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ESTIMATING INTERREGIONAL TRADE FLOWS IN FINLAND 1996¹

Jari Kauppila²

Abstract: *One of the most important separate tasks in estimating regional input-output tables is the estimation of interregional trade flows. Thus, when a project to compile the regional input-output tables began in summer 1997 in Finland one of the first steps was to set up a survey for estimating the interregional trade flows. This paper will focus on the estimation of trade flows in Finland in 1996. Special attention is paid to the survey methods for the estimation. Topics such as survey approach, designing the survey, testing the questionnaire, and problems with retail and wholesale trade are discussed. In addition, we will take a look at the final response rates, problems concerning the responses, some solutions in estimations, and discuss about survey and non-survey methods. Finally, we will reveal some results from the survey.*

Keywords: *interregional trade flows, sampling methods, survey, non-survey, regional input-output tables, regional supply and use tables.*

1. INTRODUCTION

As the interest in regional economies has been growing lately in Finland, it has become topical to find appropriate methods for investigating regional developments. Regional input-output tables provide a solid background for analysis on interdependencies between the regions and industries. Thus, regional input-output study was started at Statistics Finland in June 1997. While earlier studies in Finland have been focusing on an IO-table of 2-4 regions, the tables in the current project are to be constructed for the year 1995 at the level of 20 regions (NUTS 3 level) and 75 industries. In addition, IO-tables will be constructed based on supply and use (S&U) tables (see Piispala 1999 for more on the Finnish regional IO-project).

One of the most important separate tasks in constructing regional input-output tables is the estimation of interregional trade flows. An accurate estimation of trade flows improves reliability and usability of regional input-output tables. Especially survey approach has been seen to result more reliable outcomes (Eding & Nijmeijer 1998). Thus, when a project to compile the regional input-output tables began in summer 1997 in Finland one of the first steps was to set up a survey for estimating the interregional trade flows.

There are few studies on interregional trade flows already existing in Finland. Trade flows have, however, been mainly estimated using either non-survey methods or surveys based on smaller samples and more aggregated regions. Trade flow studies have normally been born as a by-product of regional IO-tables³. In the current project interregional trade flows form an important part of IO-tables, but are also seen as an independent field of research as such.

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³ See for example Varjonen (1971), Forssell and Häyrynen (1979), Susiluoto (1987), Susiluoto (1996).

This paper will focus on the estimation of the interregional trade flows in Finland in 1996. The estimation was carried out for 20 provinces (NUTS 3). The survey was sent to almost 10 000 establishments in manufacturing, construction, and services industries, over 2500 establishments in wholesale industry, while the sales of the biggest trade groups were examined more carefully based on the meetings with the companies. The sample was picked up from a cross-tabulation of each industry and each province, whereas the questionnaire was based on a kind of a hybrid industry approach.

In this paper we will take a look at the classifications used in the study as well as survey methods for the estimation of the interregional trade flows. Topics such as survey approach, designing of survey, and testing the questionnaire are discussed. In addition, we will take a look at the final response rates, problems concerning the responses, and some basic solutions in constructing the adjustment factors as well as in estimations. Finally, we will discuss on survey and non-survey methods and reveal some results from the survey.

2. CLASSIFICATIONS

Regional input-output tables based on supply and use framework need classifications for industries, commodities and regions (see Eding et al. 1998). Because of the increasing interest in the economic activity at the province level, it was decided that the regional division should be by provinces in the Finnish trade flow survey (and regional IO-study). Based on the regional classification that took effect in autumn 1997, Finland is divided into 20 provinces (NUTS 3 regions).⁴ However, as provinces are economically heterogeneous, some aggregations must be made on the industry level once publishing the trade flow data.

The 'working level' in the regional IO-project is 75 industries. However, when estimating the interregional trade flows, 55 industries were selected. Others were presumed to be mostly local and serve only local customers. Industries not included were for example electricity, gas and water supply as well as real estate activities. In addition, some data on trade flows already existed (for example in the case of forestry). The industrial classification used is based on TOL95⁵, in which the national characteristics have been taken into account. As mentioned, some aggregations must be made later because data on individual establishment can not be published (publishing level for any data is 3 establishments).

The commodity classification used in the regional IO-study is based on CPA⁶. In practise, this means working level of some 200 product groups. In estimating the interregional trade flows, however, the industry approach was chosen instead of commodity approach. Thus, in practice, our working level of 55 industries has to be used as it is for few product groups per each industry. This, of course, is somewhat simplified starting point and will cause some bias into our estimations on the commodity level.

Interregional trade flows will be estimated for the year 1996. This differs from the regional IO-study. Difference is mainly due to the fact that data for the year 1995 was assumed to be too difficult to obtain (year 1995 was already too far away in order to obtain reliable data). Thus, once trade flow estimates are connected into supply and use tables, it is assumed that they have not changed from 1995 to 1996.

⁴ NUTS (Nomenclature des Unités Territoriales Statistiques) is the regional classification system of the European Union. Level 3 stands for provinces.

⁵ *Toimialaluokitus 1995* (Standard Industrial Classification of 1995) is, in turn, based on industrial classification NACE Rev. 1 (Nomenclature Générale des Activités Economiques dans les Communautés Européennes) of European Union.

⁶ CPA (Statistical Classification of Products by Activity in the European Community).

The study on the interregional trade flows in Finland will be published both separately and as a part of the input-output tables once the project will be finished.

3. ESTIMATION OF INTERREGIONAL TRADE FLOWS

3.1. Survey approach

Because strictly survey-based information and double-entry approaches are expensive (and in practise almost impossible), and strictly non-survey techniques have understandably problems with accuracy, the survey had to be done either using industry or commodity approach, on the one hand, and export or import approach, on the other.⁷

Before making final decision on the survey approach and sending the questionnaire to the "field", the questionnaire was tested in firms. Based on the feedback, there were few corrections that were made to our questionnaire. First of all, it seemed clearly easier for companies to fill in a form which asks only the spatial distribution of their total sales (not sales by each commodity). Also, our tests seemed to indicate that firms have better knowledge of their sales than their purchases. These were strong arguments for industry approach over the commodity approach and for export approach over the import approach.

Secondly, instead of forcing the respondent to tell the distribution of their sales to all regions, it was decided to ask distribution only to their own region, Uusimaa (largest province in Finland both in population and economic activity), and three other main regions of sales. According to our test, it was too difficult to tell distribution of total sales and, therefore, we also left space for "uncertain" distribution of sales (part "rest of Finland"). According to our feedback, companies were *"more interested on the type of product customer buys than the actual location of the buyer"*.

Thus, as we wanted to obtain higher response rates, approaches mentioned above were adopted. However, in case of some services industries, it was assumed that firms in other industries are in a better position to answer from which regions they buy the commodities (services) of these services industries. Thus, we also asked the spatial distribution of firms total costs of the main services they have purchased. Eventually, the approach in the questionnaire was a kind of a hybrid industry approach: Not only the spatial distribution of firms' sales was asked but also the spatial distribution for purchasing some services (Piispala 1998).

The final questionnaire consisted of two parts.⁸ In part A the distribution of total sales to domestic users directly, domestic wholesalers, and abroad was asked. In part A.1 the firms were asked to give regional distribution of their direct sales to domestic users. As already mentioned, they should give the shares that are sold to the firm's own province, to the province of Uusimaa, three other main provinces from the firm's point of view, and the rest of Finland. In part A.2 the firms were asked to divide their sales to wholesale companies with similar regional division as in direct sales to domestic users. In part B the firms were asked the spatial distribution of purchasing some services and agriculture and forestry products with similar regional division as in parts A.1 and A.2.

⁷ West (1990). One another dimension on the survey approach can also be the time dimension. Establishments could be asked to report on their sales or purchases during a certain period of time. This approach was, however, discarded already from the beginning, because it had been too difficult to decide the "right" period for reporting of sales / purchases. See also Boomsma and Oosterhaven (1992) and Eding and Oosterhaven (1996) for a discussion on different approaches in estimating interregional trade flows.

⁸ See appendix 1 for the questionnaire.

If the firm sells its product first to the wholesaler or any other intermediates, it probably does not have knowledge about the final destination of its product, i.e. knowledge where the commodity is actually consumed. Thus, in order to find out the whole chain of commodity flow from firms to consumers, a survey to wholesalers was carried out. For wholesale companies the questionnaire form was modified a little. The main difference between the two questionnaires was that in the case of wholesale trade we also asked the main commodities firms sell and the cost of purchase for these products by region. This way we wanted to obtain additional information that would link the first and the second questionnaire. In our view, this data may also be used as a help when constructing the regional trade margins, for example. Trade margins may differ remarkably by region.

3.2. Sample and response rates

The sampling for our survey was done on region x industry basis (20 x 55). For picking the sample the number of company establishments for each stratum was first defined. This cross-tabulation thus showed how many establishments are located in each industry and each province. According to these figures we made the sampling using certain predetermined rules (see table 1). For each stratum, the largest establishments (defined as a number of employees > 30) and establishments in strata with eight or less outlets were all selected, while smaller establishments were picked up by a stratified simple random sample.⁹

Table 1. Rules for sampling.

	Number of establishments in each region x industry stratum	Number of establishments picked
Rule1	1 - 8	all
Rule2	9 - 20	8
Rule3	21 - 150	10
Rule4	151 - 300	15
Rule5	301 - 1500	20
Rule6	1500 -	times 0,04 (max 40)

As mentioned, our questionnaire was sent to 55 industries out of 75 industries in total in the regional IO-project. In some industries, data on regional flows already existed, and thus, they were not included into our survey. For example, data on forestry was obtained from the Finnish Forest Research Institute (METLA), where both interregional flows and export and import by region as well as by type of wood have been calculated. Retail trade and certain services which we presumed to be mostly local and serve only local customers were also left out of our survey.

The final size of our sample was over 9600 establishments. All establishments received, in addition to the questionnaire, map of regions, instructions, and a covering letter. In the covering letter our phone number, e-mail address together with internet address for our web-pages were written. It was also possible to download the questionnaire and instructions from our web-pages. At least some answers were received through e-mail.

After the first round of the survey the response rate was 26.1 per cent in total. There were only 12 industries where a response from each province was obtained. We also carried out two postal dunnings and one phone dunning after the first round. After the first dunning letter (included the questionnaire, map and instructions), the response rate rose to 40.5 per cent, while the second dunning (included only the dunning letter) increased the response rate only by few percentage points.

⁹ See also chapter 4.1.

During the survey, we were contacted by over 50 per cent of the sample establishments. However, as some of the questionnaires were not filled or the respondents denied answering the final response rate was 44.8 per cent. It must be noted that there were only six different industry x region combinations out of some 1100 where not a single response was received. This result was mainly obtained because of the carefully aimed phone dunning. The final response rates by region can be seen in table 2.

Table 2. Final response rates by region.

Region	Sample				Response					
	Number of establ.	% of population	turnover mill. FiM	% of population	Number of establ.	% of sample	% of population	turnover mill. FiM	% of sample	% of population
01	906	2,3	70731	42,3	428	47,2	1,1	38400	54,29	22,99
02	613	4,6	42327	70,0	274	44,7	2,1	22331	52,76	36,94
04	509	7,4	21265	72,4	212	41,7	3,1	14895	70,05	50,72
05	468	10,6	10789	76,5	177	37,8	4,0	6009	55,70	42,62
06	626	4,7	26358	45,6	304	48,6	2,3	17928	68,02	31,03
07	467	7,9	11799	62,2	188	40,3	3,2	6330	53,65	33,38
08	459	9,8	16876	71,1	194	42,3	4,1	12251	72,59	51,63
09	418	11,6	12865	79,5	187	44,7	5,2	7151	55,58	44,18
10	441	9,8	5280	59,6	178	40,4	3,9	1502	28,44	16,96
11	502	8,1	12667	69,0	234	46,6	3,8	6570	51,86	35,77
12	443	10,3	7699	78,2	181	40,9	4,2	4278	55,57	43,47
13	494	7,2	18209	73,8	240	48,6	3,5	12668	69,57	51,34
14	506	7,9	7197	55,1	235	46,4	3,7	3844	53,42	29,43
15	478	9,5	14528	71,0	213	44,6	4,2	11703	80,55	57,17
16	364	18,0	4272	72,5	151	41,5	7,5	3216	75,27	54,58
17	543	6,3	19137	68,5	246	45,3	2,9	11376	59,44	40,74
18	349	16,8	3211	65,4	150	43,0	7,2	2876	89,57	58,55
19	461	8,5	13924	75,0	165	35,8	3,0	10957	78,69	59,02
20	364	13,9	16761	89,1	173	47,5	6,6	12948	77,25	68,83
21	251	25,1	932	59,0	195	77,7	19,5	711	76,25	44,95
ALL	9662	6,6	336827	60,1	4325	44,8	2,9	207944	61,74	37,10

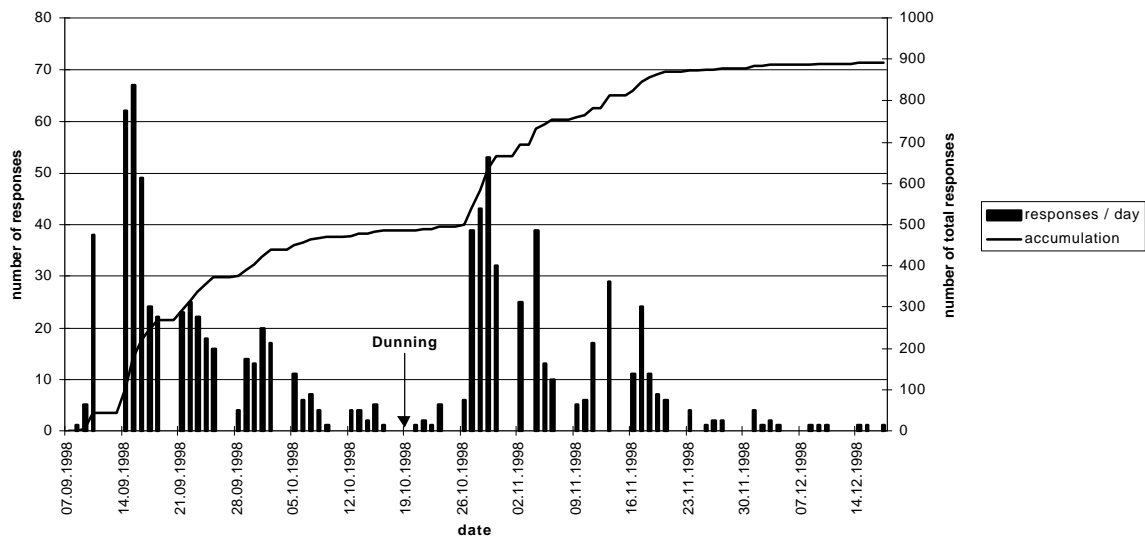
Establishments picked for our survey made only 6.6 per cent of the total number of establishments. However, in terms of their sales (turnover) they made over 60 per cent of the population. Final response rates reveal that in terms of turnover the best response rate was obtained from the region 20 (Itä-Uusimaa) with almost 70 per cent of population's turnover covered, while the lowest rate was from the region 10 (Etelä-Savo). All in all, final responses covered over 37 per cent of the total of population in terms of firms' turnover.

For wholesale companies the sample was picked basically in a similar way to the first sample¹⁰ and some 2500 establishments were selected in all. After the first round of the survey and one dunning letter, the response rate rose over 41 per cent, while the accepted answer rate was 34.7 per cent. Sales of the biggest trade groups were examined more carefully based on the meetings with the companies. Very positive results were obtained from these meetings, and because of this, and the fact, that the trade through wholesale only made about 12 percent of total sales, not much attention was paid on the increasing of the response rate of the wholesale survey.

It is interesting to examine the response activity by day. After the questionnaires were sent it took about one week before we received first answers. After that there were responses coming each day for the next 4-5 weeks (figure 1). The number of responses, however, decreased each week. In about five weeks responses had diminished almost totally. After the dunning, number of responses grew again (surprisingly almost at the level of first inquiry), diminishing again after four weeks.

¹⁰ This time we selected largest establishments on the basis of their turnover, not number of their employees as was the case in the first questionnaire. The reason for this is that the turnover figures were not available at the time of picking of the sample of the first questionnaire. It can be discussed, which is a better variable for the real size of an establishment (size of employment or size of turnover).

Figure 1. Responses per day: wholesale companies.



From these empirical results it might be possible to find some guidelines for a future survey of a similar kind. First of all, it is reasonable to assume that after 4-5 weeks number of responses will diminish. Thus, in order to carry out a survey effectively and in a time-saving way, the first dunning can be done in about five weeks after the first letter has been sent. It can be discussed, if it is wise to carry out another dunning, because the results might not be good compared to the effort and time spent (in the case of our first survey, second dunning increased response rate only by few percentage points). Better solution might be a carefully aimed phone dunning, which was also done in both our surveys.

3.3. Treatment of "Rest of Finland" and wholesale trade

As mentioned in chapter 3.1., when asked for distribution of sales, it was possible to answer "rest of Finland" in our questionnaire. Thus, it has been essential to consider a method for distributing sales recorded at "rest of Finland" into "right" regions. Sales distributed to "rest of Finland" in our more than 4300 answers averaged about 16 per cent of total sales. The share was big enough to make us seriously consider options for distributing this "surplus" item. Also in the case of wholesale trade, a more serious approach was needed. Trade through wholesale accounted for 12.2 per cent of total sales in our responses.

One possible solution for dealing with the "rest of Finland" (and wholesale trade) would have been the use of a gravity model. Basic idea behind the gravity model (named after Newton's observations on gravity) is that flow of good i from region R to region S is a function of total output of i in R , total purchases of i in S , and the distance between the two regions (Miller & Blair 1985).¹¹

However, gravity model has some pitfalls. Therefore, as there is quite reliable data on freight transport between regions, it was decided to use this data instead in the case of "rest of Finland" in our survey. The most reliable data available for distributing the sales recorded at "rest of Finland" are annual data on total freight of different commodities on

¹¹ See also chapter 5.2.

road, rail, air, and water.¹² The nature of these statistics is discussed in more detail in chapter 4.3 as well as in figure 3. In the case of sales through wholesale, results from our second (wholesale trade) survey and data obtained from meetings with the largest trade groups were used, in order to distribute sales into the region of final consumption.

4. ESTIMATING PROCEDURES AND SOME PROBLEMS CONCERNING THE RESPONSES

An estimate based on a sample survey can contain two types of errors - sampling and non-sampling. Sampling errors occur as the estimate is based on a sample, not on the entire population. Non-sampling errors, in turn, can be done in different stages of the data collection and processing.

4.1. Sampling errors

Because the estimates on trade flows are based on a sample, exact results can not be obtained. However, as each establishment in the *Register of enterprises* in the specific industry in our regional IO-study had a known probability of being selected into the sample, it was possible to estimate the *sampling variability of the estimates*.

In our survey, the establishments were first divided into certainty and non-certainty establishments. Certainty establishments (large firms based on the number of employees as well as establishments that had less than eight observations in our region x industry strata) were selected with inclusion probability one. Non-certainty establishments were selected based on a simple random sample stratified by region and industry. The final sample included 3715 certainty establishments and 5947 non-certainty establishments.

The problematic part in our survey is the non-certainty establishments. In some strata random sample might have been too small for reliable estimate. But because it was essential to include all the regions and industries (20 x 55) into the sample, there was not much room for changes. Mainly due to the fact that we only had limited resources available, it was almost impossible to carry out a bigger survey (increasing one non-certainty establishment in each stratum would have increased the survey by 1100 questionnaires). However, the fact that the random sample has been quite small in some strata of our sample, might have caused some non-accuracy into our estimations.

4.2. Non-sampling errors

Non-sampling errors, in turn, can be divided into: 1) frame errors, 2) measurement errors, 3) processing errors, and 4) non-response errors. These errors mainly attribute to inability to obtain information about all cases in the sample, definition difficulties, differences in the interpretation of questions, errors in recording the data obtained, and other errors of collection, response, coverage, and estimation.

In our survey, all phases of data collection and processing were carefully performed. Despite all efforts, there have been some typical non-sampling errors in our survey. These include problems with interpretation of questions (mainly simply problems answering to the questions), inability to obtain information about all cases in the sample, and to some extent mistakes in recording the data obtained.

¹² Data on road transport, see Tieliikenteen tavarankuljetustilasto (1996). Data on railway transport was obtained from the State Railways. Data on air transport was obtained from the Civil Aviation Administration. Data on water transport, see Kotimaan vesiliikenne (1996).

Understandably, all surveys include non-sampling errors, and it is quite difficult to construct methods to directly measure the non-accuracy caused by these errors. In the case of response and recording errors, however, all our questionnaires were tested for logical errors (i.e. distribution of sales equals 100 %, no sales was left undistributed or provinces unmarked etc.). In cases of unclear answers, respondents were contacted by phone. It can be concluded, that much effort has been paid especially to the reliability of the data obtained in our survey. Thus, this in turn gives us a solid background to start our analysis from.

In a future survey of similar kind, instead of using recording services (as in our case), it might be a better idea to record all the data by oneself, even if this was a time-consuming task. Now we had to spend much time and give a lot of effort in correcting and checking the data. In addition, the importance of clear instructions as well as consistent questions can not be over-emphasized.

4.3. Final estimates

The final estimates will be derived from data obtained from the establishments and are then adjusted using different factors to account for the non-response, under-coverage, and response errors. Each establishments data will be weighted by the inverse of the inclusion probability to get total and mean estimates.

In constructing the adjustment factors at the establishment level, estimations of exports and imports by regions will be used. However, estimation of exports and imports by regions is cumbersome since foreign trade is typically recorded on a country's borders. On exports rather reliable data can be obtained from several business statistics at Statistics Finland, but these are to some extent of weak quality. The problem is even more serious with imports since the data is scant even on a company level (not to mention establishment level). However, the 1993 *Manufacturing statistics* contains data on the use of foreign inputs by manufacturing companies. Though our survey is for the year 1996, this survey is not too far in the past. Also the value added tax register includes information of firms' purchases from EU countries. This register comprises all VAT liable firms, including also firms other than manufacturing. In the case of services, there is not much auxiliary data available for constructing the adjustment factors at the establishment level.

The non-response errors will be imputed using so called hot deck-method. According to the answers obtained from our survey, an auxiliary variable for foreign and domestic exports is searched for. According to our preliminary analysis, turnover seems to be the best possible variable.¹³ Establishments in our sample are then assorted according to this variable in each region X industry stratum. Where there is a response missing, the response of the previous answer is given to the establishment. Using this method, we will obtain "100 per cent" response rate for our survey.

The hot deck-method might however misinterpret the market situation. Let's take an example of two companies (A and B) in the same region (Z), selling the same product (Y). If company A sells products to region R, it might be right to assume that the company B has the region S as a market area, because of a normal competition situation, while when using the hot deck-method, both companies are assumed to sell their products to same region. It is however impossible to tell which situation is actually the "right" one.

¹³ This is actually very understandable, as bigger companies can be assumed to have a wider range of customers as well as more interest in spreading their business to other regions and abroad than smaller companies.

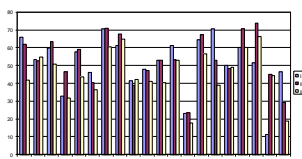
Once the non-responses in our sample are imputed, the establishments are again adjusted to the level of the population using sampling weights and auxiliary variables. In practise, this means utilizing all possible auxiliary data available on the regional trade.¹⁴

4.4. Some comparisons with auxiliary data

Returning first to the export data, the data obtained from our survey is compared with the *Manufacturing statistics* in the figure 2. The percentual share of foreign export by region is first calculated according to our survey (series I). Secondly, the share of foreign export by region is calculated from the *Manufacturing statistics* for the same establishments that were in our survey (series II). Thirdly, the share of export in the whole of *Manufacturing statistics* is calculated (series III).

First of all, it seems that the responses we have obtained are quite reliable. The absolute discrepancy does not vary remarkably by region (by industry variations are much bigger). However, there are some regions where the share of export abroad differs quite remarkable. In the case of region 20, the discrepancy is notably higher than in other regions. This is however because of a simple response error. The discrepancy in Åland (region 21) is mainly due to lack of direct data available in the *Manufacturing statistics* on this offshore island. Thus, we feel that data obtained in our survey is much more reliable in this case, especially as we have obtained auxiliary data also from a similar survey carried out by Department of Statistics and Economic Research in Åland.

Figure 2. Export by region according to our survey and Manufacturing statistics (percentual shares).



I: Our survey, II: Same establishments in *Manufacturing statistics*, III: All establishments in *Manufacturing statistics*.

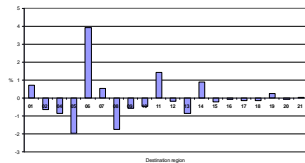
Thus, at least in case of manufacturing industries we have quite reliable adjustment factors for export abroad. The export levels obtained from the *Manufacturing statistics* will be used also when imputing the non-response errors. The whole population by region, in turn, will be adjusted at the level of the third series (the entire *Manufacturing statistics*).

Probably the most reliable data available for constructing the adjustment factors for regional exports are annual data on total freight of different commodities on road, rail,

¹⁴ More on methods, see Kovar & Whitridge (1995).

air, and water.¹⁵ Freight data is based on amounts of tons, but has been converted into currency basis using average commodity prices obtained from a separate data (national input-output tables). In figure 3 the percentual discrepancy between our survey and *Statistics on freight transport by road* (survey based) is calculated for freight transport by road industry from the province of Uusimaa (the share of sales from Uusimaa to each destination region according to our survey minus share of freight from Uusimaa to each destination region according to the *Statistics on freight transport by road*).

Figure 3. Percentual discrepancy of freight transport by road from the Province of Uusimaa (01) to other regions between our survey (preliminary results) and statistics on freight transport by road.



Difference in the two data does not seem to be relatively significant. This is actually very encouraging result for our survey. These two surveys seem to give quite similar results of freight transport by road. Also other comparisons between freight statistics and our survey seem to give similar encouraging results. Thus, based on these tests, we can say that data on freight transport can be used at least in a way that it gives us some trend setting guidelines on relations between regions.

5. TRADE FLOWS AND REGIONAL INPUT-OUTPUT PROJECT

5.1. Trade flows as a part of use and supply tables

Regionalisation of the S&U framework can be done along commodity or industry dimension or both (Eding et al. 1998). Supply and use framework of two regions, regionalised along the commodity dimension alone, is presented in table 3. Exports and imports from a region to another region within the same country, T^{rs} and T^{sr} , are displayed by the corresponding column and row, which shows these exports and imports by commodities (Piispala 1998). As mentioned, the survey on interregional trade flows was carried out at the level of 55 industries. Thus, it will be necessary to use some approximations on the commodity level, once data on survey is connected to the regional supply and use tables.

¹⁵ See also chapter 3.3.

The framework presented in table 3 is extended further in our project. The T vectors will be disaggregated by regions which will actually lead into a situation, where there are 19 T vectors for regional exports and imports for each region.

Compared to industry by industry or commodity by commodity IO-tables (where there are more assumption on the structure of the economy), the S&U tables include more realistic information on the structure of the economy and thus can be seen more unbiased. S&U tables simply tell what commodities are produced by each industry and what commodities industries and other agents in the economy consume. Especially in the case of interregional trade flows, if constructed as mentioned above, they give us much more accurate information on the interaction between regions (see also Piispala 1999).

Table 3. Supply and Use Tables in a Two-region Case. (Eding et al., 1998).

Region r	Commodities	Industries	Final Demand	Abroad	Other region(s)	Total
Commodities		U^r	E^r	X^r	T^{rs}	q^r
Industries	V^r					g^r
Abroad	M^r					
Other region(s)	T^{sr}					
Primary Inputs		Y^r				
Total	$(q^r)'$	$(g^r)'$				

Region s	Commodities	Industries	Final Demand	Abroad	Other region(s)	Total
Commodities		U^s	E^s	X^s	T^{sr}	q^s
Industries	V^s					g^s
Abroad	M^s					
Other region(s)	T^{rs}					
Primary Inputs		Y^s				
Total	$(q^s)'$	$(g^s)'$				

5.2. Survey vs. non-survey methods

Using non-survey methods, interregional trade flows can be estimated for two or more regions with data on regional total output and value added by industry as well as data on intermediate and final consumption obtained from the national input-output table.¹⁶

Normally this kind of method does not take into account the distance between the regions. In a case of many regions, the distance between provinces can be a crucial factor when estimating the interregional trade flows. Thus, versions of gravity model have been proposed for the purpose of estimating commodity flows between regions.¹⁷

Some tests have been done on the gravity approach. These tests have yielded some positive results on the outcome of the gravity model (see Polenske 1970). However, gravity model has been embedded in some studies, while some researchers think that survey based trade flows give more open picture of an economy of a region than trade flows based on non-survey methods (see for example Wilson 1970, Susiluoto 1996).

Once our trade flow survey is finished, it is our aim to make few comparisons on trade flows on industry level, based on survey and non-survey methods. As the regional supply and use tables are not yet completed, it will be a task of a future. This should, however, shed some light over the discussion on the outcome of survey based and non-survey based methods on interregional trade flows.¹⁸

6. SOME EMPIRICAL RESULTS FROM THE FINNISH SURVEY

Unfortunately we have not yet made final analysis of our trade flow data. However, some preliminary analysis is done. It seems that we have managed to capture the major part of trade flows *in terms of their value* in most of the industry-region combinations and a reasonable part of the trade flows in most of the regions. Likewise, the data seems to give similar results to the results obtained in another survey of regional trade flows which was carried out in volume terms (see chapters 3.2 and 4.4).

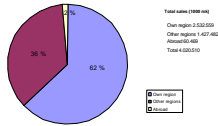
In this chapter, we have calculated trade flows for services sector from the province Keski-Suomi (region 13) to other provinces and abroad. These results are based on our survey and adjusted to the regional level simply by multiplying the level of the responses to the level of population. In other words, no actual non-response method or adjustment factor has been yet used for these results. In figures 4-6, these preliminary results are shown. It must be still emphasized, that the results shown in the figures here are based only on the responses we have obtained. These should, however, give a good picture of the possibilities of the data.

Figure 4. Split-up of trade of services industry in Keski-Suomi region 1996 (%).

¹⁶ See for example Tavaraliikenteen mallit (Models of Freight Transport) (1993).

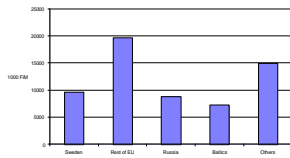
¹⁷ See also chapter 3.3.

¹⁸ On interregional commodity flow models, see also Bjurklo (1995).



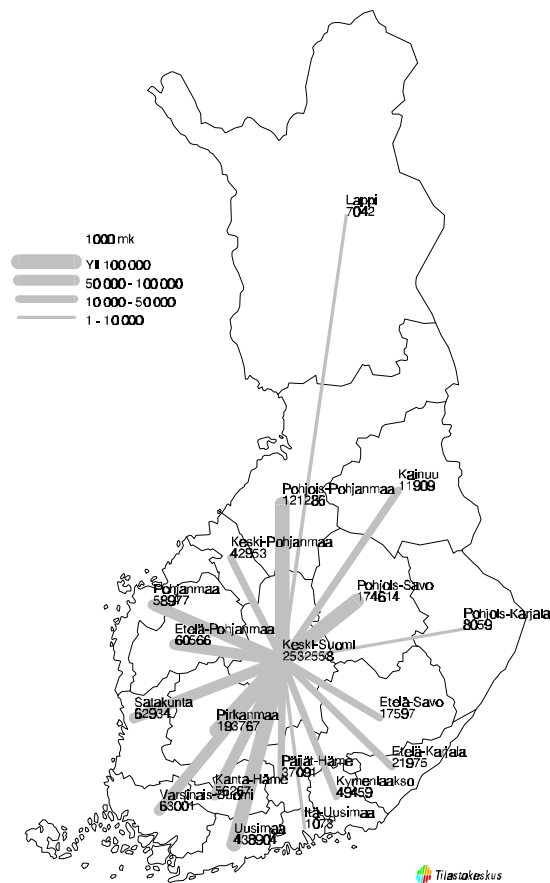
Over 60 per cent of total sales is sold to own region in Keski-Suomi (figure 4). This is certainly very true for services industries, which are mainly local. One must remember that certain services industries were assumed to be local in our survey and these are not included in the figures. This will further emphasize the importance of the own region as a destination of sales. Main destination for export abroad has been, according to our responses, EU (figure 5). Surprisingly, the share of the other countries (excluding Russia and Baltic) has been the second largest.

Figure 5. Export abroad of services from Keski-Suomi by destination 1996 (1000 FiM).



As discussed in chapter 5.1., our framework extends the S&U table further, so that instead of one T vector we have 19 T vectors for regional exports for each region (figure 6). According to our responses, the main destination for export to other regions has been the province of Uusimaa. This result is not very surprising, as Uusimaa is the largest province both in population and economically. Regions next to Keski-Suomi are also understandably important destinations of export. Sales to Lapland and eastern regions of Finland are, in turn, very small according to our responses.

Figure 6. Export of services from Keski-Suomi to other regions 1996 (1000 FiM).



7. CONCLUSIONS

Data on interregional trade flows are an essential part of input-output as well as supply and use tables. Accurate trade flow data form a solid base for reliable analysis on the interdependencies between regions and industries. Interregional trade flow data can also be used as such in analyzing these interdependencies. Therefore, it is most important to make all possible effort to ensure accuracy of the trade flow data.

In our opinion, empirical results (as shown in chapter 6) that can be obtained from the trade flow survey can be used effectively in many fields of research. Not only they give more open picture of the interdependencies between regions, they also might open new sights for still untamed destinations of trade, and thus, provide even ideas for market-area analysis of companies.

The importance of regional development has been emphasized even further by the integration of Europe and the world. Therefore, it is also essential to make efforts in order to improve methods for studying the developments of regional economies. This tendency has been already increasing in Finland, of which the current project of regional input-output tables is a living proof.

It is in our hope that researchers and institutions would benefit the results of the project once finished. Already in the working phase of the project there have been many contacts by different institutions, in order to find out what kind of information on the regional level is available and when the results of the current project can be utilized. This has been very encouraging for us, as we can see that there clearly is a need for the kind of information we are working on.

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APPENDEXES

Appendix 1. Questionnaire for manufacturing industry.

Name and address:

Filling instructions:

We ask you kindly to mark up in percentage points how your sales and costs were distributed in 1996. Please use the new classification of provinces (effective 1.9.1997) as a market area. As a help you can use the map and the classification of provinces which are in annex. If you can not classify the most important market areas in classifications of provinces, please try to mark up the share of your own province, the rest of Finland and the foreign countries.

If you do not have the exact information, you can use an

Send back as soon as possible, at the latest:

A. Distribution of sales in 1996.

		The share of total sales of the firm
A.1.	Domestic sales directly to the customers without the sales to the wholesalers	%
A.2.	Domestic sales to the wholesalers	%
	Sales to the foreign countries	%

Section A. 1.

Section A. 2. page 2

In total 100%

A.1. Distribution of domestic sales between the customers situated in your own province, the province of Uusimaa, the three most important market areas and the rest of Finland in 1996.

Province Name or code	The share of total sales without the sales to the wholesalers
The province of the firm	%
The province of Uusimaa 01	%
Province	%
Province	%
Province	%
The rest of Finland 30	%

In total 100%

A.2. Distribution of the sales to the wholesalers situated in different provinces in 1996.

The province where the wholesale is located Name or code	The share of the sales which are aimed to the wholesalers
The province of the firm	%
Province	%
Province	%
The rest of Finland 30	%

In total 100%

B. Distribution of the costs due to purchasing some services and agriculture and forest products in 1996.

Transportation and storage services		Tele and data communication services		Financing services	
Province Name or code	Share	Province Name or code	Share	Province Name or code	Share
The province of the firm	%	The province of the firm	%	The province of the firm	%
Province	%	Province	%	Province	%
Province	%	Province	%	Province	%
The rest of Finland 30	%	The rest of Finland 30	%	The rest of Finland 30	%
The foreign countries 99	%	The foreign countries 99	%	The foreign countries 99	%

In total 100%

In total 100%

In total 100%

Insurance services		Other services		Purchasing agriculture and forest products	
Province Name or code	Share	Province Name or code	Share	Province Name or code	Share
The province of the firm	%	The province of the firm	%	The province of the firm	%
Province	%	Province	%	Province	%
Province	%	Province	%	Province	%
The rest of Finland 30	%	The rest of Finland 30	%	The rest of Finland 30	%
The foreign countries 99	%	The foreign countries 99	%	The foreign countries 99	%

In total 100%

In total 100%

In total 100%

Contact information:

Name	Telephone
Email	Telefax

