16 million.

With regard to employment the following can be reported. Unfortunately, there is no systematic information in the files on which persons, who obtained temporary employment. The only available information concerns the time spent in temporary employment. The planned temporary employment for assigned unemployed equals 4 960 months (3) or 98 000

---

4 A review of all variables included in the data base and some other information about the data base can be found in Appendix II.
5 The reported numbers are throughout rounded off in a suitable way. The exact values can be obtained from the author to whom interested readers can turn.
6 As some of the early projects were less costly than expected, it has been possible for the delegation to decide on subsidies exceeding the granted SEK 262 million.
7 The conditions associated with these loans vary. In some cases the loans are to be repaid if it turns out that the project is sound in the long run. In other cases the condition has been that a certain number of previous LKAB-employees will be given permanent jobs by the subsidy-receiver. The loans are interest- and amortization free during a certain time period. This period varies among the projects to which conditional loans have been granted.
days of work (18). Converted to whole years this corresponds to 420 years of work. The information concerning planned temporary employment for non-assigned labor is unfortunately incomplete. According to available information an employment volume corresponding to 1 500 months (179) or 29 000 days of work (179) was planned.

A large number of the Mfd projects, 258, have not had the creation of temporary employment for otherwise unemployment as a direct object. Instead the purposes of these projects have been product development, training, marketing, etc. Machinery investments and other investments are also examples of projects that have received subsidies. In some cases the subsidies given to these types of projects have been conditional on the permanent employment of assigned unemployed. In order to calculate the preliminary cost per planned month in a reasonable way, these projects will have to be excluded. With this adjustment the cost per month is SEK 31 500. Corresponding preliminary subsidies amount to SEK 21 600 per month, which implies a subsidy-share of almost 70 %.

The Malmfältsdelegation has, however, not only undertaken measures with the object of creating temporary employment for assigned unemployed. Many projects have had the objective of providing permanent employment. This has for example been done by direct recruitment subsidies, subsidies for unemployed to start their own businesses, and investment subsidies conditional on increased permanent employment. The planned number of permanent jobs by measures of this type is 211.

The presentation in this section has so far been devoted to the aggregate effects of the rw/sp:s of the Malmfältsdelegation. The rest of this descriptive account aims at disaggregating, in different ways, these aggregates. First, the largest projects, according to costs, subsidies, and employment are presented. Then follows a summary of the distribution of costs and subsidies for different types of costs.

---

8 In situations when information only has been available on either the number of months or the number of days the conversion factor 20 days of work per month has been used.
The third step is an account of the distribution of the aggregates discussed above according to type of subsidy-receiver, the location of the project, and the classification of the production according to Swedish Standard Industrial Classification of all Economic Activities (SNI). Furthermore, the distribution of employment according to Nordic Classification of Occupations (NYK) and the distribution of employment over time are studied.

The ten largest projects according to cost are accounted for in table 3.1. These projects represent slightly less than half of the total preliminary costs. The most costly project, the founding of Malmfältens Finans AB, has the object of creating, developing, and stimulating profitable and lasting businesses in northern Sweden. In addition to the government contribution of SEK 50 million, private participants have contributed SEK 13 million. These funds are intended to provide for increases of both share and loan capital in businesses of direct or indirect importance for Norrbotten.

In April 1983 the government instructed the Foundation of Swedish Communal Industries to investigate the possibilities for an expansion of sheltered work in Norrbotten. As a result of this Formelprodukter, the subsidiary in Norrbotten, has expanded its operations in Kiruna, Gällivare, and Pajala. The costs for this expansion have been shared between the government and the Malmfältsdelegation. The 99 new jobs created within sheltered firms have resulted in 16 former LKAB-employees obtaining permanent jobs at Formelprodukter.

9 The object has been taken from the articles of association of Malmfältens Finans, § 3.

Table 3.1 The ten largest projects according to preliminary costs.

<table>
<thead>
<tr>
<th>Subsidy receiver</th>
<th>SEK million</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malmfältens Finans AB</td>
<td>63.0</td>
<td>corporate finance</td>
</tr>
<tr>
<td>* Luftfartsverket (The Board of Civil Aviation)</td>
<td>39.0</td>
<td>extension of runway, Kiruna Airport</td>
</tr>
<tr>
<td>Samhällsföretag (The Foundation of Swedish Communal Industries)/Formelprodukter</td>
<td>25.8</td>
<td>expansion of sheltered work, 99 new jobs</td>
</tr>
<tr>
<td>Forskningsstiftelsen Svensk Gruv- teknik, Kiruna (The Research Foundation Swedish Mine Technology)</td>
<td>25.0</td>
<td>operation of the research mine Luossavaara for one more year</td>
</tr>
<tr>
<td>SJ (Swedish State Railways)</td>
<td>21.2</td>
<td>reconstruction of railcar repair shop</td>
</tr>
<tr>
<td>Johnson Construction Company</td>
<td>20.3</td>
<td>filling of the eastern harbor area, Malmö</td>
</tr>
<tr>
<td>Stiftelsen Dundret, Gällivare (The Foundation Dundret)</td>
<td>18.0</td>
<td>reconstruction and expansion</td>
</tr>
<tr>
<td>* Rymdbolaget (The Swedish Space Corporation)</td>
<td>15.2</td>
<td>establishment of a computer development company</td>
</tr>
<tr>
<td>* Kiruna kommun (The municipality of Kiruna)</td>
<td>11.2</td>
<td>creation of a technical center</td>
</tr>
<tr>
<td>* AB Krekula &amp; Lauri</td>
<td>10.1</td>
<td>investment in a new sawmill</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>248.8</strong></td>
<td></td>
</tr>
</tbody>
</table>

Remark: Projects marked with * were decided after July 1985.

Source: The data base.
Most of the largest projects according to costs are also naturally among the projects that have received the biggest subsidies from Mfd. Table 3.2 is a summary of the ten biggest projects according to subsidies. These projects account for slightly more than 40% subsidies.

The Malmfälten's Finans and Formelprodukter have already been discussed above. Concerning the other projects in Table 3.2 the following comments can be made:

The delegation organized, together with Johnson Construction Company, a consortium with the object of carrying out the filling in of a harbor in Malmö in southern Sweden. This temporary project was staffed by former LKAB-employees and some equipment also came from LKAB.

The renovation of the holiday installations on Fårön was a project that was taken over from LKAB. Furthermore, the subsidy for the reconstruction of the railcar repair shop of the Swedish State Railways (SJ) was granted provided that eight former LKAB-employees obtained permanent jobs at SJ.

The project, approved after July 1985, with the highest subsidies is the creation of Stiftelsen Futurum (The Foundation Futurum) in Kiruna. This project follows those presented in the above table. The foundation has the assignment of taking care of and preserving museum artifacts. Apart from finance from the Ministry of Finance and the Ministry of Industry, which each contributed SEK 3 million, the Malmfältdelegation gave a subsidy of SEK 3 million.\footnote{11} In total, the foundation is estimated to have 20 employees.

\footnote{11} The background to the creation of the foundation is to be found in a government bill 1984/85 concerning regional development and equalization.
### Table 3.2 The ten largest projects according to planned subsidies.

<table>
<thead>
<tr>
<th>Subsidy receiver</th>
<th>SEK million</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malmfältens Finans AB</td>
<td>50.0</td>
<td>corporate finance</td>
</tr>
<tr>
<td>Samhällsföretag (The Foundation of Swedish Communal Industries)/Formelprodukter</td>
<td>15.0</td>
<td>expansion of sheltered work</td>
</tr>
<tr>
<td>Johnson Construction Company</td>
<td>12.3</td>
<td>harbor filling</td>
</tr>
<tr>
<td>Forskningsstiftelsen Svensk Gruvteknik, Kiruna (The Research Foundation Swedish Mine Technology)</td>
<td>10.0</td>
<td>operation of the research mine</td>
</tr>
<tr>
<td>LKAB Viscaria AB</td>
<td>5.8</td>
<td>mining</td>
</tr>
<tr>
<td>Skogsårdsstyrelsen (The County Forestry Board)</td>
<td>5.5</td>
<td>forest conservation</td>
</tr>
<tr>
<td>Malmfältarbetarnas semesterhemsförening (The holiday home organization of the ore mining district's workers)</td>
<td>4.0</td>
<td>renovation of holiday installations on Fårön, Piteå</td>
</tr>
<tr>
<td>Gällivare kommun (The municipality of Gällivare)</td>
<td>3.7</td>
<td>environmental improvements</td>
</tr>
<tr>
<td>SJ (Swedish State Railways)</td>
<td>3.6</td>
<td>reconstruction</td>
</tr>
<tr>
<td>IKAB</td>
<td>3.5</td>
<td>dismantling of railtrack, Kiruna</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>113.4</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: The data base.
Table 3.3 The eleven largest projects according to planned temporary employment.

<table>
<thead>
<tr>
<th>Subsidy receiver</th>
<th>Number of months, assigned unemployed</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Construction Company</td>
<td>878</td>
<td>harbor filling</td>
</tr>
<tr>
<td>Skogsårdsstyrelsen (The County Forestry Board)</td>
<td>408</td>
<td>forest conservation</td>
</tr>
<tr>
<td>LKAB</td>
<td>290</td>
<td>dismantling of railtrack</td>
</tr>
<tr>
<td>LKAB Viscaria AB</td>
<td>240</td>
<td>mining</td>
</tr>
<tr>
<td>Kiruna-projektet (The Kiruna Project)</td>
<td>170</td>
<td>developing industry</td>
</tr>
<tr>
<td>Gällivare-projektet (The Gällivare Project)</td>
<td>100</td>
<td>developing industry</td>
</tr>
<tr>
<td>Bergstaden AB</td>
<td>72</td>
<td>development and training, Svappavaara</td>
</tr>
<tr>
<td>Alfatherm</td>
<td>71</td>
<td>development, Kiruna</td>
</tr>
<tr>
<td>Länsstyrelsen (The County Administration)</td>
<td>60</td>
<td>improvement of farm buildings, Pajala</td>
</tr>
<tr>
<td>I 22 (The 22nd Infantry Regiment)</td>
<td>60</td>
<td>warehouse work, Kiruna</td>
</tr>
<tr>
<td>LKAB</td>
<td>60</td>
<td>fencing work etc., Kiruna</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2 409</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: The data base.

If the projects instead are ranked according to the number of months of planned temporary employment for assigned unemployed a couple of "new" projects appear. This ranking is shown in Table 3.3. The Kiruna and Gällivare projects have the aim of contributing to the development of the industry in their respective municipalities. This has been done by arranging different training courses, consulting, marketing, support for product development, and other similar activities. The development projects Bergstaden in Svappavaara and Alfatherm in Kiruna, have also provided relatively extensive temporary employment. The eleven biggest projects, according to temporary employment, account altogether for slightly less than half the total temporary employment.
Table 3.4 The ten largest projects according to planned permanent employment.

<table>
<thead>
<tr>
<th>Subsidy receiver</th>
<th>Number of jobs, assigned unemployed</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samhällsföretag (The Foundation of Swedish Communal Industries)/Formelprodukter</td>
<td>16</td>
<td>expansion of sheltered work</td>
</tr>
<tr>
<td>Bergstadens AB</td>
<td>10</td>
<td>manufacturing</td>
</tr>
<tr>
<td>* Stiftelsen Futurum</td>
<td>10</td>
<td>caring for museum artifacts</td>
</tr>
<tr>
<td>Svabor</td>
<td>9</td>
<td>manufacturing</td>
</tr>
<tr>
<td>Scand-Print</td>
<td>9</td>
<td>printing</td>
</tr>
<tr>
<td>SJ (Swedish State Railways)</td>
<td>8</td>
<td>transport</td>
</tr>
<tr>
<td>Kiruna Mark- &amp; Terrängborrning</td>
<td>7</td>
<td>rock drilling</td>
</tr>
<tr>
<td>IKAR Viscaria AB</td>
<td>6</td>
<td>mining</td>
</tr>
<tr>
<td>* Centralnämnden för fastighetsdata (The Central Board for Real Property Data)</td>
<td>6</td>
<td>development division</td>
</tr>
<tr>
<td>* Lantmäteriverket (The Central Office of the National Land Survey)</td>
<td>6</td>
<td>development division</td>
</tr>
<tr>
<td>TOTAL</td>
<td>87</td>
<td></td>
</tr>
</tbody>
</table>

Remark: Projects marked with * were decided after June 1985.

Source: The data base.

In Table 3.4 the projects are ranked according to the number of planned permanent jobs. The ten largest projects in this sense account for about 40% of the total number. The proposals for creating the development divisions within The Central Office of the National Land Survey and The Central Board for Real Property Data were made at the request of the government. Apart from subsidies from the delegation, the Ministry of Industry has also provided finance.
Let us now study the distribution of costs and subsidies according to the nature of expenditure. This is summarized in Table 3.5. As before the number of projects not included are indicated within parenthesis. Regarding preliminary costs, other investments, are the highest. Thereafter follows costs for intermediate goods and non-assigned labor. It is, however, important to point out that the costs of Malmfältens Finans AB have been coded as other investments.

Costs for assigned unemployed are SEK 69 million. About 80% of these costs have been subsidized. In the case of other types of costs, the table shows that approximately half of the costs are subsidized. As is clear from the table, it has not been possible to completely distribute total costs and total subsidies.

Furthermore, the table shows that SEK 55 million of the total costs have not been included in the base for subsidization. The total subsidies answer for about half of the costs eligible for subsidies. In

**Table 3.5 Preliminary costs and subsidies.**

<table>
<thead>
<tr>
<th></th>
<th>Preliminary costs</th>
<th>Preliminary subsidies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>557</td>
<td>265</td>
</tr>
<tr>
<td>1. thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs for assigned unemployed</td>
<td>69 (6)</td>
<td>56 (6)</td>
</tr>
<tr>
<td>Investments in machinery</td>
<td>48 (6)</td>
<td>19 (5)</td>
</tr>
<tr>
<td>Other investments</td>
<td>206 (6)</td>
<td>75 (5)</td>
</tr>
<tr>
<td>Costs for intermediate goods and non-assigned labor</td>
<td>154 (9)</td>
<td>80 (8)</td>
</tr>
<tr>
<td>Training costs</td>
<td>15 (6)</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Marketing costs</td>
<td>15 (8)</td>
<td>6 (7)</td>
</tr>
<tr>
<td>Other current costs</td>
<td>18 (6)</td>
<td>11 (5)</td>
</tr>
<tr>
<td>Unallotted</td>
<td>32 (6)</td>
<td>12</td>
</tr>
<tr>
<td>2. thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs not eligible for subsidies</td>
<td>55 (4)</td>
<td></td>
</tr>
</tbody>
</table>

Source: The data base.
many cases these non-subsidized costs have been fully or partly covered by conditional loans from the Malmfältsdelegation. As mentioned above, the conditional loans amounted to about SEK 16 million in total.

Which types of associations have been the receivers of the subsidies? Figure 3.1 and Table 3.6 try to answer this question. The projects have been classified according to whether the receiver has been a central government authority, a local government authority, a company, or a non-profit-making organization. I have found it fruitful to separate out certain projects from these four categories. This separation concerns LKAB projects and projects aimed at starting new businesses by former LKAB-employees.
Table 3.6 Costs and subsidies per month distributed according to type of subsidy-receiver.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of months</th>
<th>Total cost per month</th>
<th>Total subsidy per month</th>
<th>Subsidy/cost, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central government authorities</td>
<td>950</td>
<td>26 900</td>
<td>23 900</td>
<td>89</td>
</tr>
<tr>
<td>Local government authorities</td>
<td>760</td>
<td>50 200</td>
<td>31 300</td>
<td>62</td>
</tr>
<tr>
<td>Companies</td>
<td>1 820</td>
<td>30 300</td>
<td>18 900</td>
<td>62</td>
</tr>
<tr>
<td>LKAB</td>
<td>850</td>
<td>26 000</td>
<td>16 400</td>
<td>63</td>
</tr>
<tr>
<td>New businesses-projects</td>
<td>180</td>
<td>9 400</td>
<td>7 600</td>
<td>81</td>
</tr>
<tr>
<td>Non-profit-making organizations</td>
<td>850</td>
<td>34 400</td>
<td>28 000</td>
<td>81</td>
</tr>
<tr>
<td>Others</td>
<td>40</td>
<td>24 200</td>
<td>24 200</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4 960</td>
<td>31 500</td>
<td>21 600</td>
<td>69</td>
</tr>
</tbody>
</table>

Source: The data base.

The category companies stands for almost half the activity irrespective of which variable is studied. In the case of central government authorities, LKAB, and new businesses, the employment-shares are larger than the cost-shares and subsidy-shares, while the opposite holds for non-profit-making organizations. The projects that have not involved temporary employment of assigned unemployed have been excluded in the calculation of Table 3.6. The table shows that the overall subsidy-share is slightly less than 70%. Central government authorities have received the highest subsidies compared to costs. Thereafter follow non-profit-making organizations and new business-projects that have obtained a cost-coverage of 80% while local government authorities, companies, and LKAB have received about 60%. In absolute figures, however, the local government-projects have been the most expensive. These projects have also been at the top of the list in terms of subsidies.
Figure 3.2 Costs, subsidies, and employment distributed according to location of the projects.

Source: The data base.

Where has the work in the projects supported by the Malmfälts-delegation been performed? The predominant part has taken place in Malmfälten, although not insignificant resources have been allocated to other parts of the country. The geographical distribution of the projects is revealed by Figure 3.2.

With regard to both costs and subsidies, slightly less than 85% can be related to two program municipalities. Projects that affect Kiruna and Gällivare have, as far as possible, been accounted for separately. When this has not been possible, the projects have been classified under the heading Malmfälten. The comparatively high cost- and subsidy-columns for Malmfälten are caused by Malmfältens Finans. In the case of temporary employment, a larger share has been provided outside Malmfälten. The reason for this can, above all, be found in the JCC-project with 878 months.
### Table 3.7 Costs and subsidies per month distributed according to the location of the project.

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of months</th>
<th>Total cost per month</th>
<th>Total subsidy per month</th>
<th>Subsidy/cost, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiruna</td>
<td>2 900</td>
<td>29 500</td>
<td>20 900</td>
<td>71</td>
</tr>
<tr>
<td>Gällivare</td>
<td>610</td>
<td>49 200</td>
<td>27 800</td>
<td>57</td>
</tr>
<tr>
<td>Malmfälten</td>
<td>60</td>
<td>17 400</td>
<td>14 900</td>
<td>86</td>
</tr>
<tr>
<td>Pajala</td>
<td>340</td>
<td>31 600</td>
<td>27 800</td>
<td>88</td>
</tr>
<tr>
<td>Övertorneå</td>
<td>70</td>
<td>70 200</td>
<td>36 300</td>
<td>52</td>
</tr>
<tr>
<td>The rest of Norrbotten</td>
<td>100</td>
<td>38 100</td>
<td>45 300</td>
<td>119</td>
</tr>
<tr>
<td>The rest of Sweden</td>
<td>880</td>
<td>23 000</td>
<td>13 900</td>
<td>60</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4 960</strong></td>
<td><strong>31 500</strong></td>
<td><strong>21 600</strong></td>
<td><strong>69</strong></td>
</tr>
</tbody>
</table>

Source: The data base.

Comment: The "over-subsidization" in the rest of Norrbotten is caused by the fact that the Malmfältsdelegation has paid certain costs for the Fårö-project that arose before Mfd took over the project.

The figure also shows that the Malmfältsdelegation's relief works and special projects have affected Kiruna to a considerably greater extent than Gällivare. In connection with this, it is important to remember that the number of excess employees in Kiruna and Svappavaara was about 1 500 persons, while the corresponding number in Gällivare was about 300 persons.

With regard to costs per month and subsidies per month, the projects in Gällivare and Övertorneå are the most expensive. The costs in the rest of Sweden are considerably lower. Primarily, it is the JCC-project that contributes to low costs and subsidies per month. Apart from the rest of Norrbotten, places with expensive projects tend to get a lower cost-coverage. The deviations from the average are, however, not noticeable.
Figure 3.3 Costs, subsidies, and employment distributed according to Swedish Standard Industrial Classification of all Economic Activities (SNI).

Source: The data base.

Turning to the distribution of the projects according to branch of the economy, Figure 3.3 shows that it has been possible to classify many projects as falling within the construction branch. Slightly less than a third of the costs and a quarter of the subsidies have concerned construction. This view is further accentuated in Table 3.8. Construction is the only branch that is considerably above the average costs and subsidies per month. All other branches are below or close to the average values.

It is also of interest to note that most branches lie on a subsidy per month about the level where the actual labor costs, including social security contributions, can be expected to be. Furthermore, the variations in subsidies in relation to costs are not particularly
Table 3.8 Costs and subsidies per month distributed according to Swedish Standard Industrial Classification of all Economic Activities (SNI).

<table>
<thead>
<tr>
<th>SNI code</th>
<th>Branch</th>
<th>Number of months</th>
<th>Total cost per month</th>
<th>Total subsidy per month</th>
<th>Subsidy/cost, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agriculture, forestry, hunting, and fishing</td>
<td>640</td>
<td>18 000</td>
<td>14 500</td>
<td>81</td>
</tr>
<tr>
<td>2</td>
<td>Mines and quarries</td>
<td>1 570</td>
<td>24 300</td>
<td>15 300</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>Manufacturing</td>
<td>660</td>
<td>32 200</td>
<td>22 100</td>
<td>69</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>1 170</td>
<td>58 100</td>
<td>38 300</td>
<td>66</td>
</tr>
<tr>
<td>6</td>
<td>Wholesale and retail trade, restaurants, and hotels</td>
<td>50</td>
<td>6 300</td>
<td>6 200</td>
<td>98</td>
</tr>
<tr>
<td>8</td>
<td>Financial institutions and insurance, real estate administration, commissioned work</td>
<td>570</td>
<td>22 000</td>
<td>18 300</td>
<td>83</td>
</tr>
<tr>
<td>9</td>
<td>Community, social and personal services</td>
<td>260</td>
<td>15 100</td>
<td>13 300</td>
<td>88</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>4 960</strong></td>
<td><strong>31 500</strong></td>
<td><strong>21 600</strong></td>
<td><strong>69</strong></td>
</tr>
</tbody>
</table>

Source: The data base.

great. The largest branches according to temporary employment: mines, manufacturing, and construction have a slightly lower percentage-subsidy than the other branches.

An explanation of the great difference between, on one hand, the mining branch’s share of costs and subsidies and, on the other hand, its share of temporary employment is that the JCC-project has a low cost per month. Malmfältens Finans has been classified according to branch commissioned work, etc. which explains the high cost and subsidy shares compared to the temporary employment share.
The projects have also been classed according to whether the output has had private good or public good properties. Moreover, the former have been subdivided into projects with international, national, or local markets, while the latter have been separated according to whether the projects have benefited households or firms. However, the results of this classification will be reported in connection with the empirical cost-benefit analysis, see section 4.3.

The remainder of this descriptive review concentrates on employment. Which occupations have the otherwise unemployed had? The relevant classifications according to NYK have been coded for each project. Figure 3.4 is an attempt, using this classification as a basis, to give an answer to this question.

The assigned unemployed have, above all, been employed in mining and quarrying and also manufacturing and machine maintenance etc. These occupational groups account for about 65% of total temporary employment. The temporary employment in the other occupational groups is negligible, with the exception perhaps of the occupational group "technology, natural sciences, social-science, arts and letters, and fine arts" and the occupational group "agriculture, forestry, and fisheries". An interesting observation is that only a very small part of the temporary employment is within the occupational groups which are connected with the former LKAB-salaried employees' earlier occupations.

A possible explanation for this is that the need for temporary employment for former salaried employees was lower than for former (manual) workers. This in turn may have its explanation partly in that it has been easier to find new permanent jobs for salaried employees and partly in the fact that comparably more salaried employees have retired.
Figure 3.4 Temporary employment distributed according to Nordic Classification of Occupations (NYK).

Source: The data base.

NYK code

0 = Technology, natural sciences, social-science, arts and letters, and fine arts
1 = Administrative
2 = Accounting and general office work
3 = Commercial
4 = Agriculture, forestry and fisheries
5 = Mining and quarrying
7 = Manufacturing, machine maintenance etc.
The distribution over time of planned temporary employment is evident from Figure 3.5. During the first half-year of the Malmfälts-delegation's existence the number of employed increased from zero to about 50 persons. During spring 1984 the number steadily increased to about 200 persons. After a small decline in July 1984 this increase continued until October when the planned temporary employment reached its top with about 500 persons. After this point the number decreased until January 1985 only to increase again reaching a new top level in June 1985 with 230 otherwise unemployed in work.

The plans from the fiscal year 1985/86 implied a gradual decrease in the number assigned. In June 1986 this number was about 75. These were, in principle, all to be employed in the JCC-project or in the forest conservation-project run by the County Forestry Board. The

![Diagram of temporary employment distributed over time.](image)
latter project was also to be continued the next fiscal year. According to the plans this was the only project to be in operation the "last" month of the delegation's temporary job-creating measures — June 1987.

As mentioned earlier, the total planned number of permanent jobs was 211. For about 150 of these it has been possible, with the aid of the files, to determine the time when the job was supposed to commence. By adding the accumulated number of planned permanent jobs to the planned temporary employment it is possible to create a representation of how temporary jobs were supposed to become permanent, see Figure 3.6.
The planned total employment generated by the Malmfältsdelegation reached its maximum in October 1984 with about 330 persons. In October 1985 the planned permanent jobs were, for the first time, more numerous than the temporary. It is important in this context to stress once more that all values discussed in this section are planned/preliminary. Whether or not more than 200 persons, out of the total of 1,800 persons, today actually have permanent jobs, as a result of the Malmfältsdelegation's efforts, will be discussed in the next section.
3.2 The Outcome

The whole discussion in the previous section was based on data concerning the planned activities. In reality it is the actual activities that are interesting for the evaluation. The value of the results in the previous section depends on the extent to which the actual activities have been in accordance with the planned. This section aims at shedding light on whether or not this has been the case.

3.2.1 Costs and Subsidies

For approximately two thirds of the projects it has been possible to obtain information for the whole or part of the outcome. However, the Malmfältsdelegation has used two different methods for granting subsidies. In some cases a preliminary subsidy has been given. Subsequently, the final subsidy has been calculated based on actual, verified, costs. In the case of projects which have been dealt with in this way it is possible to perform a meaningful analysis of plans vs. outcomes.

In other cases a subsidy has been granted and then this subsidy has been paid without any demands for cost-accounts. When organizing the data base, the actual costs have been assumed to correspond to the preliminary for projects dealt with in this way. These projects are, therefore, not suited for an outcome analysis.

In total, 329 projects are fully or partly accounted for. Of these, 67 projects belong to the category where the subsidies have been paid directly. The subsidies for these amount to slightly less than SEK 41 million while the total costs are slightly more than SEK 94 million. The temporary employment for assigned unemployed in these projects amounted to 130 months. The remaining 262 accounted projects can constitute a point of departure for an analysis of the extent to which the plans have been fulfilled.
Table 3.9 Plans vs. outcomes, costs and subsidies.

<table>
<thead>
<tr>
<th>Plans</th>
<th>Outcomes</th>
<th>Percentage difference</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL COSTS</td>
<td>167.7</td>
<td>128.3</td>
<td>- 23</td>
</tr>
<tr>
<td>1. thereof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>costs for assigned unemployed</td>
<td>39.6</td>
<td>26.1</td>
<td>- 34</td>
</tr>
<tr>
<td>investments in machinery</td>
<td>8.6</td>
<td>5.4</td>
<td>- 37</td>
</tr>
<tr>
<td>other investments</td>
<td>33.4</td>
<td>16.3</td>
<td>- 51</td>
</tr>
<tr>
<td>costs for intermediate goods and non-assigned labor</td>
<td>59.4</td>
<td>58.7</td>
<td>- 1</td>
</tr>
<tr>
<td>training costs</td>
<td>2.4</td>
<td>1.4</td>
<td>- 42</td>
</tr>
<tr>
<td>marketing costs</td>
<td>5.4</td>
<td>4.4</td>
<td>- 18</td>
</tr>
<tr>
<td>other current costs</td>
<td>2.4</td>
<td>2.1</td>
<td>- 12</td>
</tr>
<tr>
<td>2. thereof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-subsidized preliminary costs/not approved costs</td>
<td>31.4</td>
<td>10.2</td>
<td>- 68</td>
</tr>
<tr>
<td>TOTAL SUBSIDIES</td>
<td>107.6</td>
<td>96.4</td>
<td>- 10</td>
</tr>
</tbody>
</table>

Source: The data base.

It is clear, from Table 3.9, that the actual total costs were slightly more than 20% lower than the planned. There are, however, reasons to suspect that this can be an overestimation of the difference. This suspicion originates from the fact that certain preliminary costs have not been subsidized. This has meant that there has been no incentive for the subsidy-receivers to account for these costs. Yet, in some cases this has happened, with the consequence that the Malmöfälts-delegation has not approved the costs in its final decision.

The relative difference between actual approved costs and preliminary subsidized costs can, with the aid of the table, be estimated as a decrease by approximately 13%. This can be compared with the actual subsidies which are only 10% lower than the preliminary. The meaning of this is that the subsidized share of the costs has been higher in the final decision than in the preliminary.
Another conclusion which can be drawn from the information in Table 3.9 is that the cost reduction is not evenly distributed over the different types of costs. If the analysis is concentrated on the three major types of costs: costs for assigned unemployed, other investments, and costs for intermediate goods and non-assigned labor, the table shows that the actual costs for assigned unemployed are 30% below the preliminary while the two other types of costs show considerably lesser reductions. This means that the otherwise unemployed's share of total actual costs is lower than the corresponding share of preliminary costs. The opposite is true for, among others, costs for intermediate goods and non-assigned labor.

3.2.2 Temporary employment

Turning to the outcome for temporary employment. In the case of assigned unemployed there are accounts for 248 projects. The total temporary employment accounted for in these projects amounts to 2120 months. This is a decrease of 22% compared with the plans. With regard to the number of days, the decrease is slightly larger, 24%. In other words, the number of days per month of actual work has been lower than planned.

As mentioned earlier, information concerning the employment of non-assigned labor is missing for a relatively large number of projects. The comparison of plans and outcomes for this variable can only be based on 170 projects. For non-assigned labor the actual employment is also lower than the planned. In this case however the decrease, 18%, is lower than for assigned unemployed. In other words the share of total employment of otherwise unemployed has been lower than planned. This is also one of the results shown in Riksrevisionsverket (1984).

---

12 Note that this also includes fully and partly accounted projects where the temporary employment has been zero.
In this context it is important to stress that the distinction between assigned and non-assigned labor is a formal distinction. It says something about which persons, among those employed in the relief work, were registered at the employment exchange as seeking employment and which were not.

It is another thing to claim that the assigned would have been unemployed and the non-assigned employed, if the relief work had not been started. This is an assumption that lies near at hand, as it simplifies empirical analysis. However, it is no more than an assumption!

The assumption that the assigned would have been unemployed is more likely than that the non-assigned would have been employed. It is difficult to predict the labor market situation for the latter if the relief works had not been started. Moreover, it is possible that the relief works only reallocated unemployment. The output that the assigned, together with the non-assigned, produced may, if the relief works had not been started, have been produced by others. These instead became unemployed, and total employment remained unchanged. In the next chapter I will return to this problem and more closely discuss these effects. With the formal character of the distinction between assigned and non-assigned in mind, the descriptive account of the delegation's job-creating measures now continues.

To further illuminate the outcome with regard to employment a special selection has been made among the projects accounted. There are in total 42 projects in the data base that fulfill the following two criteria:

1. planned temporary employment includes both assigned unemployed and non-assigned labor,

2. information on actual employment for both groups exists.
Table 3.10 Plans vs. outcomes, temporary employment in projects in which both assigned unemployed and non-assigned labor have been employed.

<table>
<thead>
<tr>
<th></th>
<th>Planned temporary employment, months</th>
<th>Actual temporary employment, months</th>
<th>Percentage difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned</td>
<td>1 281</td>
<td>857</td>
<td>- 33</td>
</tr>
<tr>
<td>Non-assigned</td>
<td>695</td>
<td>554</td>
<td>- 20</td>
</tr>
</tbody>
</table>

Source: The data base.

Table 3.10 shows the employment outcome for these projects. As is clear from the table, the employment of assigned unemployed displays a considerably larger percentage decrease than the employment for non-assigned. According to the plans 65 % of the total employment volume was intended for otherwise unemployed, the outcome is a share of 61 %.

Another interesting question is whether the employment plans have been fulfilled according to the time schedules. Figure 3.7 is an attempt to clarify this question. The continuous line shows the planned temporary employment during the period July 1983 - June 1986 while the actual temporary employment is shown by the dashed line. With reference to the figure the following observations can be made:

Firstly, it does not seem that the Malmfälts delegation's rw/sp:s have suffered from any longer delays. The actual employment reaches, as planned, its top during the second half of 1984. Secondly, it seems that the difference between plans and outcomes is at a constant level during the whole period.

The summarizing conclusion is that the actual scale of the job-creating measures, regardless of whether costs, subsidies, or temporary employment are studied, is lower than planned. Furthermore, these decreases concern the assigned unemployed to a larger extent, both regarding costs and temporary employment, than non-assigned labor and other costs. In other words, the outcome is that the assigned unemployeds share of employment and costs are lower than planned.
Are these conclusions valid for the other, non-accounted, projects? There are two arguments in favor of this. The first is that the results reported here closely coincide with the results reported in the first edition of this study. The analysis in the previous edition was based on the outcome of only 122 projects. This small number of projects seems to have had good representativity as the analysis, when 140 additional projects are included, does not give any qualitatively different results.
Besides the fact that the previous sample appears to have been representative, an inspection of the Mfd files gives some information on the outcome of projects not yet accounted for. Some of these are partly accounted for, or there exists some other kind of information on what has actually happened. It has not been possible to find anything that invalidates the above reported conclusions. At the same time, the only certain way of answering the question is, of course, to wait for all the projects to be accounted for and repeat the data analysis that, so far, has been the basis for this section.

3.2.3 Permanent employment

It has not been possible to use the files of the delegation to perform an outcome analysis for one important variable. This variable is permanent employment. The accounts of the projects include information on costs and temporary employment. When information is provided on the number of permanently employed this refers to the situation at the point when the account was written and not the present situation.

As the labor market situation for the former LKAB-employees, who were supposed to get permanent employment as a result of the delegation's projects, is of such great interest a telephone survey was made at the end of August 1987. Here it is important to separate the question of whether the job still exists, i.e. whether the person continues to be employed by the subsidy-receiver, from the question of whether the person is employed at all. The description below aims at trying to answer both these questions.

All subsidy-receivers whose projects were intended to lead to the permanent employment of former LKAB-employees were contacted. Out of a total of 89 subsidy-receivers responsible for 98 projects which were supposed to produce 211 permanent jobs, we succeeded in getting usable answers from 82 who were responsible for 199 of the planned permanent jobs. Olle Westerlund was of invaluable help when the telephone survey was being carried out.
jobs. Hence the telephone survey covers 92% of the subsidy-receivers and 94% of the jobs. The question asked was:

How many former LKAB-employees are permanently employed (or the equivalent) by you today as a result of the project?

In total, 115 persons were, in fact, permanently employed or the equivalent, which corresponds to a decrease by 42% from the planned number. We do not have any systematic information on why 84 of the planned permanent jobs did not exist at the time of the survey. There are probably many different reasons. In some cases the employment never came about, other cases concern "new businesses"-projects that did not turn out to be economically sound. Furthermore some former LKAB-employees have quit at their own request. There are also a number of instances where appointments made on probation have not turned out to be mutually satisfactory.

The outcome for the "new businesses"-subsidies which are equal to unemployment benefit for six months, is slightly better than for the other projects with the object of creating permanent employment. Out of 26 planned jobs we obtained answers concerning 23. Of these 16 still existed. In other words, there has been a decrease of 30% from the planned number.

The meager total outcome may seem worrying. The result suggests the obvious hypothesis, that the labor market situation for the former LKAB-employees who had the opportunity to obtain permanent employment as a result of the delegation's projects, is not good. This is based on the assumption that the answer to the first question, the number of jobs in projects, is a good approximation of the answer to the second question, the over all labor market situation for those concerned.

It was revealed that the validity of the hypothesis could be tested in the following way. From the information contained in the Mfd files it was possible to identify 98 of the 211 persons under consideration. Consequently, it was possible with the aid of the surveys mentioned in Chapter 1, to get a grasp of this group's labor market situation in October 1986. The results are reported in Table 3.11.
Table 3.11 The labor market situation in October 1986 for the identified former LKAB-employees who had the opportunity to obtain permanent jobs.

<table>
<thead>
<tr>
<th>Labor market situation</th>
<th>Complete survey</th>
<th>Mini survey</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>full time</td>
<td>50</td>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>part time</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Relief work</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Training</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>7</td>
<td>65</td>
</tr>
<tr>
<td>Response rate</td>
<td>87 %</td>
<td>33 %</td>
<td>74 %</td>
</tr>
</tbody>
</table>

Remark: Ten of the identified persons were not included in the populations of the surveys. Hence the joint population consisted of 88 persons. Two of different types of questionnaires were distributed. A mini questionnaire, with only one question—the labor market situation, was sent to those who had not responded to the earlier surveys.

As is clear from the above table, almost all were in the labor force. The employment rate was 95 %, and hence the unemployment rate 5 %. It is, in other words, without doubt clear that the labor market situation for the former LKAB-employees who had the opportunity to obtain permanent employment is better than for the former LKAB-employees in general. At the same time it is important to stress that there are certain indications that the 65 persons, who constitute the basis for these conclusions, are not completely representative for all 211 persons. The difference between the groups may not be as significant as the table indicates. In the following econometric analysis it will be tested whether there is still a difference between the persons who had the opportunity to obtain permanent jobs and the rest of the former LKAB-employees, when controlling for differences in personal characteristics.

The labor market situation for the whole group is reported in Table 1.5.
The conclusion so far is, therefore, that only slightly more than half of the former LKAB-employees who had the opportunity to obtain permanent employment are actually employed by the projects, but nevertheless they have jobs. A couple of possible explanations are that these persons have been attractive for other employers or that they have been active in searching for new jobs. Instead of determining which explanation has the greatest validity, there is, in my view, another question which is of greater interest:

Can the reason for the comparably better labor market situation be found in personal characteristics already existing when the persons left LKAB, or in characteristics acquired during the period when the delegation operated?

The answer to the question is of interest because it will show whether the delegation has, through its projects, succeeded in improving these persons' knowledge and experience, and thus strengthening their position in the labor market. There also exists the possibility that the delegation - consciously or unconsciously - has succeeded in choosing people for the projects who already, from the beginning, had a strong position in the labor market.

Information on certain personal characteristics, which the delegation is very unlikely to have affected, can be found in the surveys. Among these are age, children, and level of education before the delegation started to operate. An econometric analysis can show whether these variables alone can explain the differences in labor market situation between persons who had the opportunity to obtain permanent employment and other former LKAB-employees. If this is the case, it is an indication that the delegation has chosen persons with a strong position on the labor market. If, on the other hand, the differences remain, even when age and education differences have been taken into consideration, it is not possible to determine whether the projects have given new knowledge and experience or if the explanations can be found in characteristics which were impossible to measure with the aid of the surveys.
Four different estimations of a so called logit-model have been made, one estimation for the labor market situation in March 1984, 1985, and 1986 respectively and one for the situation in October 1986. The reason why estimations for each point in time have been chosen in preference to a single estimation with time as one of the independent variables, is a wish to test whether the parameter estimates for the other independent variables are time invariant.

The choice of independent variables has, of course, been restricted to the information provided by the surveys. The variables chosen coincide with the ones used for the estimations of unemployment durations and unemployment risks for the former LKAB-employees reported in Ohlsson & Westerlund (1987), Chapter 4, and Engström et al. (1988). Finally, the choice of a logit model, instead of, for example, a probit model, is that the former is easier to use from a computational point of view while the cumulative normal probability function (used for probit models) is quite similar to the cumulative logistic probability function (used for logit models).

The results of the estimations are reported in Table 3.12. Starting from the estimation for the last point in time, the econometric analysis shows that the exogenous personal characteristics, which have been possible to measure, cannot alone explain the differences in labor market situation in October 1986, see also Figure 3.8. As is clear from both the table and the figure, the probability for a person, who has had the opportunity to obtain permanent employment in the projects, to be employed is higher than for the other former LKAB-employees. This difference is statistically significant.

The same applies for the situation in March 1986. The probability that a person, employed at some time in the projects, is employed is also higher than for the others at that time. The differences between the two groups at the earlier points in time are not statistically

15 The econometric analysis has been done by Lars Engström. The logit model belongs to the class of qualitative choice models, for a survey see Amemiya (1981).

16 The results of these estimations are discussed in subsection 4.1.1.
Table 3.12 Results of the estimations of logit-models for the probability of being employed on the open market compared to any other labor market state. Estimated coefficients and (asymptotic t-values).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Has had the opportunity to obtain permanent employment in the projects</td>
<td>0.50 (1.27)</td>
<td>0.35 (1.08)</td>
<td>1.29* (2.97)</td>
<td>2.01* (3.22)</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 -</td>
<td>0.74* (3.65)</td>
<td>0.52* (2.80)</td>
<td>0.56* (2.78)</td>
<td>0.87* (3.84)</td>
</tr>
<tr>
<td>Children younger than 18 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>comprehensive school</td>
<td>0.04 (0.12)</td>
<td>-0.39 (-1.47)</td>
<td>-0.10 (-0.36)</td>
<td>-0.39 (-1.28)</td>
</tr>
<tr>
<td>secondary school</td>
<td>0.40 (1.51)</td>
<td>-0.09 (-0.40)</td>
<td>0.02 (0.07)</td>
<td>0.11 (0.41)</td>
</tr>
<tr>
<td>university</td>
<td>0.48 (1.18)</td>
<td>-0.50 (-1.37)</td>
<td>0.10 (0.25)</td>
<td>1.25* (2.29)</td>
</tr>
<tr>
<td>Previous skilled position</td>
<td>1.27* (3.54)</td>
<td>0.86* (2.58)</td>
<td>0.75 (1.94)</td>
<td>0.07 (-0.18)</td>
</tr>
<tr>
<td>Previous establishment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the Kiruna Mine</td>
<td>-0.86* (3.34)</td>
<td>-0.83* (3.04)</td>
<td>-0.87* (2.92)</td>
<td>-0.86* (2.64)</td>
</tr>
<tr>
<td>the Svappavaara Mine</td>
<td>-1.56* (4.84)</td>
<td>-0.49 (1.49)</td>
<td>-0.32 (0.94)</td>
<td>-0.04 (-0.10)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.51 (-1.45)</td>
<td>0.97* (2.80)</td>
<td>1.11* (3.00)</td>
<td>1.36* (3.37)</td>
</tr>
<tr>
<td>Log of likelihood function</td>
<td>-347.9</td>
<td>-414.8</td>
<td>-376.5</td>
<td>-324.7</td>
</tr>
<tr>
<td>Number of observations</td>
<td>662</td>
<td>662</td>
<td>662</td>
<td>662</td>
</tr>
</tbody>
</table>

Remarks: The estimated constant is the estimation for a person who has not had the opportunity to be employed in permanent job-projects. The person is 30 - 39 years old, has no children, dropped out of comprehensive school, and held a non-skilled position at the Gällivare Mine before leaving LKAB.

Parameter estimations statistically significant at the 95 % level are indicated by *. 
Figure 3.8 The estimated probability that a person is employed at different points in time according to the logit-estimations.

Remarks: The probabilities above concern a person with certain characteristics. The person is 30-39 years old, has children, has graduated from secondary school. He or she had to leave a non-skilled position at the Kiruna Mine.

The estimated probabilities in the figure are calculated in the following way. An estimated index value \( \hat{Z}_i \) for person \( i \) can be calculated as

\[
\hat{Z}_i = \hat{a} + \mathbf{X}_i \hat{b}
\]

where \( \hat{a} \) is the estimated constant, \( \hat{b} \) is a column vector of parameter estimates for the independent (dummy) variables, and \( \mathbf{X}_i \) is a row vector of the values of person \( i \) for the independent (dummy) variables. The logit formulation implies

\[
\text{logit} \left( \hat{p}_i \right) = \hat{Z}_i \text{ or } \hat{p}_i = \frac{1}{1 + e^{-\hat{Z}_i}}
\]

where \( \hat{p}_i \) is the estimated probability of being employed on the open market for person \( i \).
significant. It is, however, worth noting that the estimate for the probability of those who have had the opportunity to obtain permanent employment in projects to be employed in March 1984 is lower than for the others. This difference is nevertheless not statistically significant.

Some comments concerning the other parameter estimates are also in order. Persons aged over 50 years have a significantly lower probability of being employed according to all four estimations. This is also true for persons who previously worked in the Kiruna Mine. The opposite applies for persons with children under 18 years old.

Some parameter estimates vary over time. The fact that a person had a skilled position at LKAB only seems to have a significantly positive impact on the probability of being employed at the first two points in time. On the other hand, a university degree only significantly affects the probability of being employed at the last point in time.

A possible interpretation of these econometric results is that the measurable personal characteristics can explain the employment differences in 1984 and 1985 but not the later differences. Are these explained by unmeasurable personal characteristics or the creation of the delegation? It is reasonable to expect that the effects of the unmeasurable personal characteristics should be as large - or as small - at all points in time. If this is so, then the explanation unmeasurable personal characteristics is inconsistent with the results of the estimations. However, the usual reservation concerning missing variables in the estimations should be made. It is possible that access to information for some important variable could produce different estimation results.

The effects of the delegation's efforts ought however to increase, at least during the studied period. It took a while before the projects aiming at permanent employment could be started in any significant number. Furthermore, it is reasonable to believe that it took some time for the former LKAB-employees employed in these projects, to acquire the knowledge and the experience that have later strengthened their labor market position compared to the others.
In other words, the conclusion is that the delegation, by means of the projects aiming at permanent employment, succeeded in improving the labor market situation of those affected. This does not only apply for those currently employed in the projects, but also for those who began to work in the projects and later left.
3.3 The Differences between Projects Decided Before and After July 1985

As mentioned earlier in Section 3.1, two thirds of the projects were decided before July 1985. An examination of the data base reveals that the distribution of total planned costs for the projects is the same, two thirds of the costs concern projects decided before July 1985. On the other hand, the planned subsidies are more unequally distributed. Slightly more than 80% of the subsidies are for projects approved before July 1985. This means that the subsidized share of costs has been considerably lower during the later period. This has, to a certain extent, been compensated by the conditional loans. Almost 60% of these concern projects approved during the later period. Nevertheless, the conclusion remains that the subsidy receivers have answered for a larger share themselves.

The perhaps most important difference between the periods concerns planned temporary employment. In principle, all this type of employment was planned in projects approved before July 1985. In the projects decided after this date, it has only been possible to find temporary employment corresponding to 45 months, or 1% of the total.

On the other hand, some of the later projects have, among other things, had the creation of permanent employment as an objective. About 15% of the total number of planned permanent jobs fall within these projects.

Turning to the distribution of costs according to type of expenditure, as is indirectly clear from the above said, the costs for assigned unemployed almost vanish during the later period. Investments increase their share of total costs markedly. Increases can also be noted for training costs and marketing costs.

The subsidies' distribution according to different types of expenditure gives a slightly different picture than that given by the costs. Here it shows that, in addition to training and marketing costs, the costs for intermediate goods and non-assigned labor also increase
their share of the subsidies. The investment share, on the other hand, decreases. The explanation for this is that the relation between subsidies and costs decreases more for investments than for other types of expenditure.

Concerning the projects' distribution according to type of subsidy-receiver, the central government projects have a larger share during the later period, regardless of whether the comparison is made between the share of costs, of subsidies, or of permanent employment. The opposite applies for company projects. Non-profit-making organizations decrease their shares of costs and subsidies, while local government projects and new businesses-projects keep their shares.

If, instead the comparison is made with regard to the projects' distribution according to location, the following results emerge. Kiruna's share increases regardless of which measure is used. With regard to costs and subsidies, this is at the expense of Malmfälten and the rest of Sweden.

Finally the projects' distribution according to branch of the economy is considered. The later period has meant lower shares for agriculture & forestry and mines & quarries, while the share for services is higher, regardless of the measure used. Manufacturing increases its share of the projects if we only consider costs and subsidies.

The most important differences between the projects decided before and after July 1985 may be summarized as follows. The latter projects are characterized by

1 that no temporary employment was planned,

2 that the share of subsidies in relation to costs is lower than for the earlier projects,

3 that the share of conditional loans in relation to costs is higher than for the earlier projects,
4 higher shares of total costs for investments, training, and marketing compared to the earlier projects,

5 higher shares of total subsidies for costs for intermediate goods and non-assigned labor, training and marketing, and lower share for investments compared to the earlier projects,

6 more central government projects and fewer company projects compared to the earlier projects,

7 more projects in Kiruna and fewer in Malmfälten and the rest of Sweden compared to the earlier projects,

8 more service projects and at the same time fewer in agriculture & forestry and mines & quarries.

The above differences seem to coincide relatively well to with the intentions of Parliament as manifested in the appropriation documents. The changes in the direction of the operations that were supposed to occur from July 1985, are reflected in the projects, at least as they were planned, by among other things the move away from temporary employment, high subsidies, and the branches agriculture & forestry and mines & quarries, and towards conditional loans, training, marketing, and investments.
In a pilot study (Engström et al. (1984)), the evaluation problem of the Malmfältsdelegation's relief works and special projects was formulated in the following way:

The problem is to try to determine, from economic variables, whether the relief works and special projects started as a consequence of the labor force reductions at LKAB have positive welfare as well as positive income effects for the program participants when compared with a situation in which traditional labor market policy measures were used or where no extra resources were put into labor market policy.¹

The pilot study also contains a working plan for the evaluation. The problem formulation and the working plan have guided the work presented in this section. The problem formulation also applies to labor market training. In order to determine the welfare and the income effects it is necessary to specify alternatives for comparisons. This is the subject of section 4.1. As is clear from the problem formulation two different alternatives to the actual course of events have been chosen. The starting point for the first alternative is that if the Malmfältsdelegation had not been set up then traditional labor market policy measures, with the regular labor market policy organization as an intermediary, would have been taken. As mentioned earlier, the parliamentary resolution gave the Malmfältsdelegation the authority to carry out traditional relief works as well as special projects. It is reasonable to suppose that some of the delegation's relief works (rw:s) would have been among the rw:s that would have been carried out in the first alternative course of events. The actual extent to which projects do not differ between the alternatives is also discussed in section 4.1.

¹ See Engström et al. (1984), p. 32.
The other alternative course of events assumes that no additional resources are put into labor market policy. In such a hypothetical situation the former LKAB-employees have to compete with other job-seekers for the regular resources. The amount of resources available for the regular employment services can be obtained from the County Employment Board's statistics. With the aid of these the likely consequences of the competition between former LKAB-employees and other job-seekers are discussed.

The income analysis is presented in section 4.2, and the welfare analysis in section 4.3. Both sections are based on the alternatives specified in the first section. The net effects of the job-creating measures of the Malmfältsdelegation depend on which alternative is chosen. If traditional measures had been put into effect, the difference between the projects of Mfd and the traditional measures equals the net effect of Mfd. The projects that would not have been brought about in the alternative course of events are, of course, of special interest. These alternative-differing projects represent the net effect of Mfd on the economy. Have these projects increased the incomes of former LKAB-employees? The income analysis aims at giving an answer to this question.

The object of the welfare analysis is to determine how the social welfare has been affected by the relief works and special projects of the delegation. The value of the increased production that these projects bring about is compared with the value of the inputs needed for this production.
4.1 The Alternatives

In the introduction to this chapter a problem formulation was set out in which, among other things, two alternative course of events were mentioned. These courses of events are aimed at representing the development that would have been registered, if the Malmfältsdelegation not had been set up. It is important to stress, that these two alternative courses of events are hypothetical. These constructions of thought are, however, necessary for a further analysis of the effects of the job-creating measures of Mfd. The alternative courses of events are constructed using a number of assumptions. These will continuously be stated in the presentation. The opening assumptions concern if and, in that case, to what extent labor market policy measures would have been taken if the Malmfältsdelegation had not been set up. Two different alternatives have been chosen:

- a course of events using traditional labor market policy measures - (measure-alternative),

- a course of events in which no extra resources were granted to labor market policy - (zero-alternative).

Suppose the latter had occurred. In a situation of this kind the whole volume of temporary employment of the Malmfältsdelegation's relief works and special projects would have to be considered as additions to the aggregate temporary employment generated by labor market policy measures. A corresponding type of reasoning can be made regarding both costs and subsidies. Table 4.1 is an attempt to illustrate the above reasoning. In the zero-alternative temporary employment, costs, and subsidies of job-creating measures would have corresponded to the volume of regular relief works actually carried out during the period. Since these actual regular measures are also assumed to have been carried out in the zero-alternative they are not alternative specific. On the other hand the costs and subsidies of the delegation's relief works and special projects add to the actual course of events. The difference between the actual total scale and the alternative total scale of the job-creating measures within the range of labor market policy consequently corresponds to the rw/sp:rs of Mfd.
Table 4.1 Actual Course of Events Compared with the Zero-alternative.

<table>
<thead>
<tr>
<th>Actual course of events</th>
<th>Alternative course of events, no additional resources</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular relief works</td>
<td>Regular relief works</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The relief works/special projects of the Malmfältsdlegation</td>
<td>The relief works/special projects of the Malmfältsdlegation</td>
<td></td>
</tr>
<tr>
<td>Total actual size of the job-creating measures within the range of labor market policy</td>
<td>Total alternative size of the job-creating measures within the range of labor market policy</td>
<td>Difference between actual and alternative size</td>
</tr>
</tbody>
</table>

A corresponding line of reasoning can be made concerning total temporary employment. However, there is an important complication in this case. The temporary employment in the projects of Mfd corresponds, in itself, to the difference in the volume of temporary employment between the alternatives. It is however difficult to imagine that the former LKAB-employees in the zero-alternative would not have been given any share of the temporary employment within regular relief works. Rather the former LKAB-employees would have, at least to some extent, crowded out others. This line of reasoning leads to the conclusion that the increase in job-creating measures which, according to Table 4.1, corresponds to the volume of temporary employment in the delegation's relief works and special projects, cannot only be regarded as having benefited the former LKAB-employees. For other potential participants in job-creating programs the possibilities of getting any share of the regular resources have increased as a result of the lack of competition from former LKAB-employees.
Table 4.2 Actual Course of Events Compared with the Measure-Alternative.

<table>
<thead>
<tr>
<th>Actual course of events</th>
<th>Alternative course of events, no additional resources</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular relief works</td>
<td>Regular relief works</td>
<td></td>
</tr>
<tr>
<td>+ The relief works and special projects of the Malmfältsdelegation</td>
<td>+ Traditional labor market policy</td>
<td>Rw/sp:s of Mfd</td>
</tr>
<tr>
<td></td>
<td>measures for former LKAB-employees</td>
<td>- traditional measures</td>
</tr>
<tr>
<td>Total actual size of job-creating measures</td>
<td>Total alternative size of the job creating measures</td>
<td>Difference between actual and alternative size</td>
</tr>
</tbody>
</table>

Further on in this section there is an attempt to more closely quantify the difference between the two alternatives in the table. However, it is appropriate to discuss first the implications of the other alternative course of events. If traditional labor market policy measures had been put into effect, costs, subsidies, and temporary employment would, of course, have been higher than what in fact has been possible to register for regular measures. Table 4.2 is an attempt to clarify this line of reasoning.

The difference between the actual course of events and this alternative course of events equals the difference between the delegation's job-creating measures and the traditional measures. This applies for the costs as well as for the subsidies. With regard to temporary employment, it is assumed that the former LKAB-employees would have been employed in the hypothetical traditional projects while other job-seekers, eligible for taking part in these measures, would have been employed within regular measures. Firstly, this assumption implies that the measures for other job-seekers do not differ between the alternatives. Secondly, the difference between the delegation's job-creating measures and the hypothetical traditional measures is equivalent to the effects for the former LKAB-employees.
One consequence of this division into former LKAB-employees and other job-seekers is that it is assumed that no competition would have arisen between these groups. This is one of the differences appearing when the actual course of events is compared with a measure-alternative instead of a zero-alternative. Another is that the net effect of the Malmfältsdelegation on costs, subsidies, and temporary employment is lower if the comparison is made with the measure-alternative. The reason for this is that an increase in the volume of labor market policy measures would, more or less, have taken place in the measure-alternative.

With this short introduction it is appropriate to begin with a discussion of the quantitative meaning of the zero-alternative and the measure-alternative respectively.

4.1.1 Potential Measure Group

If the actual course of events is compared with the zero-alternative, the costs and subsidies of the relief works and special projects of the delegation equal the difference between the alternatives. The same applies for the volume of total temporary employment. The problem is how this volume would have been distributed between former LKAB-employees and other job-seekers in the alternative. Table 4.3 may constitute the start of a discussion about this. From the table the numbers of unemployed, persons in relief works, and persons in labor market training in Kiruna, Gällivare, and Pajala can be seen.

The reader may wonder why Pajala has been included. The reason is that some of the employees who left the LKAB Mining Company moved to Pajala. Hence, the Malmfältsdelegation had, as mentioned in Chapter 1, employment office clerks at the Employment Office in Pajala. The main reason why former LKAB-employees moved to this area is that they originally came from Pajala. Some had moved to Kiruna or Gällivare to work at LKAB and others had commuted on a weekly basis. Obviously, these former LKAB-employees have to be included in the analysis.
Table 4.3 Potential Measure Group.

<table>
<thead>
<tr>
<th></th>
<th>former LKAB-employees,</th>
<th>other job-seekers,</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>months</td>
<td>%</td>
<td>months</td>
</tr>
<tr>
<td>unemployed</td>
<td>15 600</td>
<td>61</td>
<td>130 500</td>
</tr>
<tr>
<td>relief work</td>
<td>4 000</td>
<td>15</td>
<td>46 700</td>
</tr>
<tr>
<td>training</td>
<td>6 100</td>
<td>27</td>
<td>45 000</td>
</tr>
<tr>
<td>Total</td>
<td>25 600</td>
<td></td>
<td>222 200</td>
</tr>
</tbody>
</table>

Sources: Information concerning the former LKAB-employees, the County Employment Board and the polls (unemployed), the data base (relief work/special projects) and Mfd (training). The County Employment Board concerning other job-seekers.

Remark: The values in this table, as in the rest of this chapter, are appropriately rounded off.

In order to obtain, among other things, comparability with the earlier discussion in this chapter the available data have been converted to months of work. The conversion has been made so that data on the situation at the end of each month during the period August 1983 - June 1987 have been used for calculations of means. These means have then been multiplied by the number of months within the period.

The sum of job-seekers, persons in relief work, and persons in labor market training can be said to constitute the number of persons eligible for labor market policy measures. In this analysis I have chosen to label this group potential measure group. During the period under study, the total time spent in the potential measure group was slightly less than 248 000 months, see Table 4.3. The former LKAB-employees accounted for slightly less than 26 000 of these months. The time that persons from the three municipalities spent as unemployed amounted to slightly more than 146 000 months. Interestingly, it can be noted that the distribution between time spent job-seeking and time spent participating in measures is identical for the two groups, 60 %
and 40 % respectively. What separates the former LKAB-employees from the others is that the former have participated to a greater extent in labor market training, while the latter have participated to a larger extent in relief work.

The measure-alternative

It is, in this context, important to point out that the total time spent in the potential measure group this far has been taken as given. The comparisons are primarily aimed at illuminating the size of labor market policy measures. It would also have been possible to try to work out comparison alternatives for the employment exchange efforts. The analysis in Ohlsson & Westerlund (1987), Chapter 4, and Engström et al. (1988) can be regarded as a comparison of an actual outcome with a measure-alternative. It is of importance here to summarize the result of this analysis.²

The hypothesis was that the delegation had increased the possibilities of the former LKAB-employees to find new jobs. To test the hypothesis a comparison group was selected. This group consisted of men who registered for work at the regular employment exchanges in the inland of upper Norrland during the period August-October 1983, see Figure 4.1 which indicates the area from which the comparison group is drawn. A number of econometric estimations were made. These estimations were based on the questionnaire surveys. This approach permitted several variables concerning education, age, children, etc. to be held constant.

Here the permanent jobs, created as a result of the projects, come into the picture. In September 1987 slightly more than 100 of these remain. As regular relief works do not generate permanent jobs, the

² Lars Engström has performed the computational work. He also performed a previous version of this analysis, see Engström & Ohlsson (1985), Chapters 8 and 9.
100 jobs created will have to be taken into consideration. The total number of months in employment, up to July 1987, in the projects aiming at permanent employment, sum to slightly more than 3,000 months. The subsequent analysis is based on the assumption that these months would have been spent in the potential measure group, and not in employment, in a measure-alternative.

This assumption must be related to the above mentioned estimations. The results show that the average duration of unemployment does not differ. At first glance, the results of the estimation may seem inconsistent with the assumption concerning the time spent in the potential measure group in a measure-alternative.

However, the number of months spent in unemployment is dependent on both the duration of unemployment and the number of unemployment periods. The surveys and the estimations of a tobit-model for the number of unemployment periods suggest that the former LKAB-employees have had fewer unemployment periods than the comparison group. The estimations thus also indicate that the former LKAB-employees have been unemployed to a lesser extent than the comparison group. Hence the assumption that the delegation has created slightly more than 100 jobs is not incompatible with the results from the econometric analysis.

At the same time, it should be emphasized that the estimations are specified in such a way, that the results regarding possible differences in the duration of unemployment between the two groups, concern individuals with identical personal characteristics in other respects. The estimations imply, in other words, that one tries to determine whether being part of a certain group provides any further explanation of the differences in the duration of unemployment. At the same time, we know that the personal characteristics are not identi-

---

3 See Ohlsson & Westerlund (1987), Chapter 4 and Engström et al. (1987).
The program municipalities
The comparison region
The other municipalities

Figure 4.1 The counties of Norrbotten and Västerbotten with the program municipalities and the comparison region indicated.
If the former LKAB-employees have "favorable" characteristics, then the duration of their unemployment ought to be shorter than for the comparison group. On the other hand, the characteristics of the former LKAB-employees would have been the same if they had had to turn to the regular employment exchanges, instead of the delegation's.

The measure-alternative can be summarized as follows. This is a (hypothetical) alternative course of events in which additional funds were made available as in the actual course of events. The main difference is that these funds were allocated to the regular labor market authorities, which, in turn, used the funds for traditional measures to the same extent as for other job-seekers.

The Zero-Alternative

Regarding the zero-alternative it may, even more rightly, be asserted that the potential measure group would have been larger. The assumption of a constant potential measure group implies namely that the regular employment exchange in the zero-alternative would have been able to mediate as many (permanent) jobs as the Malmfältsdelegation and the regular employment exchanges together actually have mediated. At the same time it can be asserted that the labor market in Norrbotten is characterized by such a strong excess supply that the matching of unemployed and vacancies does not in itself constitute a major problem. It is the demand for labor that is the restriction. Given a certain labor demand, changes in the dimensioning of the employment exchange have little impact on the number of jobs mediated. Accordingly, the dimensioning would not affect the size of the potential measure group either. Instead, this is determined by the labor demand.

---

4 See further the analysis in Engström & Ohlsson (1985), chapter 13. This chapter is written by Bengt Kriström.
To be able to assume that the potential measure group is as large in the zero-alternative as in the actual course of events, an assumption that the labor demand is equal in both alternatives is needed. It is difficult to believe that the Malmfältsdelegation, with its after all limited target group, has been able directly to affect the labor demand in Norrbotten to any considerable extent. Nevertheless, there existed 100 permanent jobs in the delegation's projects in September 1987. It is therefore reasonable to take these jobs into account also when comparing with the zero-alternative. Hence, these are assumed to constitute the delegation's direct contribution to the labor demand in Norrbotten.

However, the reservation made above concerning the danger of underestimating the difference between the alternatives is even more important when comparing the actual course of events with the zero-alternative. This is so even when considering the permanent jobs. The reason is of course the greater difference in resources for labor market policy. These reservations have to be borne in mind in the remainder of the analysis.

The zero-alternative, on the other hand, is based on very restrictive assumptions. It is not unreasonable to believe that an employment exchange organization not receiving additional funds when facing an increase in the number in search of work to a greater extent than actually happened would have tried, to encourage migration. If such an objective would have been met, then this in turn would have meant a smaller potential measure group in the zero-alternative.

There is an additional factor affecting the size of the potential measure group. The time spent in this group can be viewed as the difference between time spent in the labor force and time employed. Hence, changes in the size of the labor force may also affect the potential measure group. Unfortunately, it has not been possible to make any empirical analysis of the labor supply effects of the Malm-
fältsdelegation's measures. Therefore it is assumed that the labor supply does not differ between the alternatives.

To sum up, the zero-alternative is really what the term suggests - an alternative with no additional funds, but also without labor supply effects, migration, and almost any labor demand effects.

4.1.2 Employment in the Zero-Alternative

Suppose that no additional measures would have been taken if the Malmöfältsdelegation not had been set up, i.e. that the zero-alternative had occurred. With regard to relief work, this would have meant that only 46 700 months would have been "disposable" for former LKAB-employees and other job-seekers, see Table 4.3.

The first assumption is that the competitiveness of former LKAB-employees would have led to a proportional reduction of the number of months in relief work. Out of the total time spent in relief work, 50 600 months, the share of former LKAB-employees' share was slightly less than 8%. Let us assume that these would also have obtained 8% of the volume of temporary employment, corresponding to about 3 700 months in the zero-alternative. The difference between the actual course of events and the zero-alternative is thus only 300 months. The complete effects on employment are as follows:

---

5 See Gramlich & Ysander (1981) where the possible wage displacement effects of relief works are discussed.
As is clear from the above figures, 3 000 months in permanent employment will have to be added in the actual course of events, while no such employment would have been created in the zero-alternative. Thus, the delegation’s job creating measures have, in total, given 3 300 months of additional employment for former LKAB-employees, compared to a zero-alternative based on proportional reduction. At the same time, it is clear that the creation of the Malmöfältsdelegation has brought about an increase in employment that has accrued primarily to other job-seekers.

Naturally, the specification of the zero-alternative is not without objections. The assumptions are of an ad hoc-character, in other words they are not based on any theory. A first natural objection against proportional reduction is the following:

For the group of other job-seekers, it holds that 21% of the potential measure group was in relief work, see Table 4.3. The corresponding number for former LKAB-employees was 15%. The proportional reduction leaves the relative difference between the groups unchanged. The question then becomes: Is it realistic to imagine that the probability that a former LKAB-employee was employed in relief works is lower than the probability for other job-seekers, if both groups turned to the same employment exchange organization?
Suppose that the probability that a person in the potential measure group obtains relief work is equal regardless of whether the person in question is a former LKAB-employee or not. This means that, since the "available" volume of temporary employment in the zero-alternative would have amounted to 46 700 months and the total time spent in the potential measure group - with the time in permanent employment added to the time spent in unemployment, in temporary employment, and in training - is 251 000 months, about 19% of the total time would have been time spent in relief work. The employment effects become:

<table>
<thead>
<tr>
<th></th>
<th>Actual course of event, months</th>
<th>Zero-alternative, months</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>other job-seekers</td>
<td>46 700</td>
<td>41 300</td>
<td>+ 5 300</td>
</tr>
<tr>
<td>former LKAB-employees, temporary</td>
<td>4 000</td>
<td>5 300</td>
<td>- 1 400</td>
</tr>
<tr>
<td></td>
<td>permanent</td>
<td>3 000</td>
<td>+ 3 000</td>
</tr>
<tr>
<td>total</td>
<td>53 600</td>
<td>46 700</td>
<td>+ 7 000</td>
</tr>
</tbody>
</table>

The implication of specifying the zero-alternative in this way is that the former LKAB-employees would have been more competitive than in the previous specification. This means that the former LKAB-employees in the actual course of events have spent fewer months in relief work than they would have done if the assumptions leading to this specification of the zero-alternative are valid. The tendency that it is above all the other job-seekers who have been able to increase the time in relief work is strengthened. At the same time the permanent employment for former LKAB-employees is added in the actual course of events.
4.1.3  Employment in the Measure-Alternative

Let us drop the assumption that no additional measures would have been taken if the Malmfältsdelegation not had been set up and instead assume that traditional measures would have been taken. If the alternative to the Malmfältsdelegation's measures had been increased traditional measures, it is, in this case, reasonable to assume that no competitive situation would have arisen between former LKAB-employees and other job-seekers over regular relief works. On the other hand, the problem of estimating what size of the traditional measures for the former LKAB-employees would have been is added.

By way of introduction the volume of temporary employment in the traditional measures is discussed. This way of reasoning presupposes that the necessary financial resources would have been available. The starting point in this case is also the share of the potential measure group that obtains relief work. During the period in question 20% of the total potential measure group in the comparison region was in relief work.6 The corresponding shares for the counties of Norrbotten and Västerbotten are to be found below:

<table>
<thead>
<tr>
<th>Share in relief work</th>
<th>Corresponding number of months for former LKAB-employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>the comparison region</td>
<td>20% 5 600</td>
</tr>
<tr>
<td>Norrbotten, excl. Mfd</td>
<td>18% 5 200</td>
</tr>
<tr>
<td>Västerbotten</td>
<td>14% 4 100</td>
</tr>
</tbody>
</table>

6 Here the same municipalities in Norrbotten and Västerbotten as before are included.
If these shares are applied to the group of former LKAB-employees, this will result in about 5 000 months independent of which region is used for the comparison. The difference in temporary employment that the creation of the Malmöfältsdelegation has meant according to this line of reasoning amounts to the following:

<table>
<thead>
<tr>
<th></th>
<th>Actual course of events, months</th>
<th>Measure-alternative, months</th>
<th>Difference, months</th>
</tr>
</thead>
<tbody>
<tr>
<td>the comparison region</td>
<td>4 000</td>
<td>5 600</td>
<td>- 1 600</td>
</tr>
<tr>
<td>in relation to Norrbotten</td>
<td>4 000</td>
<td>5 200</td>
<td>- 1 300</td>
</tr>
<tr>
<td>in relation to Västerbotten</td>
<td>4 000</td>
<td>4 100</td>
<td>- 100</td>
</tr>
</tbody>
</table>

Regardless of which region the comparison is related to, the number of months in relief work would have been higher than what has been possible to register in the actual course of events. With this notion of the approximate difference in temporary employment between the actual course of events and the measure-alternative it is time to focus the interest on costs and subsidies.

4.1.4 Costs and Subsidies

As indicated above, it is assumed that the necessary financial resources to realize the volume of temporary employment would have been available. What amount of resources would have been needed? There are two different sources of information available to answer to this question:

- costs and subsidies to the Mfd projects which can also be considered as being carried out in the measure-alternative,
- costs and subsidies for the regular relief works in Norrbotten.
If the first data source is used, the calculations imply that the delegation's relief works are assumed to have been possible to expand to an unchanged monthly resource-input up to the levels of the measure-alternatives. The underlying assumption in the case of the other data source is that the regular relief works in Norrbotten would have been possible to expand to an unchanged monthly input of resources.

Regarding the Malmfältsdelegation's job-creating measures, the projects that simultaneously fulfill the following criteria are also assumed to have been undertaken in the measure-alternative:

a. the project has been undertaken in Kiruna, Gällivare, or Pajala,

b. the Malmfältsdelegation has in its decision or in the project descriptions stated that the project is a relief work, in contrast to, for example, a special project.

There are 99 projects, with a total volume of temporary employment of about 2 420 months, which fulfill these criteria. The costs per month amount to SEK 35 700 while the subsidies per month amount to SEK 23 900. Most of these projects are accounted for. The actual cost per month is SEK 46 300 (18 missing observations) while the actual subsidy is SEK 29 300 (18 missing observations).

The problem associated with using these figures is that not all available information is utilized. No information is missing with regard to costs and subsidies. The 18 missing observations are due to the lack of employment data. If all available information on plans versus outcomes for costs, subsidies, and temporary employment respectively is used for forecasts on the total outcome, in all projects, for these three variables, the calculations of costs per month and subsidy per month can be made using more data. With this approach the costs per month can be computed to be SEK 41 500, while the subsidy per month is SEK 28 200.
In other words it is not possible to find actual projects with a total volume of temporary employment corresponding to that of the measure-alternative. This means that Mfd has partly used its resources for projects which could also be expected to have been undertaken in the measure-alternative. Other projects have, because of the more far-reaching authority of Mfd, been of such a character that they would not have kept within the framework of regular labor market policy. Among these are the projects aiming at permanent employment.

I assume that it would not have been possible to undertake these special projects in the measure-alternative. Instead the former LKAB-employees would have been offered temporary employment either in those projects which have been of a relief work character or in a number of relief works which have not been brought about in the actual course of events.

In order to be able to more closely specify the measure-alternative, it is necessary to "construct" a number of hypothetical projects. One way of doing this is to start from the costs per month and the subsidies per month of the delegation's relief works and assume that it would have been possible to start a number of additional projects for equal costs and subsidies. A reasonable guess is that this is an underestimation of the costs rather than an overestimation. This guess is based on the assumption that a subsidy-granting authority in any event does not choose to undertake more expensive projects before less expensive.

The assumptions concerning costs and subsidies in the alternative courses of events are critical. An underestimation implies that the differences in costs and subsidies, between actual and alternative course of events, are overestimated. Thus, the profitability of the actual course of events, compared to the alternative course of events, may be underestimated:
The volume temporary employment based on the situation in the comparison region, Norrbotten, and Västerbotten

<table>
<thead>
<tr>
<th></th>
<th>Costs, SEK million</th>
<th>Subsidies, SEK million</th>
<th>Temporary employment, months</th>
</tr>
</thead>
<tbody>
<tr>
<td>the comparison region</td>
<td>232</td>
<td>158</td>
<td>5 600</td>
</tr>
<tr>
<td>Norrbotten</td>
<td>217</td>
<td>148</td>
<td>5 200</td>
</tr>
<tr>
<td>Västerbotten</td>
<td>168</td>
<td>115</td>
<td>4 100</td>
</tr>
</tbody>
</table>

Costs as well as subsidies would, with these assumptions, have been about 50% lower than the actual costs and subsidies of the delegation's relief works and special projects. At the same time the temporary employment has been lower than in the measure-alternative. It is however important to bear in mind that there are development projects and projects aiming at permanent employment among the delegation's projects.

The regular relief works in Norrbotten during the fiscal years 1983/84 - 1985/86 show a total cost per month of SEK 38 600, which is slightly lower than the monthly cost for the relief works of Mfd. The subsidies per month are, however, lower than Mfd:s, SEK 20 300, compared with SEK 28 200. This is a reflection of the delegation's freedom to determine the scale of subsidization.

If the measure-alternative is based on the information on regular relief works, the costs and the subsidies would have been:

---

7 The information on regular relief works has been taken from the County Employment Board. In the calculations, projects concerning nursing have been excluded. The remaining projects concern the same objectives as those of Mfd.
The volume temporary employment based on the situation in

<table>
<thead>
<tr>
<th></th>
<th>Costs, SEK million</th>
<th>Subsidies, SEK million</th>
<th>Temporary employment, months</th>
</tr>
</thead>
<tbody>
<tr>
<td>the comparison region</td>
<td>221</td>
<td>128</td>
<td>5 600</td>
</tr>
<tr>
<td>Norrbotten</td>
<td>207</td>
<td>120</td>
<td>5 200</td>
</tr>
<tr>
<td>Västerbotten</td>
<td>162</td>
<td>96</td>
<td>4 100</td>
</tr>
</tbody>
</table>

A comparison shows that the costs of the delegation are approximately 5 % higher than if the measure-alternative is based on the costs of Norrbotten. The subsidies are 20 % higher.

The measure-alternative can be summarized in the following way. The volume of temporary employment would have been higher than in the actual course of events. The creation of the Malmfältsdelegation has meant a comparatively lower concentration on relief works. The actual course of events has, on the other hand, meant a concentration on permanent employment that would not have occurred at all in the measure-alternative. The sum of temporary and permanent employment, during the four years, in the actual course of events exceeds the temporary employment in the measure-alternative.

The costs as well as the subsidies would have been lower than those of the Malmfältsdelegation in the measure-alternative. The creation of the delegation has thus led to higher costs and subsidies.
4.2 The Effects on the Incomes of the Program Participants

The object of this section is, starting from the alternatives discussed in the previous section, to discuss the effects of the activities of the delegation on the incomes of former LKAB-employees. The presentation concentrates on the income turn-out during the four fiscal years 1983/84 - 1986/87.

The decision to concentrate interest on the short-run perspective is dictated more by access to data than that the short-run effects are more important than the long-run. The information on the wages of former LKAB-employees during temporary employment in relief works and special projects can be obtained from the accounts of the subsidy-receivers. For information on incomes after training, the Statistics Sweden's Register of Incomes and Assets has to be used. The inevitable time lags in these statistics are a problem. The assessed incomes for a certain income year do not become available until two years later. This means that the income statements for 1986 are not obtainable until 1988.

It is also important, in this context, to point out that the gross wage is only one of many determinants of disposable income. As the tax and transfer system is so large and complex it is difficult, not to say impossible, to determine whether, and, if so, by how much the disposable income increases due to a gross wage increase. Despite these reservations a gross wage increase is of course of interest. The short-run income consequences of different alternative actions, for example accepting relief work, are of course important for the individual's choice.

It is worth pointing out that the severance pay the former LKAB-employees obtained is not included in the calculations below. In the

---

8 In Axelsson (1986) there is a description of the relations between different concepts of income. Furthermore, there is an account of the data sources available. These numbers to 16, which illustrates the complexity of a complete estimate of changes in disposal income.
specification of the alternatives in the previous section it was implicitly assumed that LKAB would also have reduced its labor force in the alternative courses of events. Bearing this in mind, it is not unreasonable to assume that severance pay would also have been paid in these alternatives. The severance pay is not made alternative specific by these assumption, in other words it does not represent an extra contribution to income.

Furthermore it can be argued that the severance pay is a result of negotiations between LKAB and the trade unions, and not a result of the work of the delegation. This implies that even if severance pay had not been paid in the alternative courses of events it is questionable whether Mfd should be credited for the contribution that the severance pay would, in this case, constitute.

On the other hand, it is also possible to argue that the severance payments would have been higher if the delegation not had been set up. The presumption is that, in this situation, the trade unions would have demanded higher severance pay. The existence of arguments in favor of higher as well as lower severance pay constitutes another reason why these payments are excluded.

In the data base there are 164 accounted projects for which information is available on both paid gross wage to otherwise unemployed and the number of days of work. The average gross wage per day of work has been slightly more than SEK 410. This includes holiday pay, but not social security contributions or travel and daily allowances. The calculation is based on almost 2 000 months of temporary employment.
The municipalities and LKAB have been the subsidy-receivers which have paid the highest daily wages, SEK 440 and SEK 455 respectively. The "new businesses"-projects have, on the other hand, only offered a daily wage of about SEK 250, see Figure 4.2. LKAB and companies answer for more than 50% of the number of days of work. Thereafter follow local government, central government, and new businesses in descending order.

The "new businesses"-projects belong to the projects for which there are no cost accounts. The daily wage is therefore calculated from the subsidy. In addition, the business may of course generate a surplus that increases the income of the entrepreneur.
Figure 4.3 Daily wage according to Swedish Standard Industrial Classification of all Economic Activities (SNI).

Source: The data base.

If the material is distributed by branch (Figure 4.3), it is revealed that the highest daily wages have been paid in the construction branch and in the mining and quarrying branch. Figure 4.3 also shows that the lowest daily wages have been paid in the wholesale and retail trade branch. Construction has the largest number of days of work, followed by construction and mining.

Let us use the above reported average daily pay of SEK 410 as an estimation for all projects. For a person belonging to the potential measure group the alternatives to job-creating measures have been unemployment or labor market training.
Table 4.4 Unemployment benefit.

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Highest daily amount SEK</th>
<th>Minimum income for highest daily amount SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983/84</td>
<td>280</td>
<td>6 720</td>
</tr>
<tr>
<td>1984/85</td>
<td>300</td>
<td>7 200</td>
</tr>
<tr>
<td>1985/86</td>
<td>315</td>
<td>7 560</td>
</tr>
<tr>
<td>1986/87</td>
<td>360</td>
<td>8 640</td>
</tr>
</tbody>
</table>

Sources: Enclosure 12 to the Budget Bill, consecutively.

The unemployment benefits amount to eleven twelfths of the previous income. The compensation is, however, limited to a highest possible daily amount. The benefit has been raised during the period, see Table 4.4. This means that if the monthly gross income before unemployment was SEK 8 640 or more, then the unemployed person received SEK 280 a day during the fiscal year 1983/84 and SEK 300 a day the following fiscal year.10

The training allowances for participants in labor market training are dependent on whether the participants are entitled to compensation from a recognized unemployment insurance fund. If this is the case, a training allowance equivalent to the unemployment benefit is paid. Thus, for a participant with a previous monthly gross income of SEK 8 640 or more, the allowance has been in accordance with Table 4.4. The unemployment benefit and the training allowance are, however, not completely comparable with the daily gross wage as the latter includes holiday pay. The daily gross wage excluding holiday pay calculated from the data base has been slightly more than SEK 370.

10 The Miners' Recognized Unemployment Insurance fund has assisted with the necessary facts.
Table 4.5 Zero-Alternatives.

<table>
<thead>
<tr>
<th>Zero-alternative based on</th>
<th>Former I.KAR-employees, SEK million</th>
<th>Other job-seekers, SEK million</th>
</tr>
</thead>
<tbody>
<tr>
<td>proportional reduction</td>
<td>+ 5.7</td>
<td>+ 4.9</td>
</tr>
<tr>
<td>equivalent shares in relief work</td>
<td>+ 3.4</td>
<td>+ 7.1</td>
</tr>
</tbody>
</table>

In addition to these amounts, the Mfd training premium has to be added to the actual course of events. These amounted to SEK 1.2 million. The training premiums are a concrete result of the Malmfältsdelegation's authority to act more freely than the regular employment exchange organization.

Let us assume that everybody eligible for job-creating measures has been entitled to the highest possible unemployment benefit and training allowance. By connecting the temporary employment effects discussed in the previous section with the above amounts, the short-run income effects can be estimated as the results reported in Table 4.5 and Table 4.6.

If the actual course of events is compared with the zero-alternative, the job-creating measures of Mfd have increased total incomes by SEK 10.6 million. As is evident from Table 4.5, the largest share of these income increases falls on other job-seekers. In this context, it is important to bear in mind that the increase for the latter is caused by increases in temporary job-creating measures, while the income increases for the former are above all caused by the training premium (SEK 1.2 million), associated with the training measures and permanent employment (SEK 4 million).
Table 4.6 Measure-Alternatives.

<table>
<thead>
<tr>
<th>Measure-alternative based on the situation in</th>
<th>Former LKAB-employees, SEK million</th>
</tr>
</thead>
<tbody>
<tr>
<td>the comparison region</td>
<td>+ 3.1</td>
</tr>
<tr>
<td>Norrbotten</td>
<td>+ 3.5</td>
</tr>
<tr>
<td>Västerbotten</td>
<td>+ 5.1</td>
</tr>
</tbody>
</table>

If the actual course of events is compared with the measure-alternative, the incomes of former LKAB-employees from temporary employment are lower than or equal to those in the alternatives. In total, however, the training premiums and the permanent employment also lead to higher incomes for the former LKAB-employees in this comparison, see Table 4.6.

The conclusion is that the Malmfältsdelegations labor market policy measures have, in the short-run, increased the incomes of former LKAB-employees. At the same time, other job-seekers in Malmfälten have been spared from competition and thus to a greater extent benefited from the job-creating measures, which in turn has lead to income increases.

If the objectives for the delegation's work were ambitious, this small, but nevertheless positive, outcome may be disappointing. Such a conclusion could possibly be too hasty. Firstly the measures may have positive long-run income effects as a result of training as well as permanent employment. Furthermore, the measures may also have other positive short-run effects, for instance in the form of the social contacts that a job gives. Another effect of these measures, that can be positively interpreted from the individual's perspective, is that they have meant that persons running the risk of the expiration of their entitlement to unemployment benefits have been eligible once more to receive compensation from the unemployment insurance funds.
At the same time, however, the results of the calculations imply that if the objective was to increase the incomes of the former LKAB-employees by labor market policy measures in the short-run, then it has been fulfilled. However, the average income increase is not particularly high. Taking the whole group of former LKAB-employees into account, it is in the interval SEK 1 500 - 3 000.
4.3 The Welfare Outcome

In the introduction to this chapter the object of the welfare analysis was formulated as determining in what way the social welfare has been affected by the relief works and special projects of the Malmfälts-delegation. On first reflection, a natural reaction is to study in what way the delegation has affected the total incomes in Sweden. However, such an approach may lead in the wrong direction.

The overall objective of a cost-benefit analysis is to try to determine whether the value of the change in the total production exceeds the value of the change in the total input of resources needed for the change in total production. The concepts value, total production, and total input of resources, are essential in this context. The concept value contains a price component as well as a quantity component. In a cost-benefit analysis the price shall correspond to the value that the households attach to the access to an additional unit. In some cases this value corresponds to an actual financial transaction between households and firms, in other cases not. This is one of the reasons why the total income approach may lead in the wrong direction. It is not unusual that the households' consumption does not correspond to a direct payment. Publicly produced goods and services can, for the most part, be consumed without direct payment and thus without directly affecting incomes. Accordingly, it would be unreasonable to draw the conclusion that publicly produced goods and services have no value on the basis of this.

The quantity component is also important. What is of interest here is the change in the quantity of goods and services available to the households and the change in the quantity of resources needed. If a certain project, which in itself is profitable, neither affects the total quantity of the produced good nor the total input of resources then the cost-benefit result is zero.

The procedure of a cost-benefit analysis can be divided in a number of phases. The first of these is to specify the comparison alternatives, which was the subject of section 4.1. In this case it is a question of
appraising the cost-benefit effects of the delegation's relief works and special projects compared with alternative courses of events.

The second phase is to try to determine the difference between actual and alternative courses of events, partly with regard to the direct quantities of different goods and services, and partly the quantitative input of resources. The comparison can, in this case, be made by means of the data base and the earlier discussion on alternatives. This is done in subsection 4.3.1.

The objective of the third phase is to evaluate in what way the direct production and input increases affect total production and total input of resources. This evaluation relies on some kind of notion of how interaction takes place between individual firms, individual households, and the public sector. The notion includes the conditions for interaction as well as the forms it takes and its outcome. A more concrete manifestation of such a notion is a mathematical model which formalizes the mode of operation of the economy. In this study the starting point has been the relatively small model, presented in Chapter 2, which despite its simplicity resembles, in the essential points, the economic conditions in which the Malmfältsdelegation has had to work.

Very briefly the most important results of these derivations can be said to be the following. Firstly, the market situation on the market where output is sold is of vital importance. Is the output sold on a world market or a home market? In the latter case it is also important whether the market is in equilibrium or whether excess supply or excess demand is prevailing.

The importance of the market situation can be illustrated by a couple of examples. Increased production of a good sold on a world market may, beyond the direct effects, give rise to positive multiplier-effects. These effects are income-induced, i.e. export production will increase income thus giving rise to increased demand for home goods. On the other hand, increased production of a non-traded good for which excess supply prevails may leave total production unchanged as a
result of the complete crowding-out of other producers. In the latter case no net benefits will arise.

In the case of public goods there are no markets where financial transactions between buyers and sellers take place. Here it is of importance whether it is firms or households that benefit from the increased provision of public goods.

The other important result is that the way of financing an increased production also affects the cost-benefit outcome. In the model it is assumed that the public sector manages the financing by taxation. However, taxation can be made in different ways. Income taxation in any of the regions is a possibility. Another is income taxation in both regions. The cost-benefit outcome is dependent on which type of taxation is chosen. Here it is assumed that the cost of the labor market program in Malmfälten is financed by the rest of the country. The operationalization of the cost-benefit rules derived in Chapter 2 is discussed in subsection 4.3.2.

In order to be able to carry out an empirical application of the model-results the relief works and special projects of the delegation will have to be classified according to which type of good the project contributes to the production of. Furthermore information on the market situation for the sale of the goods is needed.

In an ideal situation it is obvious which type of good is produced; the researcher has access to extensive information about all markets where the output is sold, thus making it possible to determine, for each market, whether equilibrium, excess supply, or excess demand prevails. With these results the theoretical model could be used for a cost-benefit analysis. Unfortunately, such an ideal state does not exist here.

Instead the empirical work has proceeded as follows. Using the information in the files as guidance, I have tried to determine whether the project has been aimed at producing private goods or public goods. In the case of projects of an investment character, the classification
has been made according to the type of production that the investment contributes to and not the direct investment. An example may clarify the principle. Road investments have, in this perspective, not been seen as increased production of the good/service construction which is a private good. Instead road investments have been seen as increased production of the service road-transport which is not a fully private good.

In the next step the projects in which private goods are produced have been classified according to whether the sale has taken place on a local market, a national market, or an international market. The empirical classification is intended to correspond to production of northern non-traded goods, southern non-traded goods, and export goods, respectively, in the theoretical model. This division has also been made with the aid of the information contained in the files. The empirical classification of goods with local markets may seem inconsistent with the markets for northern non-traded goods in the theoretical model. The reason for this is that the theoretical model is specified in such a way that the northern non-traded goods are demanded by all households in the country.

However, the empirical classification was simplified if a distinction was made between local and national markets instead of markets for northern and southern goods. As will be clear from the discussion below, the analysis will include the possibility of the rest of the country demanding local goods.

Projects leading to production of public goods have been classified according to whether it is firms or households which have benefited. In those cases in which it has not been possible to determine who has benefited, the production has been classified as other public goods.

A collection and econometric processing of information on all markets concerned would, of course, have been a fruitful complement to the information provided by the project files. Bearing in mind the large number of markets that are affected by the relief works and special projects, the volume of information needed on each of these for a
meaningful econometric analysis and given the time available for this study, I considered that the possible gains in precision were not in proportion to the work involved, which would have been at the expense of other parts of this evaluation.

The fourth and final step in the cost-benefit analysis, which can be found in subsections 4.3.3 and 4.3.4, is to weight all the quantitative changes in the production of goods/services and the input of resources together with a common standard. This standard is money and the weights are a set of prices, usually termed shadow prices. These shadow prices are intended to measure the households' valuation of supply of an additional unit of a certain good/service. With regard to factors of production, the shadow prices should measure the loss that the households feel they make by giving up an additional unit of a factor of production. In the case of intermediate goods, the shadow prices should measure the opportunity costs of using these resources. If actual market prices exist, these may in many cases correspond to the valuation of the households, and thus constitute appropriate estimations of shadow prices.

Problems arise when the market prices can be assumed to be bad measures of household valuation or when no market prices whatsoever exist. In these cases some kind of indirect method has to be used in empirical applications. ¹¹

4.3.1 The Direct Differences: costs, subsidies, and temporary employment

Let us now move on to the second phase of the analysis, the difference between the direct quantities in the actual and alternative courses of events. If the relief works and special projects are distributed according to the type of good to be produced, the following emerges:

¹¹ In Johansson (1987), Chapter 7, there is a review of a number of such indirect techniques.
Projects with the object of increased production of goods and services with an international market answer for about 25% of costs as well as subsidies, see Figure 4.4. These projects contribute to almost half the temporary employment. Projects with a national market have a considerably lower employment share compared with the cost and subsidy shares. The opposite applies for projects whose production is intended for the local market. The shares of costs and subsidies are considerably lower for these projects than the employment share.

The idea is that the cost-benefit rule for traded goods derived in chapter 2, equation (25), will be applied to projects with an international market. Projects with a national market will be evaluated using the rule for southern non-traded goods, equation (26), while the rule for northern non-traded goods, equation (24), will be utilized when dealing with local market-projects.

**Figure 4.4** Costs, subsidies, and employment distributed according to type of market.

Source: The data base.
Within the group public goods, projects with the object of producing public goods benefiting households answer for the largest shares. For all three measures the shares are in the interval 10-20%. Public goods benefiting firms have shares of about 5%. The category other public goods projects includes the projects that contribute to, for example, knowledge-expansion. Thus it is not possible to assign these to either households or firms.

It has been impossible to classify about 20% of the costs and the subsidies. In reality only one project of importance is concealed by this - Malmfältens Finans. The reason why it has not been possible to classify Malmfältens Finans is that the company is involved in different types of activities.

If Malmfältens Finans is excluded, it appears that projects aiming at production of private goods, regardless of whether assessment is based on costs, subsidies, or temporary employment, answer for about two thirds of the total activity. Consequently production of public goods is the objective of the remaining third of the activity.

This emphasis on private goods is accentuated if the planned permanent employment is studied. All these projects concern, in principle, production of private goods, slightly more than a third in projects with national markets and slightly less than a third in projects with international markets.

In the following presentation the discussion will start from a measure-alternative based on the situation in the comparison region. When the presentation reaches the cost-benefit outcome, the outcomes of the other alternative courses of events will also be accounted for.

The values given for employment, costs, and subsidies refer to the outcomes and not the plans. In the case of projects not yet accounted for it has been assumed that the outcome in relation to the plan coincides with the corresponding relation for projects accounted for.
Table 4.7 Employment in the Actual Course of Events and in the Measure-Alternative.

<table>
<thead>
<tr>
<th></th>
<th>Actual course of events</th>
<th>Measure-alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>temporary employment</td>
<td>3 970</td>
<td>5 600</td>
</tr>
<tr>
<td>permanent employment</td>
<td>3 010</td>
<td></td>
</tr>
<tr>
<td>minus relief works carried out in both courses of events</td>
<td>6 980</td>
<td>5 600</td>
</tr>
<tr>
<td>remaining number of months</td>
<td>1 740</td>
<td>1 740</td>
</tr>
</tbody>
</table>

Moreover, Malmfältens Finans has been excluded from the calculations. There are two reasons for this. Firstly, the company has so far only partly invested its capital in different projects. Secondly, some of the investments are projects subsidized by the delegation. This implies that an inclusion of Malmfältens Finans would lead to double counting.

If the actual course of events is compared with the zero-alternative all projects give rise to direct increases in production and input of resources. The different types of markets are affected roughly in accordance with the relative scale shown in Figure 4.4. The picture becomes completely different if the comparison is made with the measure-alternative. Table 4.7 illustrates the way in which the problem can be posed. The reasoning is based on temporary employment as this would have been the primary objective in the measure-alternative.

Out of the total 7 000 actual months, 4 000 months are the result of temporary measures and the rest come from permanent employment projects. If the measure-alternative had been in force, the temporary employment would have comprised 5 600 months. Among the Mfd projects there are a number which could also be assumed to have been carried
Table 4.8 Employment, Costs, and Subsidies in the Actual Course of Events and in the Measure-Alternative.

<table>
<thead>
<tr>
<th>Actual course of events</th>
<th>Measure-alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment, months</td>
<td>5 240</td>
</tr>
<tr>
<td>Costs, SEK million</td>
<td>319</td>
</tr>
<tr>
<td>Subsidies, SEK million</td>
<td>149</td>
</tr>
<tr>
<td>Costs for assigned unemployed, SEK million</td>
<td>72</td>
</tr>
</tbody>
</table>

\(^a\) Costs and subsidies based on the Malmfältsdelegation's relief work.
\(^b\) Costs and subsidies based on regular relief works in Norrbotten.

out in the alternative. As these projects are not alternative-specific, they ought to be excluded. They do not contribute to any changes in either production or input of resources.

After this exclusion, projects corresponding to slightly more than 5 200 months remain in the actual course of events. In addition, all other projects carried out during these fiscal years but which have had objectives other than creating temporary or permanent employment remain. In the cost-benefit analysis the two types of projects will be compared with a number of hypothetical projects for former LKAR-employees, in the measure-alternative, which correspond to 3 900 months.

The volume of these projects, measured in costs, subsidies, and employment, is evident from Table 4.8. The activity of the Malmfältsdelegation has involved an increase in costs and subsidies compared with the measure-alternative as a result of the projects with other objectives than employment. The consequence of the delegation's opportunities to subsidization beyond the regular subsidy-shares clearly emerges when studying the volume of subsidies in the measure-
The Actual Course of Events versus the Measure-Alternative.

<table>
<thead>
<tr>
<th>Actual course of events</th>
<th>Measure-alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td><strong>Private goods</strong></td>
<td></td>
</tr>
<tr>
<td>International market</td>
<td>90</td>
</tr>
<tr>
<td>National market</td>
<td>108</td>
</tr>
<tr>
<td>Local market</td>
<td>61</td>
</tr>
<tr>
<td><strong>Public goods</strong></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>9</td>
</tr>
<tr>
<td>Firms</td>
<td>14</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
</tr>
<tr>
<td><strong>Impossible to classify</strong></td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>319</td>
</tr>
</tbody>
</table>

It is reasonable to assume that the subsidies of the measure-alternative would have been about SEK 78 million instead of SEK 109 million, as unconstrained subsidization is an important feature of the Malmfältsdelegation. The costs and subsidies of the measure-alternative have been determined in the following way:

The costs are assumed to have been SEK 160 million. They are, in other words, assumed to have corresponded to those of the delegation. The subsidy share for regular relief-works is 52%. If the subsidy share is assumed to have been as high in the measure-alternative the subsidies would have been SEK 84 million.

The next problem is the following: How had the production in the measure-alternative been distributed according to different types of
Table 4.10 Difference Between the Actual Course of Events and the Measure-Alternative.

<table>
<thead>
<tr>
<th>Costs</th>
<th>Subsidies</th>
<th>Costs, assigned</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private goods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International market</td>
<td>53</td>
<td>31</td>
<td>18</td>
</tr>
<tr>
<td>National market</td>
<td>106</td>
<td>52</td>
<td>19</td>
</tr>
<tr>
<td>Local market</td>
<td>57</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td><strong>Public goods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>-67</td>
<td>-35</td>
<td>-16</td>
</tr>
<tr>
<td>Firms</td>
<td>-11</td>
<td>-9</td>
<td>-5</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>2</td>
<td>-4</td>
</tr>
<tr>
<td><strong>Impossible to classify</strong></td>
<td>10</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td>65</td>
<td>33</td>
</tr>
</tbody>
</table>

goods? In the absence of this information for regular relief works, the answer to the question can only start out from the distribution of the delegation's relief works. If these are "scaled up" to cover the 3,900 months of the measure-alternative the results reported in Table 4.9 and Table 4.10 appear. From the latter it is evident that the Mfd projects have contributed, to a larger extent, to the production of private goods than would have been the case if the measure-alternative had occurred.

The values shown in Table 4.10 are the basis for the cost-benefit analysis of the actual course of events compared with a measure-alternative based on the situation in the comparison region. It is now possible to consider this analysis.
4.3.2 Operationalization of the Cost-Benefit Rules

In general the operationalization of the cost-benefit rules is dependent on the actual empirical problem. By using the definitions and the equilibrium conditions from the model presented in Chapter 2, the rules summarized in Table 2.1 can be rewritten in a number of ways. However, before this can be done some problems have to be dealt with.

The first problem has to do with the fact that the rules presented in Chapter 2 are based on the assumption that labor is the only variable input. More specifically, increased employment in North is assumed to concern otherwise unemployed. In reality, however, there are many variable inputs. In a first best economy without public goods the shadow prices coincide with the market prices if the public budget is balanced by lump-sum transactions. If the provision of public consumption goods and public intermediate goods are initially optimal, this also holds when there are public goods in the model.

In this empirical application I assume that the economy, although not working in a first best-way, functions so that all inputs except otherwise unemployed labor can be treated as if the monetary values of the direct and indirect welfare costs of increased utilization coincide with the actual costs. The marginal willingness to pay for output appears in the rules, see for example the term \( p_t dx_t \) in equation (25). In the empirical application the terms capturing willingness to pay for output can be interpreted as the net of actual marginal willingness to pay for output and the marginal monetary valuation of inputs except otherwise unemployed labor.

This net value can be viewed as a kind of value added measure where otherwise unemployed labor and capital are factors. All other inputs, including otherwise employed labor, are treated as intermediate goods. Instead of trying to determine, on one hand, the marginal

12 See for example Boadway (1975).
13 Compare Samuelson (1954) and Sandmo (1972).
willingness to pay for output and, on the other, the marginal valuation of inputs (factors and intermediate goods), the net shadow revenue, defined as the net value discussed above, is first determined. This is then put in relation to marginal valuation of otherwise unemployed labor.

The second problem has to do with possible changes in prices due to changes in public production and employment. In the following analysis it will be assumed that flexible prices are unaffected by the projects. There are several ways of justifying this assumption. The scale of the labor market program under study is very small when compared with the entire Swedish economy. Given this, it is not very likely that prices will change to any considerable extent. Moreover, there is no empirical information available that permits an analysis of the size and the welfare effects of price changes.

The third problem concerns the changes in investment of firms perceiving sales constraints. According to the theoretical model, an increase in sales will induce these firms to reduce investment, see Appendix I. There is, however, no empirical information available to quantify these effects. Hence the operationalized rules will be derived using the assumption that investment will remain unchanged. Nevertheless, some comments on the qualitative impact of these investment effects on welfare will be made below.

In addition, no data has been available to determine how the households in Norrbotten change their demand for private goods when the provision of public goods changes. Hence, I have been forced to regard this demand as being independent of public goods provision. Furthermore, it has not been possible, in the empirical work, to separate public goods affecting traded goods production from public goods affecting non-traded goods production. The projects aimed at increasing production possibilities have all been treated as affecting non-traded goods production.

When rewriting the rules I have regarded it as desirable to try to reduce the number of variables. Furthermore, it is desirable to write
the rules in terms of intuitively meaningful variables. Finally, the transformation of the rules has to be made with the available empirical data in mind. To start with, the following definitions are introduced:

$DW$ monetary measure of welfare change (empirical counterpart to $\delta W$ in Chapter 2)

$NSR_i$ net shadow revenue, increased production of good $i$ (corresponds to, for example, $p_t^i dx_t^i$)

$SMC_i$ shadow marginal cost for increased employment of otherwise unemployed labor producing good $i$ (corresponds to $\hat{w}_1^N dl_1^q$)

$MC_i$ marginal cost for increased employment of otherwise unemployed labor producing good $i$, (corresponds to $w_1^N dl_1^q$)

$SLS_{nn}$ shadow marginal cost for otherwise unemployed in relation to net shadow revenue for private production of non-traded goods in Norrbotten, i.e. shadow labor share of "shadow value added", (corresponds to $smc_{11}/p_1^N$)

$MPC_j$ marginal propensity to consume non-traded goods produced in Norrbotten, household $j$, (corresponds to $p_1^{nxjn}$)

$GMM$ goods market multiplier, the market for non-traded goods produced in Norrbotten, $GMM = 1/(1-MPC^n)$

$\Gamma_i$ the indirect marginal product of labor when producing public goods improving the production possibilities of good $i$ in relation to the direct marginal product of labor producing good $i$, (corresponds to $F_i^q F_{nn}^{nz}/F_i^{nn}$)

$S^i$ subsidy to public production of good $i$, $\Sigma S_i^i = S$, (note that the subsidy defined here corresponds to the negative of lump-sum transfers to the southern household ($T^S$) in the model)
Table 4.11 The Transformed Cost-Benefit Rules.

Private Goods

international markets  \[ DW = NSR^t - SMC^t + (1 - SLS^{nn})GMM \cdot MPC^n \cdot NSR^t \] (25')

national markets  \[ DW = NSR^s - SMC^s + (1 - SLS^{nn})GMM \cdot MPC^n \cdot NSR^s \] (26')

local markets  \[ DW = NSR^n - SMC^n - (1 - SLS^{nn}) \cdot NSR^n \] (24')

Public Goods

affecting household utility  \[ DW = NSR^{zu} - SMC^{zu} \] (38')

affecting production possibilities  \[ DW = - SMC^{zi} + SMC^{zi} \cdot F_i \] i = t and nt (40')

Financing  \[ DW = (1 - SLS^{nn}) \cdot GMM \cdot (MPC^n - MPC^s) \cdot S \] (27')

With the aid of these definitions, the rules in Table 2.1 can be written as presented in Table 4.11. Some comments can be made with regard to the rules in the table. The direct changes in production and employment of goods with an international market (NSR^t and SMC^t represent the valuations of these changes) are supplemented by a multiplier-process on the local markets. Hence the total changes are larger than the direct, see rule (25').
The model shows that, in the case of private goods with a national market, the direct changes in production and input of resources will give rise to multiplier effects, see rule \( (26') \). The results for private goods with a local market are interesting, the total production and input of resources remain almost unchanged. The increase in direct production leads to decreases for other producers. If no differences in productivities exist then the increase in input of resources also corresponds to an equivalent decrease in input of resources for other producers. In this case rule \( (24') \) in the table will yield a zero result.

Relief works are traditionally concentrated on the production of public goods. This means that the actual course of events has lead to a lower production of public goods than in the measure-alternative. According to the theoretical model, changes in direct production of public goods for households do not cause any indirect effects if the households consider private and public goods as independent. The direct change is equivalent to the total both with regard to production and input of resources. As previously mentioned, lack of data has forced me to treat public and private goods as independent, the rule used is \( (38') \).

With regard to public goods for firms the results are considerably different, see rule \( (40') \). It is assumed that the production of private goods remains unchanged. On the other hand, it is likely that the input of resources changes. If the initial provision of public goods is low, increased provision may involve a reduction of the total input of resources. This happens when the firms' input reduction, made possible by more public goods, exceeds the input of resources needed for the production of public goods \((F^i < 1)\). In that case, an increased production of public goods is desirable from a cost-benefit point of view.

However, it is fully conceivable that the input of resources for production of public goods is larger than the input reductions in the firms \((F^i > 1)\). Since, in that case, the total input of resources in
creases, the cost-benefit outcome is negative. Given that public goods are provided free of charge and that the other inputs burden the firms with regard to costs, increased provision of public goods is desirable from the firms' point of view regardless of the cost-benefit outcome. An important issue in the empirical application is, therefore, whether increased provision of public goods for firms in the program-region, with respect to the initial provision, can be expected to give such input savings that the total input of resources decreases.

Finally, the financing of the direct changes in production and employment will also affect the local markets in Norrbotten as this implies a transfer to Norrbotten from the rest of the country. The welfare effects of this are captured by the term at the bottom of Table 4.11. In order to obtain the complete cost-benefit result, the value of this term should be added to the values obtained when applying the rules in the table.

4.3.3 Estimation of Net Shadow Revenue

With this short account of the operationalization of the rules from the theoretical model presented in Chapter 2, the presentation can now consider the concrete cost-benefit effects of Mfd's projects.

The calculations are based on the assumption that the assigned unemployed would have been unemployed in the alternative courses of events, while non-assigned labor in the projects would also have been employed in the alternative courses of events. The formal distinction between those employed in projects is, in other words, assumed to coincide with the labor market situation in the alternative courses of events.

As was clear from Table 4.10, the difference in subsidies ($S^1$) between the two courses of events amounts to SFK 65 million. The costs for

14 Compare the discussion in subsection 3.2.2.
otherwise unemployed (MC) are SEK 33 million higher in the actual course of events. Unfortunately, it is not possible to directly obtain information on the difference in net shadow revenue (NSR) between the courses of events. On the other hand, the differences in subsidies and costs for otherwise unemployed can be used to make an estimation of the minimum value.

The reasoning behind this can be illustrated in the following way. Suppose a subsidy is granted to a certain receiver. There are stipulations concerning employment of otherwise unemployed associated with this subsidy. If the subsidy-receiver estimates that the net present value of revenues and other costs exceeds the net present value of the costs for otherwise unemployed and the subsidy, then the project will be carried out. On the other hand, if the present value of net revenue is lower than the present value of net cost for otherwise unemployed then the project will not be carried out.

The problem for a potential subsidy-receiver is to determine whether the present value of a project, including an offered subsidy, is positive. The project will be undertaken if

\[
\text{present value} = \text{revenue, } - \text{costs for otherwise unemployed, present value - other costs, + subsidy } > 0
\]

This inequality can be manipulated to yield

\[
\text{revenue, - other costs, } > \text{costs for otherwise unemployed, present value - subsidy}
\]

It is important to stress that the above inequality concerns specific projects. The projects are regarded as being marginal increases of the regular activities of the subsidy-receiver. In other words, it is assumed that the size of a certain project is marginal when compared with the regular activities.
It should also be remembered that the terms measuring shadow value added in Table 4.11 (NSR) should be interpreted as the net of marginal willingness to pay for output and the marginal valuation of inputs except otherwise unemployed labor. Using an analogy, the left hand side of the above inequality may be seen as a corresponding net value for a specific project.

Regarding the right hand side, the values of the costs for the otherwise unemployed and the subsidy may be obtained from the data base. Hence, these values provide a minimum value of the marginal willingness to pay for and the marginal revenue of increased production of a certain project. Combining the above results yields for an arbitrary project $k$

$$\text{NSR}_k^k > \text{MC}_k^k - s_k$$

For projects with production intended for international markets, the net costs for otherwise unemployed (costs for otherwise unemployed - subsidies), according to Table 4.10, amount to SEK -13 million, (18 - 31). The net shadow revenues, according to the above reasoning, are therefore at lowest SEK -13 million. This amount corresponds to the minimum level of the net value of changes in production and in input of resources apart from otherwise unemployed labor.

In the case of projects with production intended for the national market the minimum value of the net shadow revenue is SEK -33 million, (19 - 52). The corresponding value for projects with a local market is positive, SEK 1 million, (21 - 20). This means that the value of the direct production difference with regard to private goods is greater or equal to SEK -45 million, - (13 + 33 - 1).

---

15 Note that the rule (24′) in Table 4.11 concerns the total effects. As direct changes in production will cause crowding-out, the total production will not change.
turning to public goods. If the projects aimed at the production of public goods for households are added together with projects producing other public goods, a minimum value of the net shadow revenue of SEK 13 million emerges - see Table 4.10. A corresponding calculation can, of course, be made with regard to the projects concerned with producing public goods for firms. This shows a minimum level of SEK 4 million. However, the production of public goods for firms does not directly affect the households. This is reflected in rule (40'), Table 4.11, by the fact that no net shadow revenue appears in the rule.

Summing these estimates of shadow value added, excluding public goods for firms, yields a minimum net shadow revenue of SEK -32 million (Σ NR Si, i = t, s, n and zu). The values of the remaining variables in the cost-benefit rules are discussed in next subsection.

4.3.4 The Total Welfare Effects

When applying the cost-benefit rules, the values of some variables can be obtained from the data base (for example S i); a number of values may be approximated by behavioral assumptions (such as NR i); and a few have to have values assigned more or less ad hoc (compare the assumption of no welfare effects of changes in the labor supply in the rest of the country). However, there remain a number of variables in the rules not yet discussed. These are

- the propensity of Norrbotten to consume local goods, (MPC N ) and consequently the goods market multiplier (GMM),
- the propensity of the rest of the country to consume goods produced in Norrbotten (MPC R)
- the relationship between the net shadow revenue of the increased production and the shadow value of the labor input needed for this production by firms in Norrbotten producing for the local market (S SR i,
whether or not increased provision of public goods for firms leads to labor-savings ($r^1$),

Several calculations have been made with different values assigned to these factors. The values assigned were

\[
\text{MPC}^n = 0.4, 0.5, \text{and } 0.6
\]

\[
\text{MPC}^s = 0.0, 0.02, \text{and } 0.04.
\]

\[
\text{SLS}^nn = 0, 0.5, \text{and } 0.75.
\]

\[
F^i = 0.5, 1, \text{and } 1.5.
\]

The reasoning behind these values is the following with regard to the propensity to consume local goods. In Anderstig & Lundberg (1978) regional accounts for Norrbotten are presented. These accounts concern production and consumption 1975. The value of final private and public consumption and investments from local production in relation to total value added in industries (including private services but excluding public services) is about 50%. Hence, I have chosen to impute values for the marginal propensity to consume local goods in the neighborhood of this average propensity.

The value added in Norrbotten 1975 was about 3% of total value added in Sweden. The imputed values for the propensity of the rest of the country to consume goods produced in Norrbotten have been set with this in mind.

The imputed values for the shadow value of labor input in relation to the net shadow revenue vary between 0.0 and 0.75. The former value should be applied if the time of otherwise unemployed is considered as being without value. The implications of this will be discussed further on. The reasoning behind the latter value is, firstly, that the shadow wage for otherwise unemployed coincides with the market wage rate. Secondly, it is assumed that the wage share of value added is 0.75. The choice not to impute a maximum value of 1 is based on the idea that no production will take place without compensation to capital. However, the value 0.75 is of course arbitrary.
Finally, the imputed values for the relation between the indirect marginal product of labor when producing public goods for private firms and the direct marginal product of labor employed in private firms. If labor is equally productive regardless of whether it is employed in private or public production the variable $F_X$'s value is unity. I have also chosen to use a value greater than unity and another less than unity in the simulations. By way of introduction it can be said that this variable has a marginal effect on the simulation results.

Furthermore, it holds that the higher the marginal propensity to consume local goods, the more positive indirect effects. This also holds the greater the difference is between the marginal willingness to pay for the increased production and the shadow value of labor input. On the other hand, the positive indirect effects become lower the higher the marginal propensity of the rest of the country to consume goods produced in Norrbotten.

If it had been possible to quantify the negative impact of increased sales on the investment of firms perceiving sales constraints, the imputed values for the goods market multiplier would have been lower. Moreover, the imputed values for the shadow value of labor input in relation to net shadow revenue would have been higher. Hence the absolute values of the welfare effects, apart from net shadow revenue and shadow marginal costs would have been lower – see also Table 4.11.

If the values of all the terms, except the ones capturing shadow value added and shadow marginal cost for otherwise unemployed labor, are summed the indirect welfare effects are obtained. The values of these indirect effects vary between SEK 4 and SEK 75 million depending on which values are assigned.

So far no consideration has been paid to the input of otherwise unemployed labor. This input is about 1 400 months higher in the actual course of events compared with the measure-alternative. The value of this difference ($\sum SMC_i$) depends on what this labor force would have been employed with instead.
If the former LKAB-employees had not worked then it is a question of the value of decreased leisure, amounting to about 1,400 months. What is the value of this loss of leisure? In some cases it is argued that the value of the leisure time of the unemployed is zero. At the same time this assumption indirectly implies that the time of the unemployed is without value. To be more precise, the unemployed are worthless, we may just as well employ them in a project as let them stay at home.¹⁶

Let us assume that the unemployed value their time to an amount corresponding to the unemployment benefit. This means that the unemployed, faced with a choice between unemployment and, for example, a relief work giving an income lower than the unemployment benefit, will choose the former. The assumption also implies that decreased leisure amounting to 1,400 months has a positive value of slightly more than SEK 9 million.

As is clear from Table 4.12 the cost-benefit result is greater or equal to SEK -43 million, -(32 + 9 + 2). In the table there are two entries not yet discussed. The first of these deals with the projects' cost for intermediate goods and otherwise employed labor. In the calculations, the market prices for these inputs have been assumed to represent the shadow prices. If the relevant shadow prices are lower than the market prices the costs may have been overestimated. The overestimation in that case affects the calculations in two ways. Firstly, the minimum values of the net shadow revenue (NSR₁) may be higher than those reported above. Secondly, the positive indirect effects may be underestimated. Taken together this implies that the result should possibly be credited with a positive value.

Moreover, no consideration has been given to possible cost-benefit effects of permanent employment from July 1987. If those employed in these projects, up to this point in time, would also in an alternative

¹⁶ An example of the absurd implications of an assumption that leisure has no value can be found in Johansson & Löfgren (1980), p. 38.
Table 4.12 Cost-Benefit Results: actual course of events compared with a measure-alternative based on the situation in the comparison region, SEK million.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net shadow revenue ( (\Sigma NSR^1) )</td>
<td>&gt; -32</td>
</tr>
<tr>
<td>Shadow cost for the time of otherwise unemployed ( (\Sigma SMC^1) )</td>
<td>-9</td>
</tr>
<tr>
<td>Indirect welfare effects</td>
<td>-2 - + 26</td>
</tr>
<tr>
<td>Overestimation of the shadow costs for intermediate goods</td>
<td>&gt; 0</td>
</tr>
<tr>
<td>The cost-benefit results of permanent jobs from July 1987</td>
<td>0 - + 16</td>
</tr>
<tr>
<td>Total</td>
<td>&gt; -43</td>
</tr>
</tbody>
</table>

course of events have been unemployed after this point, the creation of the delegation has had additional effects. The production will be higher, the employment of otherwise unemployed will also be higher and the cost-benefit result will be more positive. It is however impossible today to determine whether this will be so in the future.

Nevertheless, in order to get an understanding of the approximate magnitude of a possible long-run cost-benefit effect of permanent employment the following calculation can be made. Suppose that the growth in employment for those given the opportunity to obtain permanent jobs would, without these jobs have been equal to the growth in employment for the other former LKAB-employees. The value of the difference between these courses of events, discounted to present value at 5% real interest, with an infinite time horizon, and with the difference between the net shadow revenue and the shadow cost of otherwise unemployed taken into consideration, is SEK 16 million. This value will have to be regarded as being rather on the high side as, among other things, the econometrical estimations suggest that the growth in employment for those given the opportunity to obtain permanent employment, even without these would have been rather better than for the other former LKAB-employees.
Table 4.13 Cost-Benefit Results: actual course of events compared with a measure-alternative based on the situation in Västerbotten, SEK million.

<table>
<thead>
<tr>
<th>Category</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net shadow revenue (Σ NSR₁)</td>
<td>&gt;</td>
<td>- 46</td>
</tr>
<tr>
<td>Shadow cost for the otherwise unemployed</td>
<td></td>
<td>- 19</td>
</tr>
<tr>
<td>(Σ SMC₁)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect welfare effects</td>
<td>+ 4</td>
<td>-</td>
</tr>
<tr>
<td>Overestimation of the shadow costs for intermediate goods</td>
<td>&gt;</td>
<td>0</td>
</tr>
<tr>
<td>The cost-benefit results of permanent jobs from July 1987</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>&gt;</td>
<td>- 61</td>
</tr>
</tbody>
</table>

The cost-benefit result is difficult to judge. Suppose that the indirect welfare effects amount to SEK 20 million. The possibly positive effects of the uncertain entries will only have to amount to SEK 20 million for the cost-benefit result to become positive. It is not unlikely that this is the case.

If the scale of relief work in the measure-alternative is based on the situation in Norrbotten instead of the comparison region, the results do not differ in any essential way from the results summarized in Table 4.12. One of the basic reasons for this is that the measure-alternative based on the situation in Norrbotten with regard to the volume of temporary employment does not deviate considerably from the measure-alternative based on the situation in the comparison region.

For the same reason the calculation-results become different if the situation in Västerbotten forms the starting-point for the measure-alternative. In Table 4.13 the calculation-results obtained with this assumption are summarized. The most important difference in comparison
Table 4.14 Difference Between the Actual Course of Events and the Zero-Alternative.

<table>
<thead>
<tr>
<th></th>
<th>Costs</th>
<th>Subsidies</th>
<th>Costs, assigned</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private goods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International market</td>
<td>107</td>
<td>58</td>
<td>29</td>
<td>2 270</td>
</tr>
<tr>
<td>National market</td>
<td>108</td>
<td>53</td>
<td>20</td>
<td>1 530</td>
</tr>
<tr>
<td>Local market</td>
<td>63</td>
<td>24</td>
<td>25</td>
<td>1 930</td>
</tr>
<tr>
<td><strong>Public goods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>44</td>
<td>29</td>
<td>10</td>
<td>770</td>
</tr>
<tr>
<td>Firms</td>
<td>26</td>
<td>14</td>
<td>4</td>
<td>320</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
<td>15</td>
<td>2</td>
<td>130</td>
</tr>
<tr>
<td><strong>Impossible to classify</strong></td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>391</td>
<td>198</td>
<td>90</td>
<td>6 980</td>
</tr>
</tbody>
</table>

with the previous calculation is that the indirect effects may be considerably more positive. If these are assumed to amount to SEK 50 million, then it is necessary for the uncertain entries to give an overall net contribution of SEK 15 million for the cost-benefit result to be positive.

Let us turn to the cost-benefit appraisal of the actual course of events compared with the zero-alternative. Note that the rules to be used when comparing with this alternative do not differ from those used when comparing with the measure-alternatives. However, the differences in costs, subsidies, and employment are, of course, larger. Hence, the values from the calculations differ from those previously reported. As was clear from the discussion in section 4.1 the difference between these courses of events corresponds to all relief works and special projects of the Malmfältsdelegation. In Table 4.14 the distribution of costs, subsidies, costs for assigned and employment is given for different types of markets.
Table 4.15  The Cost-Benefit Results: actual course of events compared with the zero-alternative, SEK million.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net shadow revenue ( \sum_{i} NSR^i )</td>
<td>( \geq -95 )</td>
</tr>
<tr>
<td>Shadow cost for the time of otherwise unemployed ( \sum_{i} SMC^i )</td>
<td>( -46 )</td>
</tr>
<tr>
<td>Indirect welfare effects</td>
<td>(+20 ) (+207)</td>
</tr>
<tr>
<td>Overestimation of the shadow costs for intermediate goods</td>
<td>( \geq 0 )</td>
</tr>
<tr>
<td>The cost-benefit results of permanent jobs after July 1987</td>
<td>( 0 ) (-16)</td>
</tr>
<tr>
<td>Total</td>
<td>( \geq -121 )</td>
</tr>
</tbody>
</table>

The distribution of temporary employment between former LKAR-employees and other job-seekers is of no importance for the analysis. Regardless of how this distribution would have turned out, the delegation's projects form the difference compared with the zero-alternative.

The minimum net shadow revenue \( \sum_{i} NSR^i \) amounts to SEK \(-95\) million, see Table 4.15. As the differences between the courses of events in subsidies and costs for otherwise unemployed are considerably larger in this comparison than if the actual course of events is compared with the measure-alternative, the indirect welfare effects here become much greater. The values of these effects vary between SEK 20 million and SEK 207 million.

The shadow cost for the time of former LKAR-employees \( \sum_{i} SMC^i \) is, if calculated according to the same methods as above, SEK \(46\) million. Summing yields an overall cost-benefit result of no less than SEK \(-121\) million. However, this negative outcome may well be neutralized by positive indirect effects. Note that it is not necessary to assign the most favorable values for the result according to propensities to consume etc. to obtain a break-even result.
4.3.5 Summary

The cost-benefit calculations can be summarized in the following way. The results are uncertain because all necessary information has not been available. This problem is not, in itself, uncommon in cost-benefit analysis. The results reported in this section will therefore have to be interpreted with care.

My interpretation of the results is the following. In the prevailing situation in Malmfälten, it was probably economically reasonable to take job-creating measures. This was due more to the, in general, expansive effects of the measures than the profitability of the projects. The Malmfältsdelegation's relief works and special projects have basically constituted a financial transfer to Malmfälten and Norrbotten from the rest of the country. Compared with a situation without such a transfer, the incomes in Malmfälten have become higher. This has meant that the over-all economic activity in Malmfälten has been higher than otherwise would have been the case. In the calculations, this is reflected in the positive indirect welfare effects.

This injection had, however, been possible to bring about by other economic policy measures. An increase in regular relief works would also have had an expansive effect. This is emphasized by the calculations. The net of the indirect welfare effects are smaller if the actual course of events is compared with the alternative in which the regular relief works had been increased rather than if the comparison is made with a situation in which no increases were made in the regular measures.

As other examples of possible expansive measures can be mentioned increased governmental grants to the municipalities associated with a demand for decreases in local taxes and a geographical extension of the exemption from paying social security contributions, currently in effect in Svappavaara, to the whole of Malmfälten. This interpretation is strengthened by the fact that the possibly positive cost-benefit
result of the delegation's measures compared with increased regular relief works is very uncertain. In brief, it was economically desirable to take measures, but whether the Malmö delegation projects have given the highest possible cost-benefit result is questionable.
CONCLUSIONS

5.1 Summary of the Results

The job-creating measures of the Malmfältsdelegation during the fiscal years 1983/84 - 1986/87 can be summarized in the following way. The costs for the projects amount to SEK 557 million. The costs for intermediate goods and non-assigned labor are higher than the costs for otherwise unemployed labor.

With regard to the subsidies, in total SEK 265 million, the amount intended for intermediate goods and non-assigned labor is as large as the amount intended for otherwise unemployed.

The projects have provided temporary employment for assigned unemployed during almost 5 000 months. Temporary employment reached a peak in the middle of the period. Moreover, projects providing almost 200 permanent jobs for assigned unemployed were planned. In addition, the projects have involved temporary employment of non-assigned labor during 1 250 months.

About half of the projects have been performed within companies. Geographically, the projects have been concentrated to the two program municipalities. However, more projects have taken place in Kiruna than in Gällivare.

The branch of the economy with most projects has been construction. Thereafter follow mines and quarries, manufacturing, and finally commissioned work.

With regard to occupations, the assigned unemployed have, above all, been employed in mining and quarrying, manufacturing, and machine maintenance. About two thirds of the projects have concerned the production of private goods, while the rest have meant production of public goods.
An inspection of costs per month of temporary employment of assigned employed shows that local government authorities are the subsidy-receivers with the most expensive projects. With regard to branch, projects concerning construction are the most expensive. The projects in Gällivare have, in this sense, been more expensive than those in Kiruna.

On the other hand, central government authorities have obtained the highest subsidies in relation to costs. With regard to branch, projects within services have obtained the highest subsidy-share. The highest daily wages for assigned unemployed have been paid by local government authorities and by LKAB.

The above results concern the planned projects. For about two thirds of the projects it has been possible to obtain information on the actual outcome. A comparison of plans and outcomes shows that the actual costs and subsidies are lower than the preliminary. This is especially true for costs and subsidies regarding assigned unemployed. On the other hand the actual costs and subsidies for intermediate goods and non-assigned labor are only slightly lower than the preliminary.

These results are a reflection of the fact that actual temporary employment has been lower than planned. Moreover, this decrease concerns the assigned unemployed to a larger extent than non-assigned labor. About half of the planned permanent jobs remain. The persons, about 100, who have left permanent jobs have other jobs today.

Parliament's direction for the operations were changed from July 1985. This is also reflected in the projects. The projects after this point in time meant, as intended, no temporary employment, lower subsidies, and more emphasis on job training and marketing.

What effects have these job-creating measures had? The answer to this question depends on what would have happened if the Malmfältsdelegation not had been set up. The effects of the Malmfältsdelegation are the difference between the actual course of events and the economic development taking place during a course of events without the delegation.
Two hypothetical alternative courses of events have been specified and used in this study. The starting-point for the first of these is that traditional labor market policy measures would have been implemented. Moreover, it is supposed that job-creating measures for former LKAB-employees would have been organized to the same extent as the actual dimensioning for other job-seekers in northern Sweden during this period.

A comparison between the actual course of events and an alternative built on the above assumptions shows that no significant differences in the number of months in labor market policy measures can be found. Hence the creation of the delegation has not led to more labor market policy measures. However, Mfd has offered considerably less temporary employment and more employment in projects aimed at creating permanent jobs. At the same time, costs and subsidies for the delegation's measures, especially the projects, have been higher than the costs and subsidies for the regular measures.

With regard to incomes for former LKAB-employees, these have been slightly higher in the actual course of events. This is, above all, due to the delegation's training premiums and to the permanent employment projects.

The actual course of events has meant higher production of private goods and lower production of public goods compared with the alternative. The welfare outcome of these differences is difficult to judge. On one hand the direct welfare effects, i.e. the effects of production and employment in the projects, are likely to be negative. On the other the indirect welfare effects, due to economic expansion in northern Sweden, are likely to be positive.

The summarizing conclusion is that the actual course of events does not show any significant differences compared with a hypothetical alternative implying increased regular labor market policy measures. However, a reservation concerning the long-run effects of permanent jobs as well as training has to be made. Obviously, it has not been possible to study these and it is possible that these place the actual course of events ahead of the alternative.
The starting-point for the other hypothetical alternative course of events is that no increase in labor market policy measures would have been made. Hence, the former LKAB-employees would have competed with other job-seekers in northern Sweden for available relief works and training. A comparison between the actual course of events and this alternative shows that all Mfd measures have constituted additions to the regular measures.

With regard to time spent in the various measures, it is the other job-seekers in northern Sweden who have benefited considerably more as they, in the actual course of events, have not had to compete with the former LKAB-employees. The latter have also gained, but not as much.

The picture is the same with regard to incomes, other job-seekers have gained more than the former LKAB-employees.

The welfare outcome is that the direct welfare effects are likely to be negative and the indirect welfare effects are likely to be positive. However, the positive indirect effects are larger than when the actual course of event is compared with the other alternative course of events.

Hence, the summarizing conclusion from this comparison is that the actual course of events has implied a better level of economic development than a course of events without any additional labor market policy measures. The gainers have been the other job-seekers in northern Sweden rather than the former LKAB-employees.

Thus the overall conclusion is that labor market policy measures can improve a situation like the one in the program municipalities during this period. However, the Malmöfält delegation's measures have not shown results superior to regular labor market policy measures.
5.2 Directions for Future Research

There are several problems, emerging in connection with the subject of this study, to be dealt with in future research. The first group of problems concerns the effects of the Malmfältsdelegation's activities. As indicated in the present text, the analysis is mostly based on actual values of the studied variables when these are available and estimates of these variables otherwise. It is possible to wait for all the projects to be accounted for thus enabling the analysis to be based entirely on actual values. However, it is not likely that this will add any qualitatively new results. There is instead a more interesting problem.

It is of great interest with regard to permanent employment whether the permanent jobs will continue in the long run. This issue is more important to address when examining for the effects of the delegation.

The focus of the second group of problems is the evaluation of temporary labor market programs in general. A methodological question is: To what extent are the methods used in this study generally applicable? Moreover, what are the theoretical gaps preventing a more general application of these methods? Empirically, there are now several temporary programs in effect. These programs are being evaluated. However, the present policy seems to be that almost every large, geographically concentrated, reduction in employment should be counteracted by a temporary program. As the process of industrial change will continue, there will be new temporary programs to be evaluated in the future.

The third group of problems concerns regular relief works in general. One of their objectives is to be part of a stabilization policy. Hence, projects planned for the future are started earlier in the form of relief works. This is one of the reasons why theoretical models, explicitly incorporating intertemporal aspects, are needed for an analysis of regular relief works. Moreover, many relief works concern investments. This accentuates the need for an intertemporal approach. Another aspect is that the volume of job-creating measures, apart from
short-run effects, may also affect the economy at later dates. These long-run effects are of course important, for instance, when evaluating relief works.

Research in the disequilibrium tradition has developed in different directions. For example, the analysis has been widened to incorporate intertemporal aspects, see for example Neary & Stiglitz (1983) and Johansson & Löfgren (1987a). In Johansson & Löfgren (1987b) these ideas are used deriving explicit cost-benefit rules. These rules may well be adapted to an analysis of job-creating measures. Thus, it is possible to study the short-run as well as the long-run effects of, for example, relief works on production, employment, and welfare.

Another extension is to explicitly include intermediate goods in the analysis. The possibility of allowing for a more realistic specification of inputs would, of course, give a richer (but also more complex) understanding of the spill-over effects of job-creating measures. Furthermore, analysis may be extended in its specification of the public sector. Most regular relief works have central and local government authorities as subsidy-receivers. This raises the question of whether the work performed within relief works would otherwise have been done by regular employees. Gramlich & Ysander (1981) calls this the grant displacement effect. By introducing more than one public body into the model, grant displacement effects may be studied within the disequilibrium context.

Slightly more than SEK 21 000 million is allocated to the Swedish Ministry of Labor for the fiscal year 1987/88. This is about 6% of the total expenditure in the Government Budget. During the last quarter of 1987 on average 160 000 persons in Sweden were employed in labor market policy measures such as relief work, training, and sheltered work. This is not an insignificant number when compared with the size of the labor force, slightly more than 4.4 million, and total employment, slightly more than 4.3 million. The present volume alone of the labor market policy, very briefly illustrated by the above figures, stresses the importance of continuous research within this area.
APPENDIX I: Derivation of price changes in systems of equilibrium conditions for markets which clear through price adjustments.

General discussion

Suppose there are \( m + 1 \) markets, the first \( m \) with only one private producer. Furthermore there are two households. The \( m \) independent equilibrium conditions are

\[
X^n(Y^n, p) + X^n(Y^n, p) = x(p) + x^q
\]  

(I:1)

where \( Y^i = Y^i + p^i \) is exogenous income of household \( i \), \( p \) is a vector of prices, and \( x^q \) is a vector of public production. Differentiation of (I:1), using Hotelling's lemma, yields

\[
\left[ \frac{\delta X^S}{\delta Y^S} + \frac{\delta X^S}{\delta Y^S} \cdot s + \frac{\delta X^n}{\delta Y^n} \cdot n - \frac{\delta x}{\delta p} \right] dp = dx^q - \frac{\delta X^S}{\delta Y^S} dT^S - \frac{\delta X^n}{\delta Y^n} dT^n
\]  

m x m  m x 1  m x 1  m x 1  m x 1

(I:2)

The dimensions of vectors and matrices are indicated. Let \( E \) represent the \( m \times m \) matrix of derivatives of excess demands with respect to price. Assuming that all \( x \) are gross substitutes, so that all diagonal elements of \( E \) are negative and all off-diagonal elements are non-negative it is possible to sign the price changes due to changes in public production and lump-sum transactions. The assumptions imply

\[
|E_{ii}|/|E| < 0 \quad i = 1, ..., m
\]

\[
|E_{ij}|/|E| < 0 \quad i \text{ and } j = 1, ..., m, \quad i \neq j
\]  

(I:3)

1 Bondway (1975) has been of great help when preparing this appendix.
where $|E|$ is the determinant of $E$ and $|E_{ij}|$ is the $ij$:th cofactor of $E$.

Cramer's rule can be used to solve (1:2) for price changes. Starting with changes in public production, the price changes are

$$ dp_k = \frac{|E_k|}{|E|} \, dx^k \quad k = 1, \ldots, m \quad (1:4) $$

where $|E_k|$ is the determinant $|E|$ where the $k$:th column in this case is replaced by a column consisting of unity values. Expanding the determinant $|E_k|$ yields

$$ |E_k| = \sum_{i=1}^{m} |E_{ik}| \quad (1:5) $$

Combining (1:4) and (1:5), and using (1:3), gives the result that all prices of goods will decrease if public production of good $k$ is increased. If factor markets are specified as the "negative" of goods markets, this implies that factor prices will increase.

$$ dp_k = \sum_{i=1}^{m} \frac{|E_{ik}|}{|E|} \, dx^k < 0 \quad k = 1, \ldots, m $$

If the lump-sum transactions to the northern household are increased Cramer's rule gives

$$ dp_k = \frac{|E_k|}{|E|} \, dT^n \quad k = 1, \ldots, m \quad (1:6) $$

where $|E_k|$ is the determinant $|E|$ where the $k$:th column in this case is replaced by a column consisting of $-\delta X^i / \delta Y^n$, $i = 1, \ldots, m$. Expanding yields
Assuming all goods to be normal, prices of all goods will increase.

\[ |E_k| = - \sum_{i=1}^{m} \frac{\delta X_n}{\delta Y_n} |E_{ik}| \]  

(I:7)

Obviously, these qualitative results are also valid if the lump-sum-transactions are made with the southern instead of the northern household.

The chapter 2 model

In the model discussed in chapter 2 there are four types of markets:

(i) markets for traded goods with given international prices,
(ii) two domestic markets with fixed prices,
(iii) domestic markets with flexible prices, and
(iv) a numeraire good market, namely the market for wealth.

When studying the spill-over effects of changes in public production, the concentration is placed on the market for northern non-traded goods during the first period. The changes on the first period northern labor market follow recursively from the above mentioned goods market.

There are, however, spill-over effects from type (iii)-markets to the first period northern non-traded goods market. These effects are due to price changes on the markets with flexible prices.

It is assumed that the utility functions have the properties that first period northern non-traded goods and labor are additively separable from other goods and labor. This implies that changes in the restrictions on northern non-traded goods \((X_n^1)\) and labor \((I_l^1)\) will
only have income effects on demand. Hence, these changes may be treated in the same way as changes in lump-sum transactions.

The following discussion is based on the assumptions that (a) the public budget is balanced by lump-sum transactions in North, and (b) these transactions depend solely on public production and employment. Changes in the income argument in the behavioral functions of the northern household can be rewritten in the following way

\[
dI^n + d\pi^n + w^*_1dI^n = p_ex^n - w^*_n dI^n + w^*_{1q}dI^n + p^n_d x^n + p^n_d I^n + \\
+ (x^n + x^q)dp - (l^n + l^q)dw^n
\]  

(1:8)

The values of the first three terms are policy determined, while the value of the fourth is determined on the first period northern non-traded goods market. The values of the last two terms are determined on type (iii) markets. But how about changes in first period private investment in the production of northern non-traded goods? The first period investment function for this constrained firm is

\[
I^n_1 = I^n_1(x^n_1, p^n_2, w^n_1, w^n_2)
\]  

(1:9)

where the signs of the partial derivatives are indicated below. The income term can be expressed in terms of policy parameters, quantity constraints, and prices by differentiating (1:9) and substituting into (1:8).

If all goods are gross substitutes and the effects of prices on first period northern private investment in production of non-traded goods are sufficiently small, then all elements in a matrix E for all type (iii) markets will have the same signs as before.
In this case the system corresponding to (I:2) consists of the equilibrium condition for first period northern non-traded goods and \( m \) equilibrium conditions for type (iii) markets. The differentiated version of the system can be written

\[
F \begin{bmatrix}
\frac{dx_1}{dp} \\
\frac{dn}{dp}
\end{bmatrix} = dx^q + \frac{dx^n}{\partial n} \left( pdx^q - wd^q + w_1 d_1^q \right) \quad (I:10)
\]

where the matrix \( F \) is a bordered matrix including the matrix \( E \) and a first column containing the partial effects of changes in \( x_1 \) on the \( m+1 \) demand functions of the northern household. The first row contains the effects of prices on the demand for first period northern non-traded goods.

Also note that labor markets are treated as the "negative" of goods markets here. Hence the vector \( dp \) includes wage changes.

The impact of exogenous disturbances on the system can be illustrated in the following way. Suppose exogenous income increases, this will increase the demand for type (iii) goods. Consequently the prices of these goods will rise. As first period northern non-traded goods are substitutes for type (iii) goods, the demand for the former will increase. In addition, the increase in exogenous income will also have a direct income effect on demand.

But what happens if public production is increased? Using Cramer's rule to solve for the changes in the sales constraint, due to changes in public production of first period northern non-traded goods, yields

\[
\begin{align*}
\frac{dx^n}{dx_1} &= \frac{1 - x^{nn} p_1 - p_1 \sum_{i=2}^{m+1} (x^n_{i1} F_{i1})/F_{11}}{1 - x^{nn} (p_1 + p_1 x) - (p_1 + p_1 x) \sum_{i=2}^{m+1} (x^n_{i1} F_{i1})/F_{11}}
\end{align*}
\]
where $F_{ij}$ are cofactors of $F$. Note that $F_{11} = E$. As all $F_{i1}/F_{11}$ are positive, the last terms in the nominator and the denominator, respectively, are positive. Let $f$ represent the sums in the above expression. Then

$$\frac{dx_1^n}{dx_1^n} = \frac{1 - (x_{11} + f)p_1^n}{1 - (x_{11} + f)[p_1^n + p_1^n I^n]}$$

Increased public production will crowd out private production as the above derivative is negative. However, crowding out will not be complete as the derivative is $> -1$. The derivative above is identical to the one used in section 2.2 when the welfare effects on increased public production of first period northern non-traded goods are discussed.
APPENDIX II: The data base

The data base contains the values of the following variables for all projects:

1. Diary number
2. Subsidy-receiver, code
3. Place, subsidy-receiver, code
4. Place, execution of the project, code
5. First date of decision
6. Possible additional decisions, code
7. Planned total costs, SEK
8. Planned costs for assigned unemployed, SEK
9. Planned machinery investments, SEK
10. Planned other investments, SEK
11. Planned costs for intermediate goods and non-assigned labor, SEK
12. Planned training costs, SEK
13. Planned marketing costs, SEK
14. Planned other current costs, SEK
15. Costs not eligible for subsidies, SEK
16. Planned temporary employment, assigned unemployed, months
17. Planned temporary employment, assigned unemployed, days
18. Planned temporary employment, non-assigned labor, months
19. Planned temporary employment, non-assigned labor, days
20-55. Planned number of assigned unemployed, each month July 1983 - June 1986
56. Preliminary subsidy, SEK
57. Preliminary subsidy, costs for assigned unemployed, SEK
58. Preliminary subsidy, machinery investments, SEK
59. Preliminary subsidy, other investments, SEK
60. Preliminary subsidy, costs for intermediate goods and non-assigned labor, SEK
61. Preliminary subsidy, training costs, SEK
62. Preliminary subsidy, marketing costs, SEK
63. Preliminary subsidy, other current costs, SEK
64. Preliminary subsidy, costs for assigned unemployed, %
### Preliminary Subsidies and Related Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary subsidy, machinery investments, %</td>
<td>65</td>
</tr>
<tr>
<td>Preliminary subsidy, other investments, %</td>
<td>66</td>
</tr>
<tr>
<td>Preliminary subsidy, costs for intermediate goods and non-assigned labor, %</td>
<td>67</td>
</tr>
<tr>
<td>Preliminary subsidy, training costs, %</td>
<td>68</td>
</tr>
<tr>
<td>Preliminary subsidy, marketing costs, %</td>
<td>69</td>
</tr>
<tr>
<td>Preliminary subsidy, other current costs, %</td>
<td>70</td>
</tr>
<tr>
<td>Date of account</td>
<td>71</td>
</tr>
<tr>
<td>Accounted total costs, SEK</td>
<td>72</td>
</tr>
<tr>
<td>Accounted gross wages, assigned unemployed, SEK</td>
<td>73</td>
</tr>
<tr>
<td>Accounted social security contributions, assigned unemployed, SEK</td>
<td>74</td>
</tr>
<tr>
<td>Accounted travel and daily allowances, assigned unemployed, SEK</td>
<td>75</td>
</tr>
<tr>
<td>Accounted machinery investments, SEK</td>
<td>76</td>
</tr>
<tr>
<td>Accounted other investments, SEK</td>
<td>77</td>
</tr>
<tr>
<td>Accounted costs for intermediate goods and non-assigned labor, SEK</td>
<td>78</td>
</tr>
<tr>
<td>Accounted training costs, SEK</td>
<td>79</td>
</tr>
<tr>
<td>Accounted marketing costs, SEK</td>
<td>80</td>
</tr>
<tr>
<td>Accounted other current costs, SEK</td>
<td>81</td>
</tr>
<tr>
<td>Accounted not approved costs, SEK</td>
<td>82</td>
</tr>
<tr>
<td>Accounted temporary employment, assigned unemployed, months</td>
<td>83</td>
</tr>
<tr>
<td>Accounted temporary employment, assigned unemployed, days</td>
<td>84</td>
</tr>
<tr>
<td>Accounted temporary employment, non-assigned labor, months</td>
<td>85</td>
</tr>
<tr>
<td>Accounted temporary employment, non-assigned labor, days</td>
<td>86</td>
</tr>
<tr>
<td>Accounted number of assigned unemployed, each month July 1983 - June 1986</td>
<td>87-122</td>
</tr>
<tr>
<td>Final subsidy, SEK</td>
<td>123</td>
</tr>
<tr>
<td>Formal definition according to the Malmfältsdelegation's decision, code</td>
<td>124</td>
</tr>
<tr>
<td>Conditions associated with the Malmfältsdelegation's decision, code</td>
<td>125</td>
</tr>
<tr>
<td>Planned number of permanent jobs</td>
<td>126</td>
</tr>
<tr>
<td>Month when the permanent jobs started</td>
<td>127</td>
</tr>
<tr>
<td>Conditional loans, SEK</td>
<td>128</td>
</tr>
<tr>
<td>Definition according to the project descriptions of the Malmfältsdelegation, code</td>
<td>129</td>
</tr>
</tbody>
</table>
130 Code if the subsidy-receiver runs more than one project
131 Code for projects of the same subsidy-receiver
132 Code for type of market
133 Swedish Standard Industrial Classification of all Economic Activities (SNI), code
134-136 Nordic Classification of Occupations (NYK), code
137-139 Number of months for each NYK-code
140 Number of permanent jobs according to the delegation
141 Actual number of permanent jobs, August 1987
142 Months of employment in permanent jobs until July 1987

The source material has been coded by Per Hedin and the undersigned. The punching has been carried out by Skellefteå Datainsamling. The original material is on a data tape. This tape has been copied on to a data file at UMDAC, University of Umeå Computer Center. The data file has been controlled and corrected for coding- and punching-errors.

In connection with the work on this study, all available new information has been punched into the data file. I have done this work myself. After these updates, the file has once again been controlled and corrected for coding- and punching-errors. The latest updates were made in the middle of August 1987.
APPENDIX III: List of terms

I have chosen throughout this study to translate terms and names to English. This has been done mostly with the aid of


For Swedish-speaking readers a list of some of the translated terms may be of interest.

appropriation document
articles of association
assessed income
branch of the economy
budget bill
Central Office of the National Land Survey
Central Board for Real Property Data
conditional loans
County Administration
County Employment Board
County Forestry Board
daily allowance
diary number
early retirement pension
employability assessment center
employment exchange
Foundation of Swedish Communal Industries
government bill
holiday pay
job-creating measures

remleringsbrev
bolagsordning
taxerad inkomst
näringsaren
budgetpropositionen
lantmäteriverket
centralnämnden för fastighetsdata
villkorslån
lånsstyrelse
länsarbetnsämnd
skogsårsstyrelse
traktamente
diarienummer
förntidsension
arbetsmarknadsinstitut
arbetsförmedling
Samhällsföretag
proposition
semestersättning
sysselsättningsskapande Åtgärder
labor market policy measures
labor market training
Miners' Recognized Unemployment Insurance Fund
National Audit Bureau
National Labor Market Administration
National Labor Market Board
Nordic Classification of Occupations
occupational group
parliamentary resolution
recruitment subsidies
register of appropriations
relief work
salaried employees
severance pay
sheltered work
social security contributions
Statistics Sweden
Swedish Standard Industrial Classification of all Economic Activities
training allowance
training premium
travel allowance
wage subsidized employment

arbetamarknadspolitiska åtgärder
arbetamarknadsutbildning
gruvindustriarbetarnas erkända arbetslöshetskassa
riksrevisionsverket
arbetsmarknadsverket
arbetsmarknadsstyrelsen
nordisk yrkesklassificering
yrkesområde
riksdagsbeslut
rekryteringsstöd
statsliquren
beredskapsarbete
tjänstemän
avgångsvederlaq
skyddat arbete
sociala avgifter
statistiska centralbyrån
svensk näringsgrensindelning

utbildningsbidrag
utbildningspremie
reseersättning
lönebidrag
REFERENCES


