FIGURE 7.4

CUMULATIVE DISTRIBUTION OF COMPENSATION CLAIMS AND RECEIPTS FROM CP RAIL FOR HOUSEHOLDS WHICH WENT TO EVACUATION CENTRES

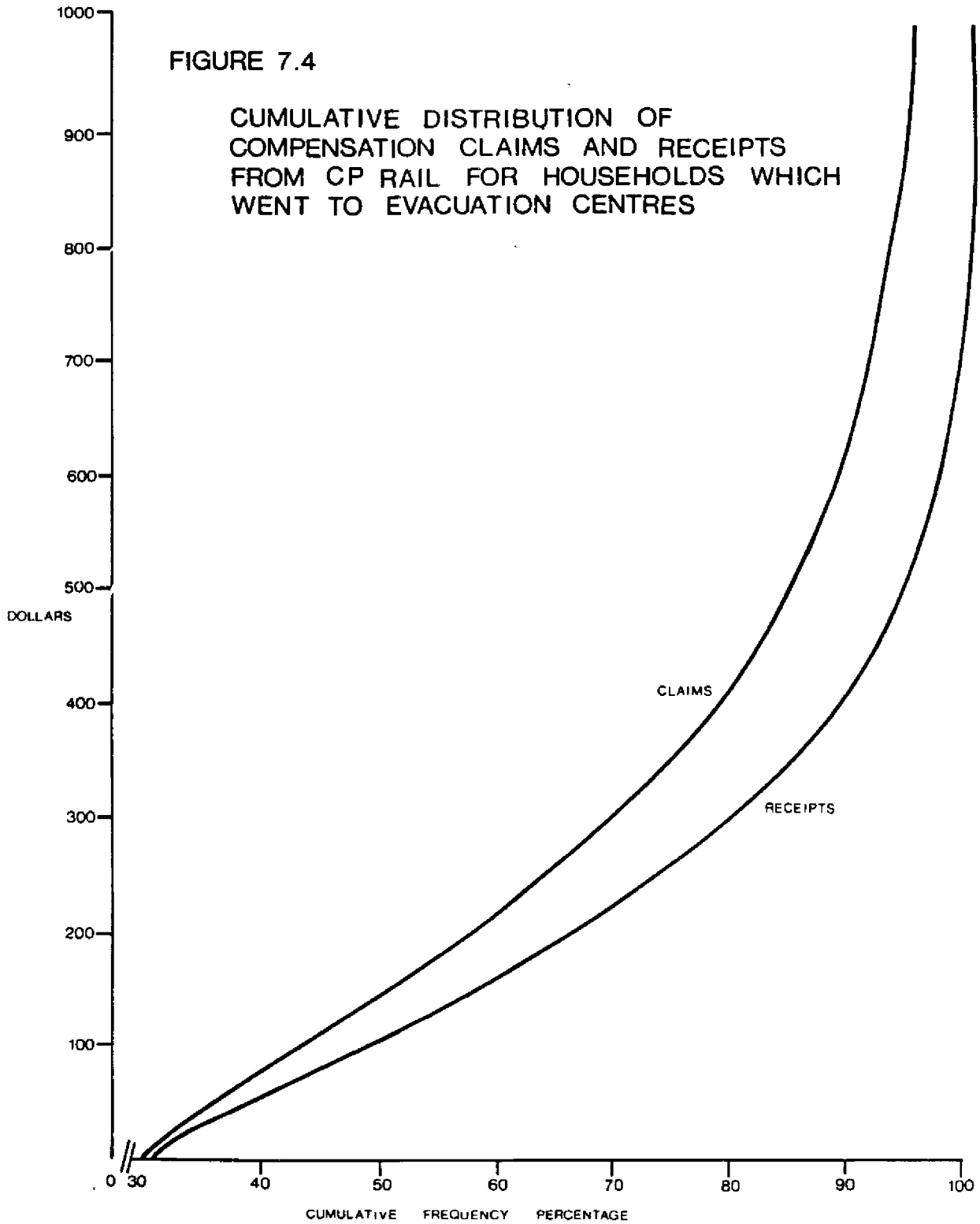
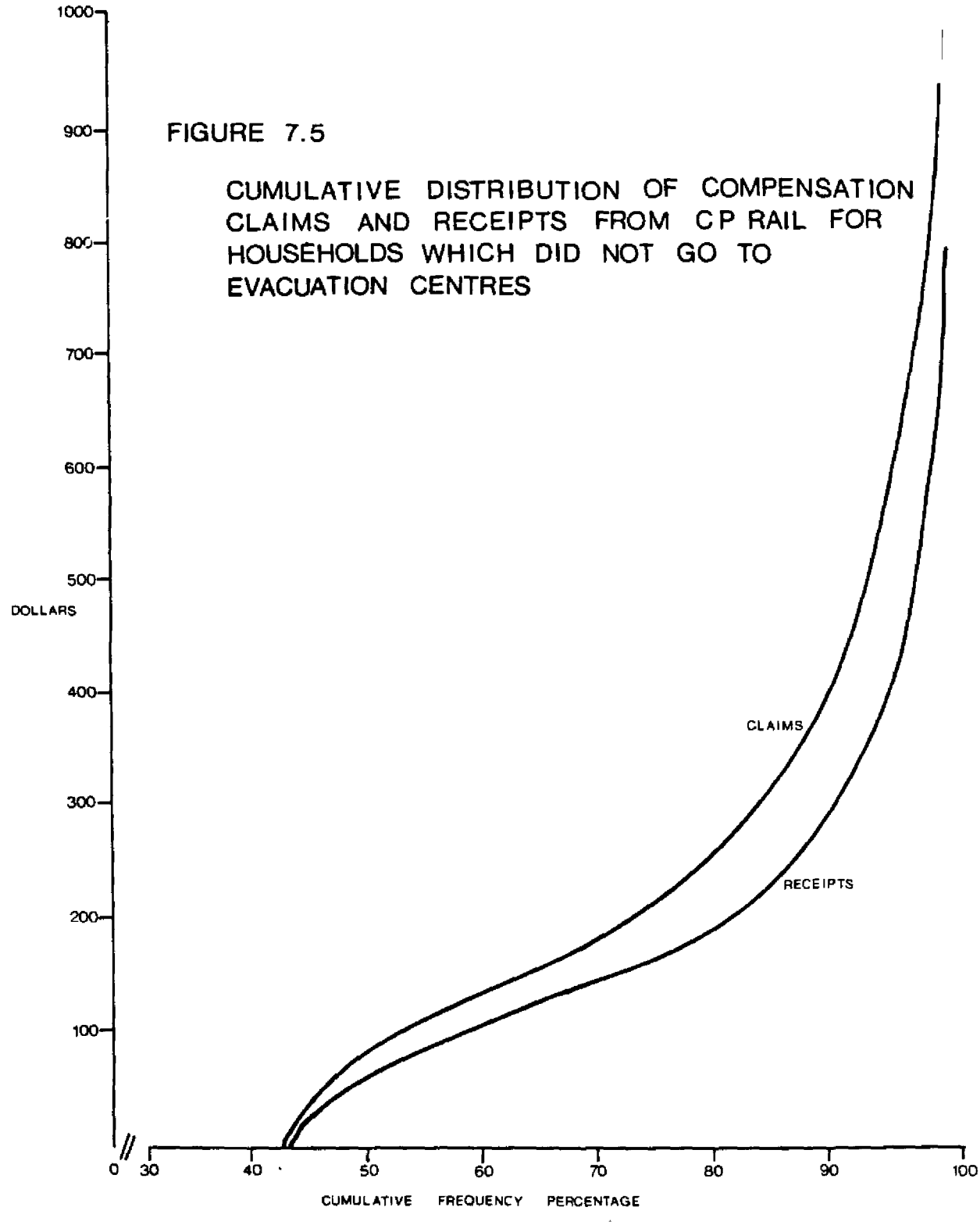


FIGURE 7.5

CUMULATIVE DISTRIBUTION OF COMPENSATION CLAIMS AND RECEIPTS FROM CP RAIL FOR HOUSEHOLDS WHICH DID NOT GO TO EVACUATION CENTRES



7.3. AN ANALYSIS OF HOUSEHOLD COSTS IN RELATION TO EVACUATION LOCATION

The discussion so far has distinguished between households that went first to evacuation centres and those that went directly to private homes and hotels. It is interesting to consider a more detailed breakdown of household costs in terms of evacuation location. Relevant information obtained from the questionnaire reponses is presented in Table 7.11.

Households have been classified according to the first location to which they evacuated. Only for those who first went to an evacuation centre is it possible to identify households who did not go elsewhere during the evacuation period. Information about this sub-set of households (only 14 out of the 175 households that responded to the Evacuation Centre survey) is contained in the last row of Table 7.11.

Table 7.11 shows that:

a) average household costs borne by all households that first went to evacuation centres were nearly three times those of the households which remained in the evacuation centre throughout the evacuation. When allowance is made for differences in household size and the number of days households were evacuated, the difference falls to just less than 2:1 as shown in the last column of the table. Nothing is known about the second location of those who left the evacuation centres and went elsewhere. From the information on average household costs it seems that a significant proportion may have gone to hotels.

b) those households that went to hotels bore the highest costs, followed by those that went to friends and then those that went to relatives. Variations in household size and number of days evacuated counteract each other so that the relative differences in household cost and household cost per person/day are almost identical.

Table 7.11

HOUSEHOLD COSTS DURING THE EVACUATION AND EVACUATION LOCATION

First Evacuation Location	Average Household Cost During Evacuation	Average Household Size	Average Household Cost Per Person	Average Number of Days Evacuated	Average Household Cost Per Person/Day
Evacuation Centre	247.1	3.7	66.8	4.7	14.2
Friends	211.0	3.3	63.9	3.9	16.4
Relatives	153.1	4.0	38.3	3.2	12.0
Hotel	438.6	3.1	141.5	4.1	34.5
Only Evacuation Location Evacuation Centre	84.9	3.6	23.6	3.1	7.6

c) the lowest household costs, in total and on a per person per day basis, were borne by households which remained in the evacuation centres the entire period.

In summary, Table 7.11 shows clearly that household costs and cost per person per day varied markedly according to the evacuation location. Comparing each group with each other group, these differences in the average household costs were found to be statistically significant on the .01 level in all cases. What turns out to be a far more difficult task is to explain statistically the variation in household costs within each group. Various attempts were made to specify relationships between household costs and such factors as household size, days away from home, distance evacuated, and income level. These relationships were estimated using multiple regression techniques and the most satisfactory regression equations were as follows:

First Evacuation Location	Equation	Adjusted r^2
Evacuation Centre (only location)	$HC = \underset{(1.7)}{7.9D^2}$	0.61
Friends	$HC = 0.4 + \underset{(1.1)}{8.0D^2} + \underset{(1.4)}{5.2S^2}$	0.38
Relatives	$HC = 38.1 + \underset{(0.7)}{3.8D^2} + \underset{(1.0)}{3.7S^2}$	0.14
Hotel	$HC = 85.9 + \underset{(3.2)}{8.2D^2} + \underset{(4.1)}{9.8S^2}$	0.24

Where: HC = total household costs,
D = days away from home,
S = household size, and

numbers in parentheses are the standard errors for the estimated coefficients.

The adjusted r^2 values for equations 1 to 4 show the proportion of the variation in household costs for each group that is "explained" by the respective equation. In the case of those households that went only to an evacuation centre (a sub-sample of 14 of the 175 households in the evacuation sample), the equation explains 61% of the variation in household costs. The only explanatory variable which is statistically significant is the number of days away from home. Under the assumption of a quadratic relationship, the first day's cost for this group was only about $8 per household on average. This rose to $24 per household for the second day and to $40 per household for the third day.

In equations 2, 3 and 4, household size and days away from home proved to be statistically significant in explaining some of the variation in household costs. It is interesting that for the groups that went first to friends and hotels, the coefficient estimated for days away from home is virtually the same as for the evacuation centre group. This means that, other things equal, the incremental cost of a day's evacuation was very similar for all three groups.

However, the incremental cost of a day's evacuation was considerably lower for households that went to relatives. As might be expected the importance of household size in determining costs is greatest for households that went to hotels, somewhat less for those that went to friends, and less still for those that went to relatives. It is not a significant variable in the case of those that stayed exclusively in evacuation centres.

The low r^2 values for equations 2, 3 and 4 may be partly explained by the fact that the questionnaire responses did not allow identification of those households that went to friends, relatives or hotels and remained there throughout the evacuation. Hence, the samples used for estimating equations 2 to 4 were not as pure as that for the evacuation

centre where it could be established which households remained in the centres throughout the evacuation period. Other explanatory variables, such as income and distance evacuated, were tested but found to be insignificant.

The difficulty of explaining more than a small proportion of the variation in household costs through regression analysis suggests that the variety of arrangements within each group was considerable. Some people paid nothing or virtually nothing to friends or relatives, whereas others paid considerable amounts. Some people spent hundreds of dollars in hotels whereas others shared rooms and paid comparatively little. Had it been possible, incorporation of information on these kinds of arrangements would probably have done much to improve the explanatory power of the regression equations.

7.4. PUBLIC SECTOR COSTS

Agencies representing all four levels of government which have responsibilities in Mississauga were involved in some way during the emergency: the City of Mississauga, the Regional Municipality of Peel, the Province of Ontario, and the Federal Government. Details of this involvement and that of other organisations in neighbouring jurisdictions as well as volunteer agencies are provided in Chapters 2,3, and 4.

In estimating the costs borne by the public sector, a decision had to be made whether to include all the costs incurred (such as, the full cost of providing the emergency services used) or only those in excess of normal requirements. Since it is a primary function of government to provide such service at all times it can be argued that it is only the excess costs which are properly attributable to the Mississauga evacuation. This is the position taken in this study.

In the sections which follow, estimates of the costs to each level of government involved in the evacuation are provided. The City of Mississauga, the Regional Municipality of Peel and the Provincial Government each provided their own estimates which were originally put together for internal accounting purposes. The level of detail and scope of coverage of these estimates do not correspond exactly. However, to the extent possible, the estimates are presented in a manner intended to facilitate comparison.

The only Federal agency for which cost data were obtained in this study was the Royal Canadian Mounted Police Similar cost data were provided by the Metropolitan Toronto Police Force.

7.4.1. Costs to the City of Mississauga

Table 7.12 presents a detailed summary of the additional costs incurred by the City as a result of the emergency. The columns are defined by department and the rows by expenditure type (e.g. wages and salaries, materials and supplies) and item. More than 60% of the total estimated costs of $1.6 million is due to direct damage to buildings and their contents caused by the explosions and fire at the crash site. Overtime wages and salaries account for a further 10% and materials and supplies 12%. The remaining 15% of the estimated total costs are divided among wages for labour used unproductively (4%), fixed costs wasted during the evacuation (4%), and lost revenues (7%). These items require some further explanation.

Unlike the case of the business sector, most of the services provided by the public sector are not sold to the users. Hence there is no market price with which to estimate the value of an interruption of these services. One important

Table 7.12

PUBLIC SECTOR COSTS: THE CITY OF MISSISSAUGA

($)

Department	Fire	Mississauga Transit	Buildings	Engineering and Works	Recreation and Parks	Information and P.R.	Treasury and Others	Total
EXPENDITURE								
Damage to Buildings and Contents	0	0	0	0	0	0	956,507	956,507
Damage to Vehicles	0	0	0	0	0	0	44,215	44,215
Overtime Wages and Salaries	63,681	30,790	451	38,156	25,517	1,946	4,835	165,376
Wages for Unproductive Time	0	0	0	0	14,930	0	55,732	70,662
Fire Fighting	95,031	120	0	920	0	0	3,633	99,704
Municipal Administration	0	0	0	0	0	0	288	288
Clean-up Operations	0	0	0	11,741	0	0	0	11,741
Communications	0	787	44	0	74	989	0	1,894
Health and Welfare of Citizens	0	0	0	0	0	0	285	285
Engineering and Public Works	0	0	0	11,673	0	0	0	11,673
Equipment Rental and Accommodation	0	1,009	7	8,577	11,793	0	30,232	51,618
Miscellaneous	0	53	0	865	16,915	2,025	2,319	22,177
Lost Revenue	0	80,000	0	0	0	0	30,000	110,000
Fixed Costs Wasted During Evacuation	0	0	0	0	0	0	60,000	60,000
TOTAL:	158,712	112,759	502	71,932	69,229	4,960	1,188,046	1,606,140

Source: Adapted from information provided by the Finance Department of the City of Mississauga.

exception in this regard is the Mississauga transit system, which was out of service during the evacuation. The revenues lost by the Mississauga Transit Commission are included as a real cost insofar as they reflect the value of the lost public transportation services due to the evacuation. Similarly revenues lost at the city's community centres also indicate the value of services that were not available to people because of the evacuation.

The lack of market prices for valuing the reduction in services provided by the City makes it difficult to estimate the economic costs involved. One way around this requires the plausible assumption that people value these services at, or above, the costs of providing them (if they did not, presumably political pressures would be exerted to reduce the commitment of funds to these services). Consequently, the wages paid to labour that was unproductive, and the fixed costs that were wasted during the evacuation represent what is probably a low estimate of the value of these foregone, non-marketed services, normally provided by the City of Mississauga. These costs are included in Table 7.12.

7.4.2. Costs to the Regional Municipality of Peel

Table 7.13 summarized the costs to the Regional Municipality of Peel. These are the Region's own estimates of the additional costs, over and above what would have been incurred under normal circumstances. By far the most important component was overtime costs incurred by the regional police force: over 80% of the total.

For purposes of comparison, the costs to the City of Mississauga in the categories of expenditures used by Peel are as follows:

total wages and salaries = $165,377 and total materials = $177,203.

Table 7.13

COSTS TO THE REGIONAL MUNICIPALITY OF PEEL

($)

Account \ Department	Police	Sanitary Sewer	Waterworks	Engineering and Admin	Waste Management	Social Services	Planning	General Government	Total Peel
Direct Labour	-	2,692	8,878	44	2,211	-	-	-	13,825
Salaries	155,715	-	-	-	-	31	203	-	155,949
Fringe Benefit	23,228	-	-	-	-	-	245	-	23,473
Total Wages & Salaries	178,943	2,692	8,878	44	2,111	31	448	-	193,247
Materials & Supplies	22,767	-	122	2	-	6,101	18	-	29,010
Purchased Services	166	-	120	1,000	-	4,095	7	101	5,489
Cost of Water Used	-	-	15,489	-	-	-	-	-	15,489
Total Materials	22,933	-	15,731	1,002	-	10,196	25	101	49,988
TOTAL:	201,877	2,692	24,609	1,046	2,211	10,227	473	101	243,235

*From Table excluding damages to buildings and vehicles, wages for comparative time, wasted fixed costs, and lost revenue.

Source: Office of the Treasurer and Commissioner of Finance, the Regional Municipality of Peel

It is clear that, even on the basis of the narrower cost definition used in the estimates for the Regional Municipality, the costs to the City were considerably greater than those of the region. If other items are included in the comparison, especially direct damages to buildings and vehicles, the difference in total costs to the two levels of government becomes much greater.

7.4.3. Costs to the Metropolitan Toronto Police Force

The Metropolitan Toronto Police Force committed 1,667 person days during the evacuation. This involved an estimated additional salary expense of $249,192. Vehicle costs of $8,510 were also incurred by the Force including $1,640 for mobile sound truck equipment (all estimates provided by the Metropolitan Toronto Police Force).

7.4.4. Costs to the Province of Ontario

Estimates of the costs borne by the Ministries and agencies of the Province of Ontario are summarised in Table 7-14. The major costs were incurred by the Ministries of Environment, Health and Labour, all of which had responsibilities for surveillance, monitoring and testing to ascertain the extent of the possible risks confronted by the public. Most of the costs attributed to the Ministry of the Solicitor General were for the personnel and equipment provided by the Ontario Provincial Police.

7.4.5. Costs to the Federal Government

The only federal agency to incur additional costs of any magnitude because of the emergency was the R.C.M.P. Fifty-two men per shift were committed for 3 shifts a day over a 7 day period. The overtime incurred amounted to $43,453 and approximately $500 was expended for food. Twenty-six vehicles were utilised but no record of vehicle expenses was maintained.

Table 7.14

COSTS INCURRED BY PROVINCIAL MINISTRIES AS A RESULT OF THE MISSISSAUGA DISASTER

Name of Ministry	Salaries (see below) (a) 1 $	2 $	3 $	4 $	5 $	Travel, Meals, Accom. etc. Supplies Equip. Office Rent	Rental air Monitoring Equipment	Ministry Programs, Subsidies, Grants, etc.	Organi-sations asked to assist	Total
Gov't Services		10,389.86								10,389.86
Attorney General	2,047.00		1,883.00			2,190.00		23,035.00		29,155.00
Sol. General			106,335.00	151,300.00		24,324.00				281,959.00
Environment	400.00	3,000.00	50,000.00	13,000.00	5,000.00	6,000.00	97,000.00	(b)	(c)	174,400.00
Corp. & Soc. Serv.				26,000.00		3,500.00		25,000.00	42,300.00	96,800.00
Health								199,740.33		199,740.00
Housing	1,106.13	1,345.95		1,027.47		144.41				3,623.96
Labour			17,500.00	900.00		9,270.00		21,730.00		49,400.00
Trans. & Comm.		3,768.26		8,235.16		7,110.45				19,113.87
Civil Ser. Comm.	651.18									651.18
Northern Affairs	525.83									525.83
Educ./Coll./Univ.				3,623.23		6,515.23				10,138.46
TOTALS	4,730.14	18,504.07	175,718.00	204,085.86	5,000.00	59,054.09	97,000.00	269,505.33	42,300.00	875,897.49

(a) Salaries: 1 Staff absent from work because of domestic evacuation.
2 Staff prevented from attending work in the disaster area because of entry restrictions.
3 Staff actually working on emergency activities.
4 Staff overtime due to the emergency.
5 Temporary help due to the emergency.

(b) $15,000 increase in subsidy to M.R. Centre, Mississauga.
$10,000 loss of revenue, M.R. Centre, Mississauga.

(c) Canadian Forces: $32,300
Canadian Red Cross: 10,000

Source: Ontario Ministry of the Solicitor-General

7.5. BUSINESS SECTOR COSTS

The City of Mississauga was not only "evacuated" in the 24 hours following the Saturday midnight derailment - it was shut down. At 00:30 on Monday, November 12th, Mayor McCallion declared the evacuated area to be closed. The normal Monday morning start to the production of goods and services in a sizeable and thriving urban economy was not to take place and, as it turned out, business-as-usual was not to be reestablished until the following week. In economic terms, just as the services of the housing stock were lost to the residents of Mississauga during the evacuation period, so the flow of good and services normally produced with the city's stock of business capital was abruptly turned off. One of the major costs of the mishap was the value of the goods and services foregone due to this interruption in productive activity.

In an attempt to account for such a loss of economic welfare it is always difficult to define the geographic area or group of people to be considered. It has been decided here to focus upon the effect on business activity within the evacuated area.

Other effects outside of the city arose because of normal interdependence within the business sector. Firms in Mississauga supply materials, services, and markets to other firms outside of Mississauga. An interruption of the flow of such supplies or of the availability of markets, even for a period as short as a week, can interfere with production. These firms also bore some of the burden of the emergency. Although such effects may have been more concentrated in areas close to Mississauga, they are in general widely transmitted to other parts of the domestic economy and even internationally.

The above discussion also draws attention to two other matters. First, in the preceding sections on the economic impact of the accident on households, the study considered the costs borne by residents of the evacuated area. Here the focus is on the interruption of business activity located within the evacuated area. But the people to whom the losses accrue - the owners and employees of the firms that were closed and the consumers of what is produced by the firms - live both inside and outside of it.

Second, some of the costs that accrue to owners of Mississauga firms are not really "costs" from the point of view of the whole society (for example, all residents of Ontario). Some business lost by firms in Mississauga will have been gained by firms elsewhere in the province. What is involved is a transfer of income from one group to another group, both part of the larger community. On the other hand, some of the costs are genuine burdens of the whole society: production foregone in Mississauga that was not made up elsewhere during the emergency or in Mississauga afterwards. A more comprehensive study would involve an attempt to separate the transfers from the more fundamental costs.

7.5.1. Measuring Economic Losses to the Business Sector

Two measures of the loss in economic welfare due to the evacuation were considered in this study: the reduction of profits accruing to firms operating in Mississauga and the reduction in the net value of goods and services (i.e., in "net value added") produced by those firms. The profit measure is familiar; it identifies the burden of the mishap to the owners of the firms affected. The second measure - net value added - applies to a broader group that includes

the workers that would have produced the goods and services foregone, as well as to the owners of the producing firms.

The net value added to production by a firm in a given year is defined as the gross value of the firm's product during that year minus the value of its purchases from other firms. This is a more informative measure to use in regard to the output loss during the evacuation period than the total value of production, especially if one wants to focus primarily on production foregone by firms located in Mississauga. A measure of net value added excludes the value of materials and other inputs produced outside the evacuated zone and/or before the evacuation period.

To grasp this more fully consider first a firm that has on hand an inventory of materials or intermediate goods that it would have used during the closed-down period. If these intermediate goods were not so perishable as to spoil during that period, they will have been used afterwards and their value will not have been lost. What was lost during the evacuation period is the value of the further processing that would have been done within the firm. If the intermediate goods did not spoil during the period of closure (and "materials" or "intermediate goods" should be broadly interpreted to include such things as inventories of food in retail stores), their value would be accounted for by this measure because the firm's net-value added for the accounting period would be reduced accordingly. That is, in the net-value added calculation, the (positive) revenue, that would normally be set against the (negative) cost of the spoiled materials, will not have been received.

Now consider a second firm in which the production of a week's output normally involves materials or services delivered within that same week. There are two possibilities:

(a) if the firm's supplier is also within the evacuated zone normal production of these intermediate goods will also have been foregone, but their value is accounted for by a net-value added calculation for the supplier, not for the firm that uses the goods; (b) if, on the other hand, the supplier is outside of the evacuated area, its production need not be lost, though it may be if it cannot find alternative buyers or if the material cannot be stockpiled. In any event the lost production of such a firm could clearly not be included in the output lost within the closed sector.

As a measure of welfare lost by consumers, the reduction in net value added due to an interruption in production is a potential (rather than an actual) loss, because some of the consumption can be replaced by goods and services produced elsewhere in the economy during or after the period of closure, or within the closed sector after it reopens. However, such replacement is not likely to be complete. While there is always some excess capacity available to supply sudden increases in demand, it is not likely to be sufficient to replace all lost production and what is available cannot always be brought into play on short notice to produce the specific goods that need to be replaced.

As income, net value added can be broken down into: the wages and salaries of the workers who produce it; the profits and return on capital and land received by the owners of the firms involved; and the taxes paid to government. However, the proportions of net value added that accrue to employees and employers in normal times are not likely to apply to the reduction in net-value added due to a single stoppage of production for a week. Employers are likely to bear a considerably higher proportion of the loss relative to their normal share of net value added.

A firm that went bankrupt.....

The impact of a public emergency on the fortunes of a business can depend very much on when it occurs. For a small engineering firm, with offices located near the scene of the derailment, the required closing could not have come at a worse moment. At the time of the accident, the firm was having difficulty completing a large job due to events beyond its control. As a result, a projected payment to the company was deferred and it was consequently short of cash, to an extent sufficient to worry both the firm's management and its bank.

When the emergency occurred, the firm attempted to continue operating out of an office in a hotel, but it was a frustrating operation. Activities were hampered not only because company files were inaccessible, but also because a large and expensive piece of equipment which had been rented for the job was parked in the evacuation zone. Work on the project was held up for about 10 days.

During this period, the firm continued to pay all regular salaries and wages. Hourly paid employees hired by the firm do specialized work. Laying them off, due to the emergency, would likely have created still further delay afterwards.

A claim of $9,000 was filed for expenses directly related to the shut-down. But this may understate the actual impact. The firm declared bankruptcy not long afterwards. The former owner believes that it could well be operating today if its activities had not been disrupted by the Mississauga emergency.

They will bear the burden of spoiled inventories and other special costs. Many employers are likely to continue to pay wages and salaries in such a situation, particularly to those employees not paid on an hourly basis. The household and business surveys indicate that, though some employees lost income, others did not experience an interruption in pay. The latter group apparently included even hourly-paid employees, although detailed information was not collected.

Both of the measures of the economic burden of business closing considered here are well known accounting variables upon which data are widely collected and published. Despite this, an attempt to construct dependable estimates of the actual reductions in net value added and business profits due to the Mississauga closing is difficult, and is impossible at the level of accuracy one normally expects in regard to these variables. The accounting systems of individual business units are not set up to handle such an unusual occurrence. Some firms with which the study team has been in contact have made estimates, but these are typically only rough approximations. Furthermore, one cannot assume that the estimate of any given firm is comparable with the estimates of other firms, since various common assumptions would be necessary for comparability. Whatever data of this nature have been gathered in the course of the study have to be viewed as anecdotal at best. Attempts to understand the magnitude of the costs to the business sector that are described in the following sections are based on different types of data.

7.5.2. An analysis of the impact on net value added

Since regional breakdowns of national product accounting and related data are available, it is possible, in principle, to calculate the daily output of the business sector in a particular locality. If the world were simple, one could do this for Mississauga's business sector, then multiply this number by the average number of days during which firms were closed. This would supposedly provide an estimate for the local output loss due to the accident.

The world is not that simple. But such a calculation, viewed in perspective and with caution, can still be useful in order to make a judgement about the orders of magnitude involved. Was the lost production in the hundreds of thousands of dollars? Millions? Hundreds of millions? It may also be possible to conclude the likely direction of the bias in such a number, in the sense that one may be able to argue that the true number is likely to be, say, lower than the number calculated.

Unfortunately the statistical agencies do not estimate production specifically for Mississauga on a comprehensive basis. From the available data, the figure that most closely approaches our needs is an estimate of aggregate annual net value added in Mississauga's manufacturing sector.

In 1977, the latest year for which data are available, net value added in Mississauga's manufacturing sector amounted to $831,203,000.[1] Applying aggregate manufacturing growth rates to adjust the figure to 1979 levels results in an

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[1] *Statistics Canada (1977) p.271. This number refers to the broad definition of manufacturing activity, which includes administrative and related activities as well as the more narrowly defined manufacture of goods.*

estimate of $1,118 million.[1] In the absence of an estimate of the average number of working days per year in manufacturing it is assumed for the sake of this analysis that factories worked 5-day weeks. They would then operate 260 days per year, assuming no closings for annual vacations. On this basis, the daily net value added in Mississauga's manufacturing sector in 1979 was $4.3 million.

The business survey (see Appendix 2) reported on in the next section provides an estimate of the average number of days closed due to the evacuation. On average, firms were closed for 3.8 days. Thus, based on average annual estimates, and some plausible assumptions applied in order to keep the calculation simple, the net value added lost due to the closing of Mississauga manufacturing sector would be $16.3 million.

Again with simplifying assumptions, this number can be expanded to include production in other sectors as well as manufacturing. To do this one needs a percentage breakdown of annual production into its broad industrial components. In order to have sufficiently detailed breakdown, it was necessary to use data on real domestic product for the whole Canadian economy.[2] Based on the 1979 weights used to categorize real domestic product by industry, manufacturing accounts for 23% of total output. The service producing industries have a weight of 59%. However, the latter figure

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[1] *A growth rate of 14.6% is available for the Ontario manufacturing sector for 1977-8: (Statistics Canada, 1978, p. 94). For 1978-9, the growth rate of 17.4% for total manufacturing shipments for all Canada was used (Statistics Canada, 1981, p. 68).*

[2] *The weights used are from Statistics Canada, 1980.*

includes various activities in the public sector. While the weights for public and private service activities cannot be precisely separated, taking out the most important public sector categories results in an estimate of the private service sector's output as 40% of the total.[1]

The remaining components of total product are the primary goods-producing industries (11%) and construction (7%). The former industries (such as forestry, mining and agriculture) are likely to play a very small role in an urban economy in southern Ontario; it is here assumed that it is so small in Mississauga as to warrant a zero weight. For this study the output of Mississauga's business sector is assumed to consist of manufacturing, construction, and private service industries in the approximate proportions 23:7:40, which imply relative shares of 33%, 10% and 57% respectively.

On this basis, the average net value added per day by Mississauga's business sector in 1979 was $13.2 million, made up of $4.3 million in manufacturing, $1.3 million in construction, and $7.6 million in the service sector. The average net value added in a period of 3.8 days would be $50.2 million. These calculations are summarized in Table 7.15.

7.5.3. Limits to the analysis of impact on net value added

If one wants to use these numbers as a guide to the net loss of production due to the emergency, it is advisable to consider the ways in which they could be in error. The major sources

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[1] *The sectors removed were Education, Health and Welfare, Public Administration and Defence. These components include some private sector activities such as physicians in general practice. On the other hand, some of the industries not removed involve some public sector activities.*

Table 7.15

Average Net Value Added by
Mississauga's Business Sector

	Per day	Over average closing period of 3.8 days
	$ million	
Manufacturing sector	4.3	16.3
Construction sector[1]	1.3	5.0
Service sector[2]	7.6	28.9
TOTAL	13.2	50.2

NOTES

1. Based on a calculated ratio of construction output/ manufacturing output of 0.307.

2. Based on a calculated ratio of service sector output to manufacturing output of 1.767.

of potential error are as follows:

(a) less than the whole of Mississauga was closed down. Since business is not spatially distributed in a uniform manner, and we have little specific information on the business concentration in the closed part relative to the part that was not closed, a simple adjustment to account for this matter is impossible;

(b) some portion of the production foregone was replaced by extra production after businesses reopened;

(c) some businesses operate more than 5 days per week and some close down for annual vacation periods. The former is probably a larger source of inaccuracy than the latter, which means that our assumption of 260 working days per year is too low. A higher number would decrease our estimate of average daily output. Therefore, this issue leads to an upward bias in the results in Table 7.15;

(d) spoilage in inventories has to be added to the production foregone during the emergency in order to calculate the total loss;

(e) there are minor seasonal variations in manufacturing output, the basis of the above calculations. In Canadian manufacturing as a whole, November's output is slightly higher than average.[1] There is no reason to believe that Mississauga's output differs from the national seasonal average in one direction or another. Thus, the time output loss per day of closure could be greater than the annual average because the accident happened to occur in a month of high

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[1] *The ratio of seasonally adjusted to seasonally unadjusted manufacturing shipments in November 1979 was 0.978. This is not a large adjustment: for example, the largest downward adjustment in 1979 occurs in May, when the ratio was 0.930. It must, however, be allowed for.*

production. Furthermore, this fact might have reduced the ability of some companies to replace lost output after reopening, because their production facilities would already have been working closer to full capacity;

(f) seasonal variation in the service industries is not likely to differ dramatically from that in manufacturing, but the volatile nature of construction activity makes that component of our calculation questionable. Because construction spending varies so much from place to place through time, a seasonal adjustment based on past national averages would not be very dependable when applied to a particular city;

(g) the composition of Mississauga's domestic product is not necessarily identical with the make up of real domestic product for the whole Canadian economy, nor consistent with our assumptions about primary and service industries;

(h) the estimate of the average number of days closed weights each firm in our sample identically. The number of days closed may in fact vary with the size of the firm. If, for instance, large firms remained closed longer than small firms, they should be weighted more heavily in the average. As well, this average is subject to sampling error. As noted below, manufacturing and wholesale firms appear to be under-represented in the sample, relative to retail service firms.

The direction of the bias introduced by points (f), (g), and (h) is unknown. Points (a), (b), and (c) are likely to lead to an overestimate; that is, they call for the estimate to be scaled downwards relative to average daily production figures. Points (d) and (e) are likely to lead to

an underestimate, and would call for an upward adjustment of the estimate of lost production. Overall the direction of the bias cannot be predicted a priori, though the fact that some sources of error will offset other sources to some unknown extent allows one to have more confidence in using our calculations as rough estimates of the likely production losses.

Although these calculations are indeed rough guides to the production losses, the analysis still provides some information on the orders-of-magnitude involved. Thus is is safe to say that the value of lost production in Mississauga was in the tens of millions of dollars, rather than in the hundreds of millions or hundreds of thousands of dollars.

7.5.4. A framework for analysing the impact on business profits

Even if it is not practical to generate an estimate of the overall reduction in profits due to the closing of business, it is possible to make some tentative observations about the harm done to the business sector. Some insight into the problem can be gained merely by considering the various possiblities that arise.

Consider a hypothetical firm that produces and sells its goods at a constant rate through time, and that can stop and start up its production without additional costs. If all firms were like this, calculating profits lost by firms fully closed down by the Missisauga emergency would be simple. For each firm, the daily reduction in profit could be estimated from its daily profit under normal circumstances, which could be obtained from annual accounting statements for earlier years, with appropriate adjustments analogous to those applied in our calculation of daily

net-value added. The total reduction in the profit of a firm would be the daily profit times the number of days it was closed.

Since these hypothetical assumptions do not hold, it is useful to ask what can be said in general about the effects of more realistic assumptions. To do that it is helpful to consider the revenue and cost components of profit separately. Both will be affected by a closing, but, in most cases, differently. In theory, a firm that has experienced an unplanned interruption in its business can find that its annual total costs have risen, fallen, or remained constant; that its annual total revenue has risen, fallen or remained constant; and that each has changed to a different extent. Combining changes in cost and revenue indicates that its profit may have changed in either direction or may have remained constant.

In practice, all of the possible changes are not equally likely. A typical firm is likely to find that sales revenue has fallen or remained constant, the latter occurring because the nature of the firm's product is such that a brief interruption has no effect on sales or because lost sales are made up after reopening. An increase in revenue is possible. For example, a firm that supplies special services during the evacuation on an emergency basis may permanently gain new customers as a result. But, since this will occur very infrequently, for this analysis it will be assumed that it is not a possibility.

In regard to cost, both increases and decreases are likely outcomes. Decreases can occur when a firm that stops production is able to curtail purchases of materials and labour. Increases can occur because of extra costs due to inventory spoilage, special expenses related to starting and stopping production, overtime pay after reopening, and so on.