Department of Communications
Ministère des Communications

# DEMAND FOR LAND-MOBILES

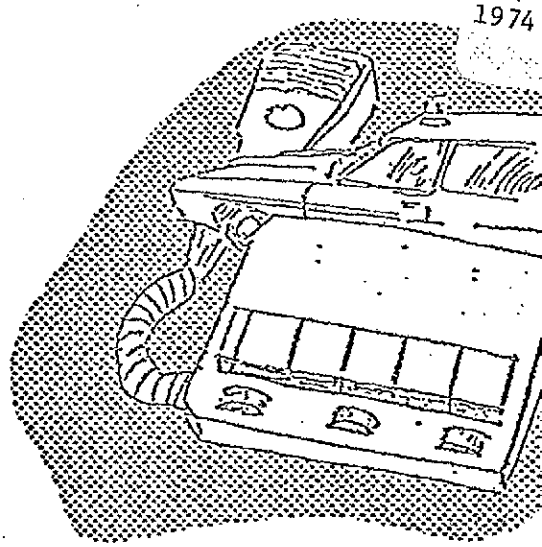
## A NATIONAL PROFILE



*ECONOMIC POLICY AND STATISTICS BRANCH*

COMMUNICATIONS CANADA







# DEMAND FOR LAND-MOBILES

## A NATIONAL PROFILE

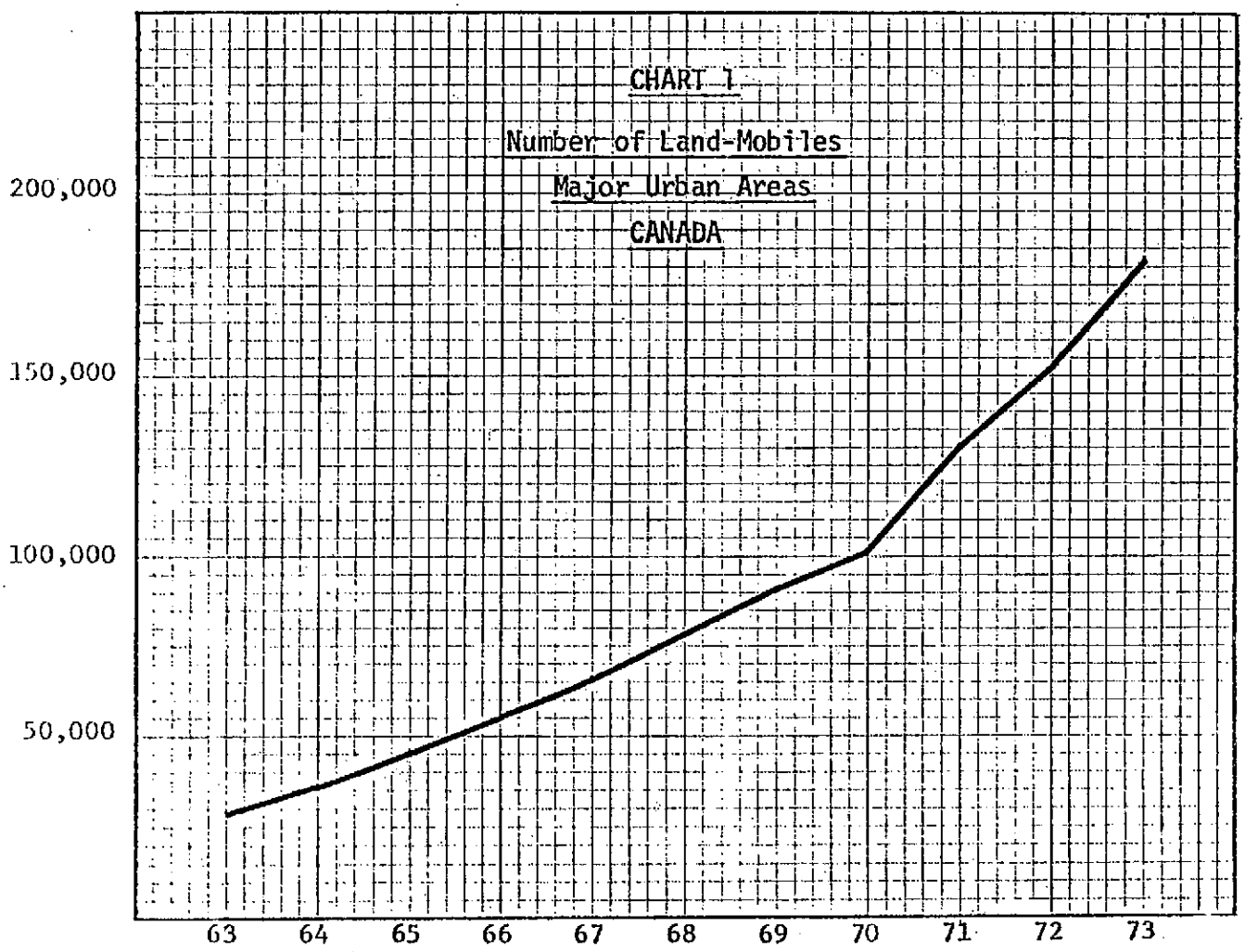


OTTAWA, NOVEMBER 1974

# GROWTH

The number of land-mobiles has shown a tremendous growth rate over the past ten years.

In the 34 major cities in Canada, representing over 90 per cent of the land-mobiles in use, the annual compounded growth rate amounted to 20.0 per cent for the period 1963-1973.



# URBAN CENTRES

The main urban centres accounted for 78.5 per cent of land-mobiles in use in 1973 and showed an annual growth of 19.3 per cent in the 1963-1973 period.

TABLE 1

Number of Land-Mobiles

| | 1963 | 1973 | Compounded Growth Rate (%) |
|---|---|---|---|
| Toronto | 5,426 | 29,598 | 18.9 |
| Vancouver | 3,802 | 22,187 | 19.3 |
| Montreal | 4,043 | 21,202 | 18.0 |
| Edmonton | 1,824 | 13,450 | 22.1 |
| Calgary | 1,069 | 9,295 | 24.1 |
| Quebec | 1,201 | 8,067 | 21.0 |
| Hamilton | 1,221 | 6,347 | 17.9 |
| Winnipeg | 1,068 | 6,198 | 19.2 |
| London | 1,165 | 5,774 | 17.4 |
| Ottawa | 608 | 5,424 | 24.5 |
| Victoria | 571 | 5,023 | 24.3 |
| Regina | 1,696 | 4,780 | 10.9 |
| Halifax | 739 | 4,218 | 19.0 |
| St. John's | 106 | 1,405 | 29.5 |
| TOTAL | 24,539 | 142,968 | 19.3 |

# CONCENTRATION

It is interesting to note that only 6 industrial sectors accounted for over 84 per cent of land-mobiles in use in 1973. This proportion amounted to 90.8 per cent in 1963.

TABLE II

1973

| | Sectors | Number of Land-Mobiles | Percentage Distribution |
|---|---|---|---|
| 1) | Transportation * | 67,309 | 37.0 |
| 2) | Public Administration | 35,907 | 19.7 |
| 3) | Construction | 17,897 | 9.8 |
| 4) | Manufacturing | 12,760 | 7.0 |
| 5) | Services | 11,927 | 6.5 |
| 6) | Trade | 8,308 | 4.6 |
| 7) | Others | 28,020 | 15.4 |
| | TOTAL | 182,128 | 100.0% |

* Includes public utilities and communications

# SECTORAL BEHAVIOUR

Taking all cities into consideration, the importance of each sector of land-mobile usage has changed considerably over the period 1963-1973.

The Public Administration sector accounted for 40.4 per cent in 1963, in comparison to 19.7 per cent in 1973.

In 1973, a little more than 6 per cent of all land-mobiles in major urban areas was concentrated in the services sector. This proportion was only 1.3 per cent in 1963.

Due to technological changes in the construction industry, its share of land-mobile usage was 3.0 per cent in 1963 and 9.8 per cent in 1973.

TABLE IV

Land-Mobiles in Major Urban Areas

Sectoral Distribution

| Sector | 1963 % | 1963 # | 1973 % | 1973 # |
|---|---|---|---|---|
| Transportation | 39.7 | 11,506 | 37.0 | 67,309 |
| Public Administration | 40.4 | 11,893 | 19.7 | 35,907 |
| Construction | 3.0 | 888 | 9.8 | 17,897 |
| Manufacturing | 4.4 | 1,309 | 7.0 | 12,760 |
| Services | 1.3 | 381 | 6.5 | 11,927 |
| Trade | 2.6 | 780 | 4.6 | 8,308 |
| Others | 9.2 | 2,704 | 15.4 | 28,020 |
| TOTAL | 100.0 | 29,461 | 100.0 | 182,128 |

# VARIANCE BY CITY SIZE

NOT ALL CANADIAN CITIES SHOWED THAT DEGREE OF CONCENTRATION:

In cities with a level of population higher than 800,000 (Vancouver, Toronto and Montreal), the 6 major sectors accounted for over 88 per cent of the total number of land-mobiles.

In cities with a level of population less than 40,000 (Sydney, Bathurst, Sept-Îles....), the 6 major sectors accounted for slightly over 71 per cent of the total number of land-mobiles.

TABLE III

1973

| Population Level ('000) | Share of 6 Major Sectors (%) | No. of Mobiles |
|---|---|---|
| 800 + | 88.7 | 64,710 |
| 800-300 | 86.0 | 41,941 |
| 300-90 | 80.6 | 25,669 |
| 90-40 | 86.9 | 8,221 |
| less than 40 | 71.2 | 13,567 |
| TOTAL | 84.6 | 154,108 |

# CONSTRUCTION

During the period 1963-1973, the land-mobile radio demand grew more or less uniformly among major urban areas. The average growth for the construction sector was 35.4 per cent. Most cities experienced small variations around this level.

Due to several technical, economic and safety factors, the share of land-mobiles in this sector more than tripled during the period 1963-1973.

Land-Mobiles

Major Urban Areas

Construction Sector

| Level of Population ('000) | Share (%) | | Annual Rate of Growth |
|---|---|---|---|
| | 1963 | 1973 | 1963-1973 (%) |
| less than 40 | 8.2 | 14.0 | 36.3 |
| 40-90 | 3.3 | 11.5 | 33.2 |
| 90-300 | 1.9 | 8.0 | 35.8 |
| 300-800 | 3.8 | 11.7 | 31.8 |
| 800 & over | 2.5 | 8.0 | 33.2 |
| TOTAL | 3.0 | 9.8 | 35.4 |

# CONSTRUCTION

The strong growth is explained by rapid changes in methods and structure of operations in the construction industry:

- *More prefabricated materials*
- *Proportion of high rise in relation to total residential construction*
- *Use of cranes and prefabricated components*
- *Increase in the depth of foundation of buildings*
- *Safety factors*

To explain the growth of land-mobiles in this sector the following factors were selected:

- *The stock of radio-mobiles in the previous period to indicate the degree of adaptation* ($L_{t-1}$)
- *The number of land-mobiles in the city to capture the diffusion process. It is implicitly assumed that the more land-mobiles in the city, the more a given contractor will be aware of that benefit.* ($LV_{t-1}$)
- *A time trend to take into account technological change* (T)
- *Dummy variables reflecting the size of the city* (P2, P3, P4, P5)
- *The value of building permits as a proxy for the level activity in this sector* ($BP_t$)

By the least-squares method, the following results were obtained:

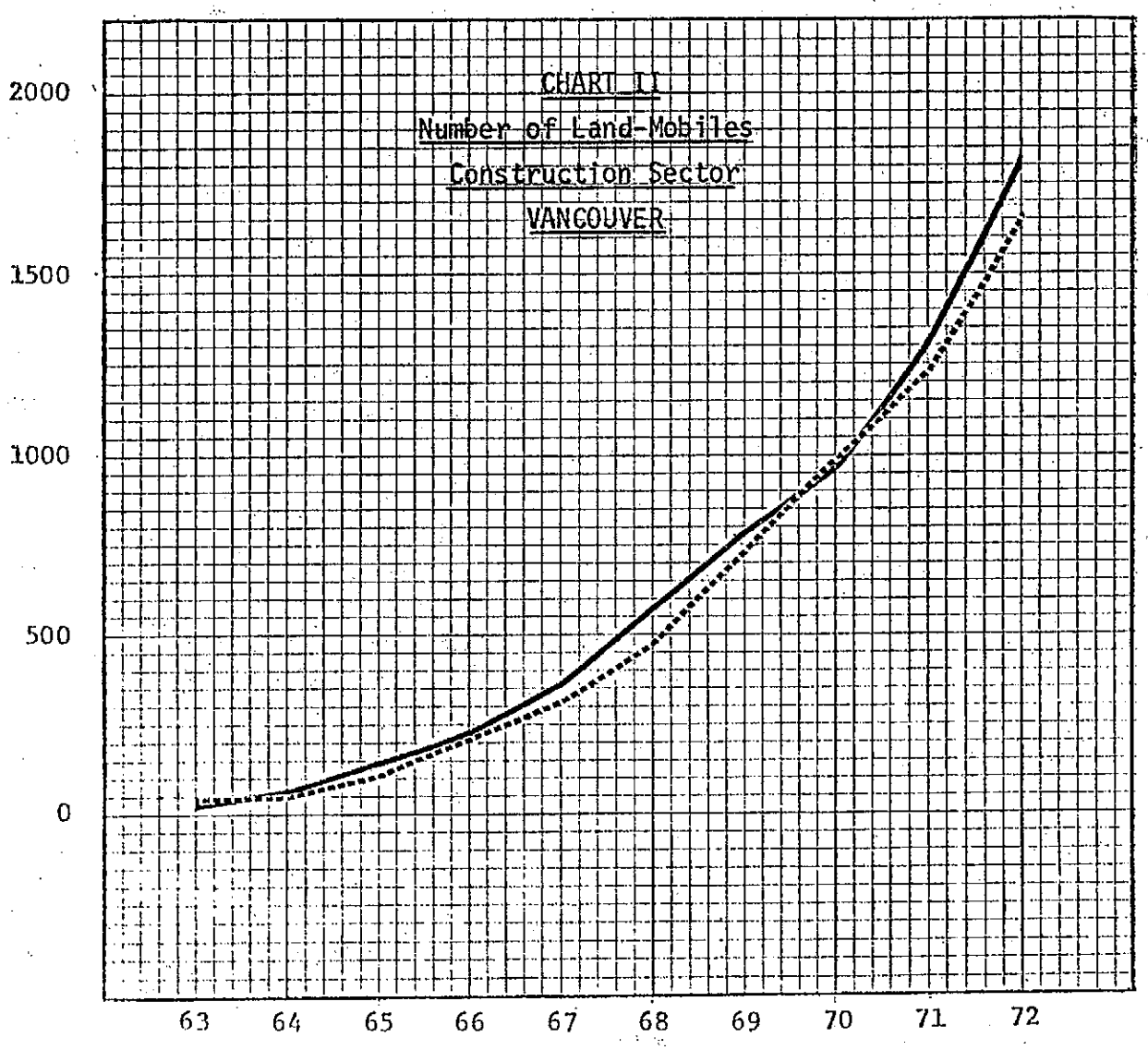
$$\log (L_t - L_{t-1}) = \underset{(-6.1)}{-2.3379} - \underset{(-4.1)}{.5998P_2} - \underset{(-2.5)}{.4897P_3}$$

$$- \underset{(-1.9)}{.5264P_4} - \underset{-(1.9)}{.7498P_5} + \underset{(3.9)}{.2357} \log(L_{t-1})$$

$$+ \underset{(4.8)}{.4492} \log(LV_{t-1}) + \underset{(4.1)}{.2879} \log(BP_t)$$

$$+ \underset{(4.3)}{.1028T}$$

$R^2$ ADj: .8091 D.W. = 1.67



# TRANSPORTATION

In almost every major urban area, the share of the transportation sector changed very little during the period 1963-1973.

However, the size of the city has an impact on the importance of the transportation sector.

In urban areas with less than 40,000 inhabitants, 26.9 per cent of land-mobiles are concentrated in the transportation sector. In cities with more than 800,000, this proportion rises to 47.8 per cent.

TABLE V

Land-Mobiles

Share of Transportation

(%)

| Level of Population ('000) | 1963 % | 1963 # | 1973 % | 1973 # |
|---|---|---|---|---|
| less than 40 | 36.4 | 538 | 26.9 | 5,123 |
| 40-90 | 24.5 | 364 | 26.6 | 2,515 |
| 90-300 | 39.5 | 2,465 | 32.8 | 10,430 |
| 300-800 | 28.5 | 1,990 | 29.5 | 14,373 |
| 800 and over | 46.3 | 6,149 | 47.8 | 34,868 |
| TOTAL | 39.1 | 11,506 | 37.0 | 67,309 |

# TRANSPORTATION

The increasing demand for radio-communication in broadcasting and telephony as well as in building a complex of power transmission systems over long distances to the consumption centres have created a rapid expansion of land-mobiles in this sector.

In transportation, this strong demand is explained by new needs and new utilizations as vehicle indentification, field supervisory control and public security.

*The growth of land-mobiles was functionally related to:*

- *Stock of radio-mobiles in this sector in the previous period* ($L_{t-1}$)
- *Stock of radio-mobiles in the city in the previous period* ($LV_{t-1}$)
- *Personal income* ($PI_t$)
- *Dummy variables taking into account the size of the urban areas* (P2, P3, P4, P5)

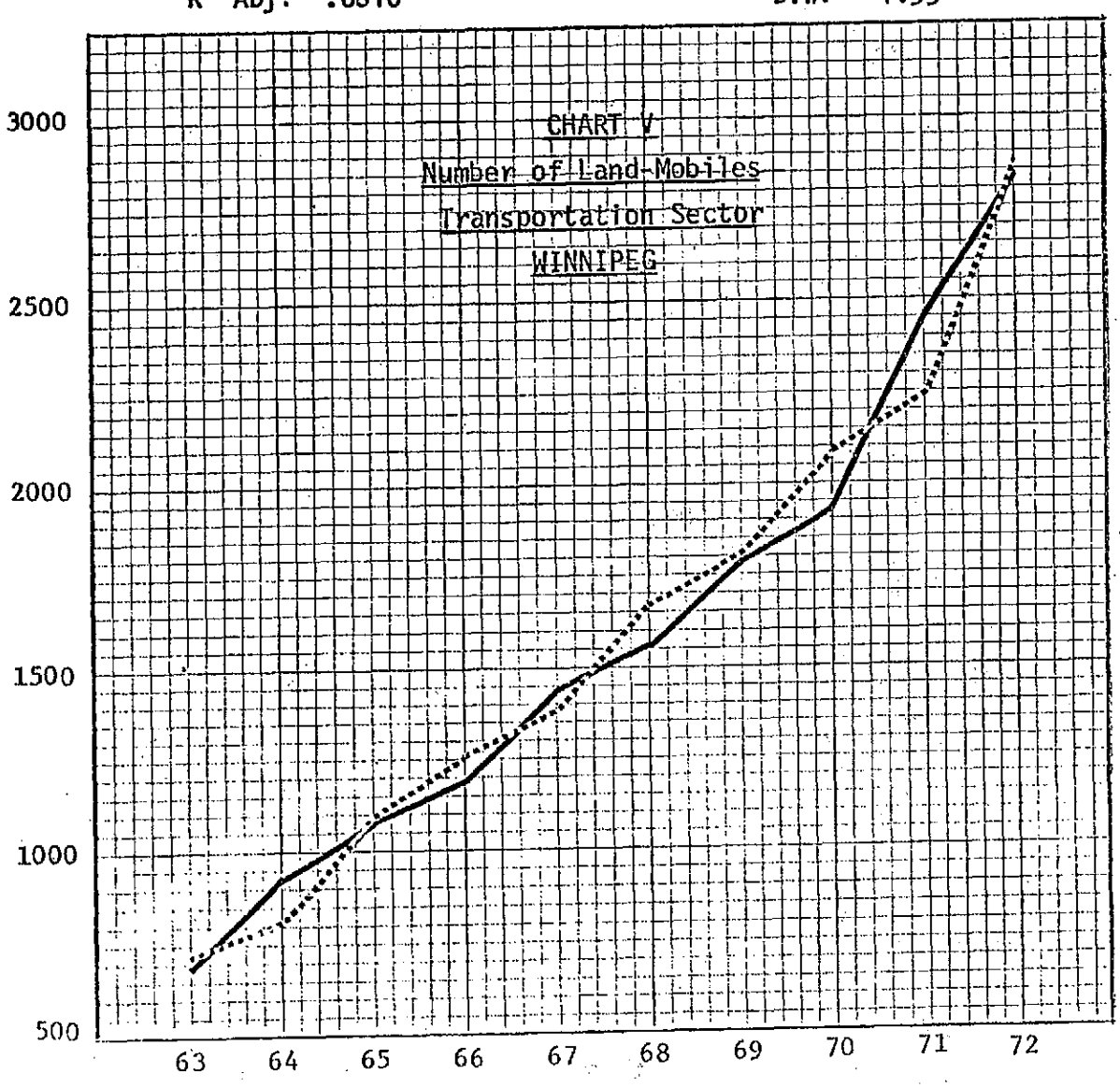
The estimation method provided the following results:

$$\log(L_t - L_{t-1}) = \underset{(-5.3)}{-1.7492} - \underset{(-4.4)}{.5523P_2} - \underset{(-3.0)}{.4660P_3}$$

$$- \underset{(-2.6)}{.6300P_4} - \underset{(-1.6)}{.5686P_5} + \underset{(8.4)}{.5077}\log(L_{t-1})$$

$$+ \underset{(2.6)}{.2388}\log LV_{t-1} + \underset{(3.3)}{.3156}\log(PI_t)$$

$R^2$ ADj: .8610 D.W. = 1.99



# SERVICES

Among the major users of land-mobiles, the service sector experienced the most rapid rate of growth; an average of 39.5 per cent a year during the period 1963-1973.

The growth pattern of land-mobiles was very different among major urban areas. The growth was respectively 72.1 percent and 79.5 per cent in Edmonton and Winnipeg, while the land-mobiles in the service sector advanced by 30.2 per cent and 34.9 per cent in the Toronto and Montreal regions. In Halifax, the demand for land-mobiles in services increased by 51.6 per cent a year during the period 1963-1973.

As a result of economic and technical factors the importance of the service sector was steadily increasing.

Land-Mobiles

Urban Areas

Service Sector

| Level of Population ('000) | Share (%) 1963 | 1973 | Annual Rate of Growth 1963-1973(%) |
|---|---|---|---|
| less than 40 | 0.1 | 6.2 | 58.2 |
| 40-90 | 1.3 | 6.1 | 40.0 |
| 90-300 | 0.5 | 4.9 | 48.8 |
| 300-800 | 1.5 | 9.6 | 46.3 |
| 800 and over | 1.7 | 5.4 | 33.4 |
| TOTAL | 1.3 | 6.5 | 39.5 |

# SERVICES

New applications for land-mobiles have produced an explosive demand for this means of communication in the service sector.

- *In many cities in North America telemetering medical devices are integral parts of ambulance services*
- *In the field of personal services, vehicles can be readily dispatched by radio, greatly increasing the degree of service that can be provided*

The function which explains the growth of land-mobiles in the service sector (apart from the dummy variables that reflect the size of city and the stock of land-mobiles in the previous period for the service sector) comprises the following factors:

- *Variation in the number of the total land-mobiles in the city to take into consideration the business sector in the service area. (It is implicitly assumed that this variable reflects the economic activity of the city)* (DLV)
- *Personal income per capita. This variable captures the demand for personal services* (PIC)
- *A time trend to approximate the rate of technological change* (T)

The following results were obtained:

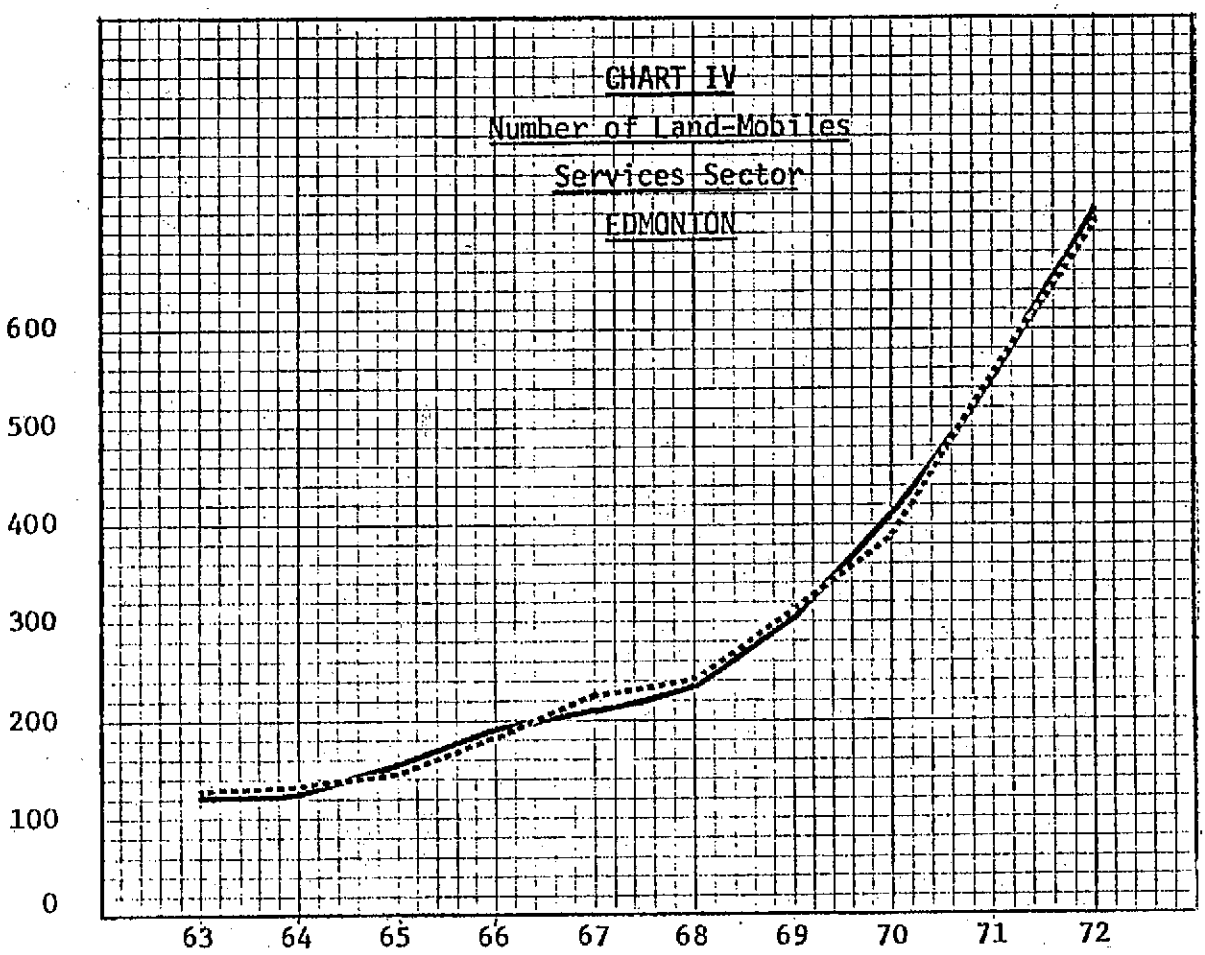
$$\log(L_t - L_{t-1}) = \underset{(5.2)}{-2.2792} + \underset{(2.1)}{.4558P_2} + \underset{(1.9)}{.4136P_3}$$

$$+ \underset{(4.0)}{.9898P_4} + \underset{(3.0)}{1.0314P_5} + \underset{(2.9)}{.2076 \log L_{t-1}}$$

$$+ \underset{(4.5)}{.4171 \log DLV_t} + \underset{(1.8)}{.4888 \log PIC_t}$$

$$+ \underset{(3.3)}{.1267T}$$

$R^2$ ADj = .7993 D.W. = 1.8



# PUBLIC ADMINISTRATION

The necessity to establish a flexible and efficient communication system for public security in the early sixties resulted in a massive concentration of land-mobiles in this sector.

In 1963, in the major urban areas, 40.4 per cent of land-mobiles was concentrated in the public administration sector compared with 19.7 per cent in 1973.

A growth of 11.7 per cent was therefore observed in this sector over the period 1963-1973.

This modest increase is partly due to the fact that in this sector the need for radio-communication has been recognized to a considerable extent for some time.

Land-Mobiles

Major Urban Areas

Share of Public Administration

(%)

| Level of Population ('000) | 1963 % | 1963 # | 1973 % | 1973 # |
|---|---|---|---|---|
| less than 40 | 34.8 | 514 | 7.6 | 1,451 |
| 40-90 | 55.3 | 822 | 28.8 | 2,725 |
| 90-300 | 43.0 | 2,682 | 23.8 | 7,576 |
| 300-800 | 44.5 | 3,108 | 23.3 | 11,387 |
| 800 and over | 35.9 | 4,767 | 17.5 | 12,768 |
| TOTAL | 40.4 | 11,893 | 19.7 | 35,907 |

# PUBLIC ADMINISTRATION

This sector is mainly comprised of police, fire, public works and other government services.

Public communication systems represent a considerable investment of public funds and are essential for the protection of life and property.

The growth of land-mobiles in the public administration sector was related to:

- *Dummy variables in 1971 and 1972 to take into account certain administrative decisions to replace equipment* (D)
- *Cities where federal police* (FP) *and provincial police* (PP) *are based.*
- *Stock of mobiles for the previous period in the public administration sector* ($L_{t-1}$)
- *Variation of land-mobiles in the city* (DLV)
- *Number of police* (PO)

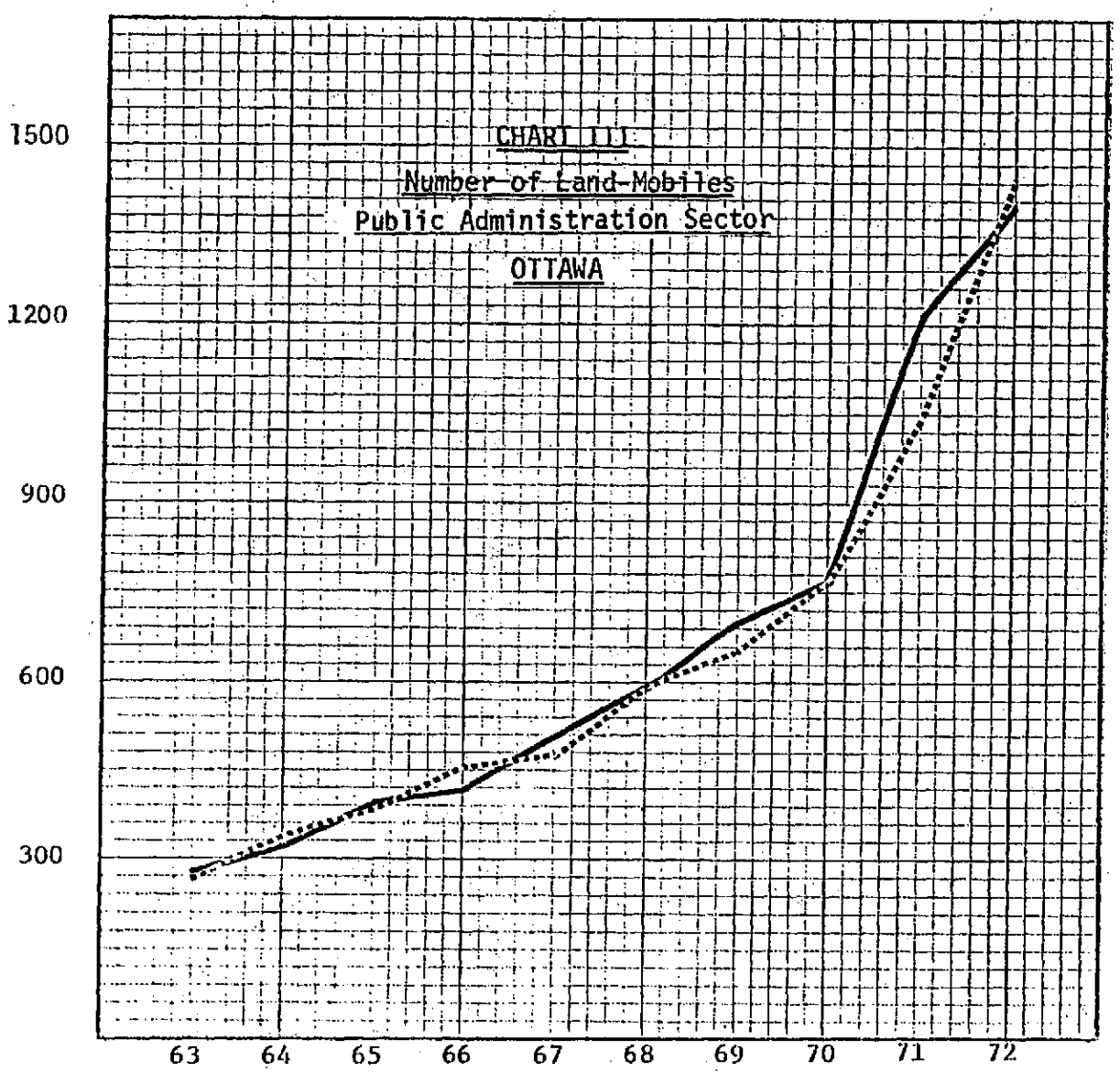
The following function was obtained:

$$\log (L_t - L_{t-1}) = -1.9921 + \underset{(5.2)}{1.0554D} + \underset{(2.0)}{.2895FP} + \underset{(1.5)}{.2766PP}$$

$$+ \underset{(3.2)}{.2651} \log L_{t-1} + \underset{(6.6)}{.5604} \log DLV_t$$

$$+ \underset{(1.9)}{0.1520} \log (PO_t)$$

$R^2$ ADj = .6650 D.W. = 1.8



# SUMMARY AND CONCLUSIONS

Over the period 1963-1973. 147,333 land-mobiles were added to the existing stock of 29,461 units.

Over 73 per cent of this growth was accounted for by Transportation (37.9%), Public Administration (16.3%), Construction (11.5%) and Services (7.8%).

Toronto, Vancouver and Montreal accounted for 40.5 per cent of the total growth over the same period.

The importance of small cities as users of land-mobiles has considerably increased over the period 1963-1973.

Over the period 1963-1973, all urban centers in Canada experienced rapid growth in the Services sector (39.5%) and the construction sector (35.4%), whereas the Public Administration sector lagged behind with a modest growth rate of 11.7 per cent.

# GROUPING OF CITIES

| Less Than 40,000 | 40,000 - 90,000 | 90,000 - 300,000 | 300,000 - 800,000 | 800,000 - and over |
|---|---|---|---|---|
| Prince Rupert | Sault Ste Marie | Victoria | Edmonton | Vancouver |
| Kelowna | North Bay | Regina | Calgary | Toronto |
| Prince George | Kingston | Saskatoon | Winnipeg | Montreal |
| Grand Prairie | Sherbrooke | London | Hamilton | |
| Kenora | Trois-Rivieres | Kitchener | Ottawa | |
| Port Alfred | Moncton | Halifax | Quebec | |
| Sept-Iles | | St. John | | |
| Rouyn | | St. John's | | |
| Sydney | | | | |
| Bathurst | | | | |
| Corner Brook | | | | |