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CHICAGO'S ROLE IN THE NATIONAL AND REGIONAL INFORMATION NETWORK, 1982-1990

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Chicago has long been a dominant national center among the U.S. system of cities, as well as a preeminent regional capital. This study examines the significance of Chicago as a sender of information throughout the United States and within the Midwest. Using a competing destinations model, it is found that only population size of the destination centers is important in determining the flow of Federal Express letters, packages, and boxes sent from Chicago to 47 national centers in both 1982 and 1990. In contrast, for the Midwest region, holding population size and distance constant, the more 'isolated' centers (Minneapolis-St. Paul, St. Louis, and Kansas City) received considerably higher-than-expected flows. From this analysis, it appears that Chicago strengthened its position somewhat within both its national and regional setting.

INTRODUCTION

Chicago has maintained a position of prominence in the hierarchy of American cities throughout the 20th Century. In terms of population, Chicago was ranked second nationally, only behind New York, from 1890 until 1980, when it was surpassed by Los Angeles. Another measure of metropolitan dominance, besides population, is corporate control, especially significant in today's service-based economy. The metropolitan economies of the United States have shifted from a reliance upon manufacturing-based employment to a service-based employment structure. As the former premier industrial city, Chicago has had to cope with the devastating effects that the economic shift has had on its manufacturing sector. Chicago is now looking to its service sector and corporate headquarters functions to help maintain and enhance its prominence.

During the 1980s, Chicago suffered massive job losses in manufacturing. For example, between 1980 and 1985, the Chicago metropolitan area lost a total of 187,000 jobs, 184,000 of which were in manufacturing alone (Employment and Earnings 1980,1985). Chicago also lost jobs in other sectors but gained 82,000 jobs in finance, insurance, and real estate. In partial contrast to the employment problems of the 1980s, the early 1990s has seen a growth in total jobs (140,000), though continued attrition in manufacturing employment (-24,000) (Employment and Earnings 1990, 1994). As Noyelle and Stanback (1984) predicted, manufacturing-based centers such as Chicago had a more difficult time in adjusting to the new U.S. metropolitan service economy. Nevertheless, Chicago's role as a command and control center has aided its
transition, in contrast to, say, Baltimore or Buffalo.

One indicator of a city's corporate control and position in the urban hierarchy is intermetropolitan information flow. An analysis of the flow of information identifies a metropolitan area's position both regionally and nationally. In the light of the structure of the economy, these flows may be considered representative of the network connecting the corporate control centers and subordinate centers. The corporate headquarters and producer services are located in command and control centers such as Chicago. The subordinate centers specialize in consumer services, the production of goods, or military or extractive industries (Wheeler 1987). The analysis of the flow of information sent and received by Chicago will help demonstrate how well the center has responded to the challenge of its economic transformation.

The purpose of this study is to examine Chicago's position in the intermetropolitan information network (Palmer 1991). The study seeks to determine Chicago's position as a sender of information in both the Midwest and the national hierarchy of metropolitan centers. This analysis will help answer questions concerning Chicago's success in responding to its transformation to a service-based economy, comparing data from 1982 and 1990.

Three hypotheses are advanced, following the conceptual framework outlined by Wheeler and Mitchelson (1989a, 1989b). First, the genesis of information will reflect Chicago's role as a command and control center, here measured by the agglomerative effects of population size. Second, the role of distance decay, traditionally important in accounting for migration and commodity flows, is expected to be of limited significance in explaining intermetropolitan information flows. It is thus the sender of information that controls where it will go, whether the information is sought or not. The third hypothesis, following Fotheringham's (1983) model, is that there will be neither an agglomerative nor a competitive effect among destinations for Chicago's information origins. This hypothesis stems from the second, i.e., that distance among destinations plays little role in the choice of destinations. Overall, it is expected that Chicago's response to the economic transformation from manufacturing to service employment has been sluggish, though important, as manufacturing job-loss has been slowly replaced by employment in the producer service sector.

**DATA AND METHODOLOGY**

The data used in this study were provided by the Federal Express Corporation of Memphis, Tennessee. The values provided represent the flow volume of overnight letters, boxes and packages among 47 large U.S. metropolitan areas (Figure 1). The regional analysis consists of 12 Midwest centers (Figure 2). The same metropolitan centers are used for both 1982 and 1990. We thus deal with a 47 x 47 (national) and a 12 x 12 (regional) origin and destination matrix.

Although Federal Express is the dominant overnight delivery company in the United States, it services only 45% of the market (Foust, 1989). The overnight delivery sector is
Federal Express pick-up and delivery zone does not correspond to the Chicago metropolitan area (Figure 3). The methodology used with these flow data is appropriate to test the three hypotheses. We employ Fotheringham's competing-destinations model (1983):

\[ \text{INFO}_{ij} = a_1 P_{ij}^{a_2} D_{ij}^{a_3} A_{ij}^{a_4} \]  

(1)

where \( \text{INFO}_{ij} \) = number of Federal Express messages sent from Chicago and other metropolitan areas; \( P_{ij} \) = the population size of each metropolitan area linked with an information origin such as Chicago; \( D_{ij} \) = the airline distance between Chicago and the other centers; and \( A_{ij} \) measures accessibility among the destinations, where it is defined as

\[ A_{ij} = \sum P_{ik} / D_{jk}^{a_5} (k \neq j). \]  

(2)

The model is solved by use of ordinary least squares by taking the common logarithm of each side of equation 1.

\[ \log \text{INFO}_{ij} = \log a_1 + a_2 \log Pop_{ij} + a_3 \log D_{ij} + a_4 \log A_{ij}. \]

Based on previous studies (Wheeler and Mitchelson, 1989a, 1989b) and Mitchelson and Wheeler (1994), we expect only the population variable to be significant.

**FINDINGS AT THE NATIONAL LEVEL**

Chicago in 1982 and in 1990 was one of the five regional centers among which the totality of U.S. information flows have been organized; the others were New York, Los Angeles, Dallas-Ft. Worth, and Atlanta (Wheeler and Mitchelson, 1989a; Mitchelson and Wheeler, 1994). The competing-destinations model for both 1982 and 1990 showed a rather remarkably high \( R^2 \), 0.69 and 0.75 respectively (Table 1). The parameter estimates generally follow the hypothesized relationships, with only the population size of
Chicago’s information destinations showing an exceptionally large explanatory role. The distance variable was only weakly notable, indicating a modest distance decay. The accessibility measure, as expected, had almost no influence in 1982, though it was somewhat stronger in 1990, reflecting a competitive effect. Such an effect shows that more isolated centers receive a disproportionate volume of flows, independent of the role of population and distance. Thus, Chicago shows an increasing level of connection with centers in the non-manufacturing belt and therefore an increased connection with centers in the South and West.

<table>
<thead>
<tr>
<th>Variables</th>
<th>1982a</th>
<th>1990b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (a^2)</td>
<td>0.81</td>
<td>0.74</td>
</tr>
<tr>
<td>Distance (a^3)</td>
<td>-0.19</td>
<td>-0.22</td>
</tr>
<tr>
<td>Accessibility (a^4)</td>
<td>-0.06</td>
<td>-0.30</td>
</tr>
</tbody>
</table>

Source: Computed by authors from Federal Express Corporation’s data.

\[ aR^2 = 0.59 \quad bR^2 = 0.75 \]

Table 1: Parameter Estimates for the Competing-Destinations Model for Chicago’s National Flows, 1982-1990.

**FINDINGS AT THE MIDWEST REGIONAL LEVEL**

At the regional level, marked differences are noted (Table 2) (Figure 4). Population size is significantly diminished in importance, while distance shows the expected weak relationship with flows for 1982, but a stronger-than-expected linkage for 1990. It is the accessibility measure, however, that gives the most startling results. The accessibility variable was virtually as important as the population parameter in 1982, the negative sign indicating the competitive effect. Thus, within the Midwest, Minneapolis, Kansas City, St. Louis, and perhaps Cedar Rapids receive a higher volume of flows than expected (Figure 3).

The greatest surprise for the Midwest model, however, occurs for 1990. The population parameter remains weakly positive, the distance decay is somewhat stronger than in 1982, but the accessibility measure (-0.98) shows an extremely robust effect. Again, centers at the greatest distance from the Midwest system of cities (Minneapolis, Kansas City, St. Louis, and to a lesser degree Cedar Rapids) receive a disproportionately high volume of information, controlling for distance and population effects. A possible explanation for this finding is that Chicago uses these large ‘gateway’ centers (not Cedar

<table>
<thead>
<tr>
<th>Variables</th>
<th>1982a</th>
<th>1990b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (a^2)</td>
<td>0.35</td>
<td>0.34</td>
</tr>
<tr>
<td>Distance (a^3)</td>
<td>-0.17</td>
<td>-0.37</td>
</tr>
<tr>
<td>Accessibility (a^4)</td>
<td>-0.32</td>
<td>-0.98</td>
</tr>
</tbody>
</table>

Source: Computed by authors from Federal Express Corporation’s data.

\[ aR^2 = 0.66 \quad bR^2 = 0.78 \]

Table 2: Parameter Estimates for the Competing-Destinations Model for Chicago’s Regional Flows, 1982-1990.

Rapids) as a destination. To the extent that these gateway centers serve a localized command and control function, these centers may process information from Chicago that is later disseminated to smaller centers within their hinterlands. The strong negative estimate associated with the destination accessibility variable suggests the very discrete partitioning of space by Chicago’s producers of information via a second tier of cities like Minneapolis and St. Louis.
The data analysed here suggest that Chicago's economy became more healthy during the 1980s. The $R^2$ values for the model were higher in 1990 than in 1982. At the national level, Chicago increasingly served centers in the West and South. At the regional level, Chicago not only dominated Midwestern centers within the traditional manufacturing belt but also disproportionately served gateway centers such as Minneapolis, Kansas City and St. Louis. All these findings suggest a somewhat more strengthened and mature role for Chicago in the business of producing information flows in the 1990s than for the 1980s.

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CHARACTERISTICS AND GENESIS OF TWO GRAY BROWN LUVISOLS, SOUTHWESTERN ONTARIO, CANADA

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Soils belonging to the Luvisolic Order and characterized by clay-enriched Bt horizons are widespread in the Great Lakes region. The formation of the Bt horizon is generally believed to be the result of clay translocation. It is likely that this interpretation of the nature and genesis of these soils is, for some soils, overly simplistic. An analysis of two well drained Luvisols located on Late Quaternary moraines in the vicinity of London, Ontario reveals that the soils are polygenetic. Multiple criteria, based on particle size, elemental and mineralogical data, indicate the presence of lithologic discontinuities in both soils, separating a basal calcareous silty clay till from a relatively thin, non-calcareous clay-rich deposit which grades upwards into a silty surficial veneer. The Bt horizon in these soils coincides with the clay-rich deposit. Clay mineralogy indicates pre-weathering of the till prior to deposition. However, the clay content of the Bt horizons cannot be accounted for simply in terms of the decalcification of the original till or pedogenic clay translocation. The characteristics of the two Luvisolic soils are largely a function of the inherent stratification of the parent materials on which have been superimposed the relatively minor effects of Holocene pedogenesis.

INTRODUCTION

According to the Canadian System of Soil Classification (Agriculture Canada Expert Committee on Soil Survey, 1987) soils belonging to the Luvisolic Order are generally characterized as having a diagnostic and morphologically distinct clay-enriched B horizon (Bt) in which silicate clay has accumulated, underlaying a light coloured eluvial A horizon. The formation of such horizon sequences has been accounted for in one of several ways. Clays are believed to have accumulated in the Bt horizon as a result of translocation, neoformation from solution, or alteration of other minerals to form clay minerals in situ. Alternatively, the clay-rich horizon may be the result of a stratified sequence of parent materials, including at least one with a relatively high clay content. The first three of these mechanisms are generally regarded as pedogenic in nature, whereas the contribution made by the presence of lithologic discontinuities to soil profile morphology is an intrinsic characteristic of the surficial geology.

Previous studies on the origin of Luvisols in southern Ontario have concluded that clay translocation essentially accounted for the observed soil profile morphologies (Gillespie and Elrick, 1968; Acton, 1970; McKeague et al., 1972). However, a number of authors have speculated that argillic B horizons also may be associated with lithologic discontinuities (Raad and Proetz, 1970; Mahaney, 1986; Mahaney et al., 1987). Soils with Luvisolic morphologies occur extensively in the vicinity of London, in Middlesex County (Fig. 1), southwestern Ontario (Hagerty and Hilborn, 1987). Six pedons with well-developed Luvisolic characteristics revealed the presence of complex soil stratigraphies which had strongly influenced the characteristics of the soils (McCarthy, 1988). This paper examines the data for two of these pedons in order to establish the origin of the Bt horizons.

Figure 1: Location of the Study Area and Sampled Sites.
STUDY AREA AND SITES

The surficial geology of Middlesex County is complex and reflects the imprint of a number of different geomorphic processes during the late Quaternary. Multiple advances and recessions of the Late Wisconsinan Erie, Huron and Georgian Bay glacial lobes have left a sequence of recessional moraines and till plains (Fig. 1; Sado and Vagners, 1975). The silt loam to silty clay textures of the tills reflect the influence of the underlying Paleozoic bedrock and glacio-lacustrine deposits over-ridden by successive ice advances. Today, thin proglacial lacustrine deposits with variable textures mantle the landscape in the west and northwest of the county and up to 10 m thick silt- and clay-textured deep-water lacustrine deposits cover an extensive area to the south and east of Strathroy (Fig. 1; Sado and Vagners, 1975; Cooper et al., 1978). Elsewhere, in the area surrounding London, lacustrine silt and clays, near shore sands, aeolian sands and deltaic and beach gravels were deposited. Deposition of aeolian silts continues today, especially in the spring when fields are crop-free and wind-erosion and deposition are common occurrences.

In Middlesex County, Luvisols have been mapped on a variety of landforms (Hagerty and Hilborn, 1987) in deposits where a number of different parent materials with complex stratigraphic relationships occur. The two soils that are the focus of this study were selected because they possess morphological characteristics considered typical of southwestern Ontario Luvisols. The present vegetation at both sites consists of beech-maple deciduous forest representing the northern extension of the Carolinian forest into Canada. Although the original forest cover at both sites has been thinned by selective cutting, neither site has been totally cleared for agriculture. Consequently, the soils are considered to be relatively undisturbed. Pedon 1 is located in the southeast corner of Middlesex County (Fig. 1) on undulating topography associated with the Westminster Moraine deposited by the Late Wisconsin Erie Ice Lobe, comprised of silty clay loam to silty clay textured calcareous till believed to be Port Stanley Till (Barnett et al., 1976). Soils at this location have been mapped in the Muriel Unit (Hagerty and Hilborn, 1987). Pedon 2 is located in the northeast section of Middlesex County (Fig. 1) on the rolling and slightly mound topography of the Mitchell Moraine deposited by the Late Wisconsin Huron Ice Lobe. Rannoch, St. Joseph and Southern Tills have all been identified in this area (Sado and Vagners, 1975). These tills are calcareous, with silty clay loam, silty clay and occasionally clay loam textures. Hagerty and Hilborn (1987) have mapped the soils of this area under the Huron Unit.

MATERIALS AND METHODS

Assessment of Parent Material Uniformity

A primary objective of this study was to establish the uniformity of the soil parent material. In establishing the presence of lithologic discontinuities in soils it is important to use characteristics that reflect the nature of the parent material and not the results of pedogenic processes. Indices of parent material uniformity do not have to be perfectly inert, immobile or stable, but only so persistent in the given environment as to be relatively unaffected by pedogenesis (Brewer, 1976).

For this paper a number of criteria derived from specific analytical techniques were selected to test for parent material uniformity and the presence of lithologic discontinuities. Due to the large number of ways in which different parent materials may influence soil development, various criteria have been used for establishing parent material uniformity. One means of circumventing the difficulties associated with each of the various techniques involved is to approach the assessment of lithologic uniformity from a number of directions. The criteria most frequently applied to the solution of parent material uniformity problems consist of the nature of mineralogic changes with depth, the nature of elemental changes with depth, and the particle size distribution of the non-clay fraction (Barshad, 1964).

Although depth distributions of resistant
mineral species may be more reliable indicators of parent material uniformity than elemental contents (Norton and Hall, 1985), often it is difficult to obtain enough grain counts of such minerals to achieve any acceptable level of statistical significance and, even then, grain counts are limited in accuracy due to the inexact identification of many minerals by optical microscopy (Brewer, 1976). As a result, many studies utilize depth distributions of specific elements. Elements used are those which are thought to be specific to a particular mineral or minerals that are resistant to weathering, such as zirconium for zircon, titanium for anatase and rutile, and yttrium for rutile and brookite (Smeck and Wilding, 1980).

In calcareous deposits, depth distributions are more definitive if plotted on a carbonate-free and clay-free basis to remove inflections resulting from carbonate leaching and clay movement. Apparently, plotting ratios of resistant minerals (as represented by specific elements) is even more useful, as both should be concentrated equally or diluted by clays or carbonates (Smeck and Wilding, 1980). Consequently the ratios Zr/Y, Zr/Ti, Zr/Sr have been used in the search for lithologic discontinuities in soils (Evans and Adams, 1975; Murad, 1978; Chittleborough and Oades, 1980).

Particle size parameters have been used in parent material uniformity studies in conjunction with other techniques, both to emphasize and refute conclusions drawn from mineralogical and elemental evidence (Evans and Adams, 1975; Smeck and Wilding, 1980). Sharp increases in such parameters as sand, silt and clay and sand/silt and silt/clay ratios with depth may indicate the presence of a lithologic discontinuity. However, the use of particle size parameters is of limited value if the breakdown of silt and sand occurs during soil development (Sudom and St. Arnaud, 1971). The approach is most useful in areas of moderate weathering and in parent materials with well-defined particle size distributions. The non-clay particle size distribution has been used successfully to identify sediment stratification in glacial and fluvioglacial parent materials in southern Ontario (Raad and Protz, 1971).

The mineralogy of the silt and clay fractions also can be used to support or refute evidence for parent material uniformity. Mineral distributions in the silt, coarse clay and fine clay fractions should exhibit depth trends indicative of weathering. Contamination is recognized by a non-clay mineralogy that does not match that of the parent material or cannot be explained by weathering of original grains of the parent material (Barshad, 1964). Within a specific sand or silt fraction, minerals that are relatively resistant to weathering, such as quartz and zircon, should show a relative increase in abundance from the parent material to the surface, while those minerals less resistant to weathering should show a relative decrease (Marshall, 1977).

Field and Laboratory Methods

At each site, a pit was excavated to a depth of at least 1 m. Soil horizons were described according to established procedures (Anonymous, 1985). Bulk samples were taken in duplicate from each horizon identified in the field. A series of undisturbed samples were collected using Kubiena tins from the centre of the profile face for subsequent micromorphological and microprobe analysis. An auger sample from a depth of 2 m was collected from the bottom of the pit to provide an additional measure of parent material uniformity.

All samples were air dried and fractionated using a 2 mm sieve. Particle size analysis was performed on duplicate samples using the pipette method (Day, 1965). Initially, no chemical pretreatments were employed for the removal of organic matter or carbonates. However, in a subsequent particle size analysis secondary carbonates were removed from selected samples using both 1N NaOAc adjusted to pH 5 (Jackson, 1956) and 6N HCl. Ultrasonification, followed by the addition of sodium metaphosphate was used to aid dispersion of the samples prior to size fractionation. Sand sizes were fractionated by dry-sieving and the fine clay fraction (<0.2 μm) determined by centrifugation (Jackson, 1956). The method used is repeatable to within 10% and less.

Total carbonates were determined

gravimetrically (Sheldrick, 1984) on oven-dried soil ground to pass a 100-mesh (150 μm) sieve. Between-run controls in the mid-part of the range (25%) gave %RSD of less than 5%. The mean % error between this method and a similar set-up using the Chittick apparatus is less than 10%. Samples near the detection limit (0-1%) tend to be more variable. pH was determined on a 1:2 soil to 0.01 M CaCl₂ suspension using a combination electrode system. For a routine operating range of 3.5 to 8.0, between-run duplicates gave a %RSD of less than 2. Organic carbon was determined using a modified Walkley-Black technique (Sheldrick, 1984). Precision on within-run duplicates using this technique is below 10% RSD. Accuracy, determined by comparison with control samples (Agriculture Canada Expert Committee on Soil Survey reference soil samples 15, 16 and 17 (McKeague et al., 1978)) is within 10% of accepted values.

In this study, elemental data from horizon-based samples were obtained using a variety of techniques. Analysis of long-lived elements (Ce, Yb, Cr, Cs, Fe, Zn, and Co) was performed by Instrumental Neutron Activation Analysis (INAA) on oven-dried, < 150 μm, 500 mg samples. This relatively large sample size was considered to significantly reduce the possible effects of sample heterogeneity. Short-lived elements (Ti, Mg, K, Al, Mn, and Ca) were determined by INAA on 100 mg samples. The 500 mg samples were irradiated for 1 h in aluminum tubes in the McMaster University Nuclear Reactor (Hamilton, Ontario) operating at 2 MW with a neutron flux of approximately 7X10²²n/cm²/s. Samples were irradiated simultaneously with a number of standards to provide a measure of analytical accuracy. The reference standards run as unknown samples are within ±5-10% of the certified values. NBS 1632B, a bituminous coal sample, was used to provide control for Al, Ca, Ce, Co, Cr, Cs, Fe, K, Mg, Mn, Ti, Zn. NRC Marine Sediment Reference Material BCSS-1 was used for Cr, Co, Zn, Fe, Cs. The 100 mg samples were irradiated with both standards for 60 seconds using a rabbit system. Samples were counted after irradiation with a PHYGE (hyperpure germanium) detector with 10% efficient resolution of 1.7 KeV at 1332 KeV.

The PHYGE detector was connected to a Canberra Series 80 multichannel analyzer which is linked to a PDP 11/44 computer operating under RSX 11M version 4.0. Data reduction was by spectral data resolution programs that correct for inter-elemental interferences as well as fission product production from uranium (Ernst and Hoffman, 1982).

X-ray fluorescence analyses for Zr, Y, and Sr were performed on soil samples using an automatic Philips PW-1450 sequential wavelength dispersive spectrometer using the method outlined by Wu (1984). Boric acid press pellets were prepared using 2 g of soil with 0.2 g of an organic binding agent (soma) under 35 tons of pressure in a 3.8 cm die. Analytical accuracy was checked using a granodiorite standard (UWO-1; Wu, 1984). The between-run reproducibility of the determinations, as monitored by the reference standard, is generally better than ± 5%. Precision on within-run duplicates, as measured by percentage relative standard deviation (%RSD) is below 10% for all elements.

Clay minerals were identified using a Rigaku X-ray diffractometer with a nickel-filtered Cu Kα radiation source and a scanning speed of 2°2θ/min. Oriented clay mounts were prepared on glass slides, following ultrasonic dispersion and centrifugation, using filtration onto cellulose membranes. Five pre-treatments were employed, including Mg-saturated clay (air dried at 0% relative humidity; ethylene glycol soaked) and K-saturated clay (air-dried at 0% relative humidity; heated for 1 h at 300 °C; heated for 1 h at 550 °C). The diffractograms were interpreted by standard methods (Brindley and Brown, 1980) and the clays expressed as relative amounts as a function of diffraction peak intensity. With each X-ray scan, a quartz standard was run to ensure accurate diffraction peaks.

Micromorphological and electron microprobe analyses were performed on thin-sectioned samples to establish the role of clay translocation in the formation of the argillic B horizons and to establish the composition of the clay fractions involved. Sample impregnation was achieved under vacuum using Hysol resin.
and a proprietary hardener, both heated to 75 °C, followed by oven-curing at 75 °C. Illuvial clay was quantified under 100X magnification on a 25 X 25 mm area in thin section. Counts of at least 6, 000 points were made on two areas per thin section at right angles to one another to maintain counting errors at an acceptable level (1% clay, 27% error; 3% clay, 16% error; 8% clay, 9% error; Brewer, 1976). This method provided data for illuvial clay + pores following procedures outlined in McKeague et al. (1980). Argillan data were calculated subsequently on a pore-free basis (Murphy, 1983).

Polished thin sections were carbon-coated prior to electron microprobe analysis and compositional analyses were performed using a JEOL Model JXA 8600 electron microprobe equipped with four wavelength dispersive spectrophotometers. Operating conditions were 15 kV accelerating voltage utilizing an absorbed sample current of 10 mA and a beam diameter of approximately 2 µm. Elemental compositions were determined by energy dispersive spectroscopy using a TRACOR Northern Series 2 5600 EDX-ray analytical system.

The following analytical standards were used to calibrate the system: orthopyroxene (OPX R2537 (ROPX); Howie and Smith, 1966) for Si and Fe; anorthite (Anorthite 90; Barnett, 1992, pers. com.) for Al. Precision of the analytical method is indicated by replicate determination of the kaersutite calibration monitor, giving, in cation proportions: Si 5.896 ± 0.034; Al²⁺ 2.104 ± 0.034; Al³⁺ 0.365 ± 0.036; Fe total 1.524 ± 0.019 (Fleet and Barnett, 1978).

Selective dissolution of various forms of Fe, Al, Mn and Si known to be pedogenically active were performed using solutions of sodium citrate-bicarbonate-dithionite (Mehra and Jackson, 1960) and acid ammonium oxalate (Sheldrick, 1984). Fe, Al, Mn and Si concentrations in the extracts were determined by atomic absorption spectrophotometry using an IL Model 257 spectrophotometer and appropriate lamps, flame conditions and calibration standards. Accuracy was determined by comparison with values obtained on control samples (Canadian Soil Survey Committee reference soil samples 15, 16, and 17 (McKeague et al., 1978)). Samples are within 10% of accepted values. %RSD are below 10% for all elements.

RESULTS

Site and Pedon Characteristics

Pedon 1, classified as an Orthic Gray Brown Luvisol (Agriculture Canada Expert Committee on Soil Survey, 1987) is located in the southeastern corner of Middlesex County (42°58′N, 80°56′W) (Fig. 1) at an elevation of 875 m a.s.l. on undulating non-stony, morainal topography. The pedon was sampled to a depth of 2 m from an upper slope (5-9%), south-southwest trending pedon which was moderately well to well drained (Table 1). Pedon 2, classified as an Orthic Gray Brown Luvisol and at an elevation of 330 m a.s.l., is located in the northeastern section of Middlesex County (43°12′N, 81°18′W) (Fig. 1). Pedon 2 extends to a depth of 2 m and was sampled from a moderately well-drained upper slope position trending north-northwest (Table 1). Both pedons were described and sampled during the period September to November, 1986.

Particle Size Data

In the surface horizons (Ah and Ae) of both pedons the silt fraction is at its peak and comprises approximately 50% of the total distribution of particle sizes (Table 2). Pedon 1 exhibits a sharp decrease in silt content at the base of the Ae horizon, followed by a more gradual decrease and subsequent increase with depth. Pedon 2 shows a sharp decrease in silt content in the Bt horizon and then a sharp increase below.

In Pedon 1, the sand fraction reaches a maximum in the Ae, decreases abruptly in the Bt horizon, and subsequently increases again in the Ck horizons (Table 2). In Pedon 2, the sand fraction is at a maximum in the Ah horizon and then decreases gradually with depth in the profile. The very fine- and fine-sand fractions exhibit maxima in the Ah and Ae horizons of both profiles, while the very coarse-sand
### Profile 1: Orthic Gray Brown Luvisol

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth(cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ah</td>
<td>0-15</td>
<td>Black (10 YR 2/1 m), dark gray (10 YR 4/1 d), silt loam; weak, fine subangular blocky; slightly sticky, friable, soft; many, fine to coarse oblique roots; few, medium, interstitial pores; wavy, clear boundary.</td>
</tr>
<tr>
<td>Ae</td>
<td>15-25</td>
<td>Pale brown (10 YR 6/3 m), very pale brown (10 YR 7/3 d); loam; weak, medium, subangular blocky; nonsticky, friable, loose; moderate, fine to coarse oblique roots; common, medium, vesicular pores; wavy, gradual boundary.</td>
</tr>
<tr>
<td>II Bt</td>
<td>25-85</td>
<td>Dark grayish brown (10 YR 4/2 m), grayish brown (10 YR 5/2 d); clay; strong, medium, subangular blocky; sticky, firm, very hard, few, fine, oblique roots; very few, fine, tubular pores; common, thin argillans; wavy, clear, boundary.</td>
</tr>
<tr>
<td>III Ck₁</td>
<td>65-110</td>
<td>Yellowish brown (10 YR 5/4 m), light yellowish brown (10 YR 6/4 d); clay; strong, medium, subangular blocky; few, fine tubular pores; sticky, firm, very hard; some stones; strong effervescence.</td>
</tr>
<tr>
<td>III Ck₂</td>
<td>110-200 +</td>
<td>Auger sample at 2 m; yellowish brown (10 YR 5/4 m), light yellowish brown (10 YR 6/4 d); clay loam; strong, medium subangular blocky; sticky, firm, very hard; strong effervescence.</td>
</tr>
</tbody>
</table>

### Profile 2: Orthic Gray Brown Luvisol

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth(cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ah</td>
<td>0-12</td>
<td>Very dark gray (10 YR 3/1 m), gray (10 YR 5/1 d); clay loam; weak, fine, subangular blocky; slightly sticky, friable, soft, many, fine to medium roots; common, medium roots; common, medium, interstitial pores; wavy, clear boundary.</td>
</tr>
<tr>
<td>Ae</td>
<td>12-24</td>
<td>Yellowish brown (10 YR 5/4 m), light yellowish brown (10 YR 6/4 d); silt loam; weak, fine, platy; nonsticky, very friable, soft, few, fine roots; few, medium tubular pores; wavy, clear boundary.</td>
</tr>
<tr>
<td>II Bt</td>
<td>24-44</td>
<td>Dark brown (10 YR 4/3 m), brown (10 YR 5/3 d); clay; strong, medium, subangular blocky; sticky, firm, very hard; few, fine roots, few, very fine, tubular pores; common, very thin argillans; wavy, gradual boundary.</td>
</tr>
<tr>
<td>III Ck₁</td>
<td>44-100</td>
<td>Yellowish brown (10 YR 5/4 m), light yellowish brown (10 YR 6/4 d), silty clay, distinct, yellowish brown (10 YR 5/8 m) mottles; strong, medium, subangular blocky; sticky, firm, very hard, few fine tubular pores, some stones; strong effervescence; strongly calcareous.</td>
</tr>
<tr>
<td>III Ck₂</td>
<td>100-200 +</td>
<td>Auger sample at 2 m; yellowish brown (10 YR 5/4 m), light yellowish brown (10 YR 6/4 d); silty clay; few distinct, yellowish brown (10 YR 5/8 m) mottles; strong effervescence; strongly calcareous.</td>
</tr>
</tbody>
</table>

* Lithologic designations are based on identified lithologic discontinuities in this paper

Table 1: Soil Profile Descriptions*
fraction increases in the Ck horizons. An examination of the particle size data (Table 2) indicates that the clay fraction (< 2 μm) exhibits an accumulation in the B horizon of each profile which is particularly marked in Pedon 2. The accumulation is especially pronounced in the case of the fine clay fraction (<0.2 μm) which decreases both above and below the B horizon in both profiles. The ratio of clay in the B horizon to clay in the A horizon in both soils is greater than 1.2. An increase in the coarse clay fraction, and a corresponding decrease in the silt/clay ratio are observed in both pedons (Table 2). The fine clay/total clay ratio shows an increase in the argillic horizons relative to the Ae horizons.

Mineralogy

The distribution of major minerals within the silt fraction (Table 3) suggests a substantial degree of carbonate weathering has taken place within the sola. Decalcification of an originally calcareous deposit would explain the apparent increase of quartz, feldspars and pyroxene in the sola, however, the presence of magnetite only in the Ck horizons of both profiles indicates the possible existence of a discontinuity below the Bt horizons.

Data on the relative distribution of phyllosilicate and non-phyllosilicate minerals in the fine and coarse clay fractions from both soils are provided in Table 4. The relatively high chlorite concentrations in the clay fractions of the surface horizons (Ah and Ae) of both pedons could be the result of the weathering of chlorite-rich silt and sand and the production of clay-sized chlorite. However, it is unusual for chlorite to decline with depth in Canadian soils and this suggests chlorite may have been introduced into these profiles through aeolian contributions. Although the degree of Al-hydroxy interlayering is not as pronounced in Pedon 2 as it is in Pedon 1, the increase of Al-hydroxy interlayering in the clay fractions of the surface horizons of both soils suggests weathering at the surface has been more intense than at depth. On the other hand, since Al-hydroxy interlayering of the clays persists into the subsoil horizons, it is likely some of the interlayering is an inherited feature from the regional till.

In both profiles, the presence of feldspars within the coarse clay fraction of the A horizons and their absence at depth suggests the presence of a lithologic discontinuity below the Ae horizon. The fact that calcite in the coarse clay fraction is restricted to the Ck horizons of both pedons indicates the weathering front does not extend below the Bt horizon. The presence of expanding layer silicates in the fine clay fraction of the Bt and Ck horizons of both profiles suggests some smectite or smectite-interstratified minerals have been inherited from the till. The relatively low concentration of expanding clays within the fine clay fraction of the surface horizons indicates either they have been destroyed under the prevailing slightly acidic weathering regime, or they are not an inherent feature of the surface deposit.

Soil chemistry

Data on the distributions of total carbonate, exchangeable calcium and magnesium, total organic carbon (TOC) and pH clearly indicate that the sola are in a condition suitable for clay translocation (Table 5). Both the A and B horizons have lower concentrations of carbonates than the subsoil. However, apparently only the sola of Pedon 1 has been mildly acidified (pH between 5.0 and 6.0). Carbonate and micromorphological data also indicate the absence of any carbonate reprecipitation and suggest that the A and B horizons have formed in deposits that effectively have been decalcified. In contrast, the Ck horizons of these pedons remain calcareous, with relatively high levels of total carbonates (30-50%), neutral pH and abundant exchangeable calcium and magnesium.

In general, the distribution of elements such as Zr, Y and Ti (Table 6) considered to be resistant to weathering appears not to be typical of a normal weathering profile. Only Zr decreases with depth. Instead, the majority of elements show marked accumulations within the Bt horizons. Ca, Mg and to a lesser extent Sr, tend to increase with depth. As expected, given the morphological evidence for clay translocation, Al has accumulated within the Bt horizons.
<table>
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<tr>
<th></th>
<th>SAND</th>
<th>VCS</th>
<th>MS</th>
<th>FS</th>
<th>VFS</th>
<th>SILT</th>
<th>CLAY</th>
<th>FC</th>
<th>CC</th>
<th>F/C</th>
<th>TB/TA</th>
<th>FC/TC</th>
<th>Si/TC</th>
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<td>25</td>
<td>0.5</td>
<td>0.3</td>
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</table>

Particle size fractions reported as wt %
- VFS - very fine sand (0.106-0.053 mm)
- FC - fine clay (<0.2 μm)
- CC - coarse clay (2-0.2 μm)
- F/C - fine to coarse clay ratio
- TB/TA - ratio of total clay in Bt horizon to total clay in Ae horizon
- FC/TC - ratio of fine clay to total clay
- Si/TC - ratio of silt to total clay

Table 2: Particle Size Data* and Calculated Ratios

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<th>FELS</th>
<th>CALC</th>
<th>DOL</th>
<th>PYRX</th>
<th>AMPH</th>
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* xx - abundant, xxxx - very abundant
  tr - trace, - not present

Table 3: Major Minerals Present in the Silt Size Fraction

Table 4: Minerals Present in the Fine and Coarse Clay Fractions.

<table>
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<tr>
<th>Hyd Mica</th>
<th>Vermic</th>
<th>Chlor</th>
<th>Exp</th>
<th>Musc</th>
<th>Quartz</th>
<th>Calcite</th>
<th>Felds</th>
<th>Magn</th>
<th>Al-hydroxy interlayers</th>
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<td>-</td>
<td>-</td>
<td>x</td>
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<tr>
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<td>xxx</td>
<td>-</td>
<td>x</td>
<td>xxx</td>
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<td>-</td>
<td>xx</td>
</tr>
<tr>
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<td>xxx</td>
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<td>xx</td>
<td>xxx</td>
<td>-</td>
<td>x</td>
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</tr>
<tr>
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PROFILE 2

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<td>xxx</td>
<td>xxx</td>
<td>-</td>
<td>-</td>
<td>- xx</td>
</tr>
</tbody>
</table>

c' - designates coarse (2.0-0.2 µm) fraction
f' - designates fine (<0.2 µm) fraction
xxx - abundant
xx - moderate
x - weak
not present

Table 5: Selected Chemical Parameters.

| pH | TOC | CARB | Ca^2+ | Mg^2+ | K^+ | Fe | Al | Ca | Mg | K | Mn |
|----|-----|------|-------|-------|-----|----|----|----|----|----|----|----|
| PROFILE 1 |     |      |       |       |     |    |    |    |    |    |    |    |
| Ah | 5.98 | 3.0  | 0.75  | 10.33 | 1.56 | 0.59 | 1.9 | 4.4 | 1.0 | 0.3 | 0.3 | 430 |
| Ae | 5.51 | 0.4  | 0.75  | 1.65  | 0.44 | 0.96 | 2.0 | 5.2 | 1.0 | 0.3 | 0.2 | 550 |
| IIBt | 5.74 | 0.3  | 1.51  | 16.80 | 2.41 | 0.80 | 4.1 | 8.9 | 1.0 | 0.6 | 0.4 | 920 |
| IIICk2 | 7.64 | 0.1  | 31.04 | 14.57 | 1.01 | 0.41 | 2.6 | 4.9 | 12.3 | 0.6 | 0.5 | 710 |
| IIICk1 | 7.34 | 0.1  | 35.34 | 11.47 | 0.94 | 0.42 | 2.4 | 4.1 | 16.0 | 0.6 | 0.4 | 620 |
| PROFILE 2 |     |      |       |       |     |    |    |    |    |    |    |    |
| Ah | 7.34 | 3.6  | 1.51  | 21.43 | 1.74 | 0.59 | 2.2 | 6.3 | 1.6 | 0.5 | 0.5 | 680 |
| Ae | 7.03 | 0.8  | 1.51  | 11.47 | 1.09 | 0.40 | 2.5 | 5.2 | 1.1 | 0.4 | 0.5 | 570 |
| IIBt | 7.59 | 0.8  | 2.27  | 23.38 | 2.34 | 0.63 | 3.6 | 8.7 | 2.1 | 0.5 | 0.8 | 650 |
| IIICk2 | 7.76 | 0.3  | 48.86 | 12.89 | 1.14 | 0.45 | 2.3 | 4.3 | 14.9 | 0.8 | 0.4 | 550 |
| IIICk1 | 7.71 | 0.2  | 45.24 | 19.54 | 1.02 | 0.46 | 1.8 | 3.5 | 17.8 | 0.8 | 0.3 | 450 |

pH measured in 0.01M CaCl₂
TOC (wt % total organic carbon)
CARB total carbonates (wt % CaCO₃ equivalent)
Exchangeable Ca, Mg and K (cmol kg⁻¹)
Total Fe, Al, Ca, Mg and K are reported in wt %
Total Mn is reported in mg kg⁻¹
Selective dissolution techniques

Further information on the nature of pedogenic processes operating in these soils is provided by the selective chemical extractions for Fe, Al, Mn and Si (Table 7). Acid ammonium oxalate-extractable Fe and Al (Fe$_a$, Al$_a$) display eluvial-illuvial distributions in these soils, with a maximum concentration in the Bt horizons. However, oxalate-extractable Si (Si$_o$) increases with depth, reaching a maximum in the Ck horizons. Dithionite-extractable Fe and Al (Fe$_d$, Al$_d$) show clear concentrations in the Bt horizons and the dithionite-extractable Si (Si$_d$) shows a progressive increase with depth.

The ratio of oxalate-extractable Fe to dithionite-extractable Fe (Fe$_o$/Fe$_d$) shows no general tendency with depth in the two profiles, although values in the sola do tend to be higher than in the subsoil (Table 7). Blume and Schwertmann (1969) have accounted for relatively low Fe$_o$/Fe$_d$ ratios in clay-rich B horizons elsewhere by suggesting clay translocation in calcareous sediments begins immediately following decalcification, when lithogenic highly aged iron oxides with low Fe$_o$/Fe$_d$ ratios are the main participants. Generally, oxalate-extractable iron release only begins once the soil becomes acid, by which time most of the clay has been removed from the upper solon and, under acid conditions, further clay mobilization and translocation is inhibited by aggregation through the formation of Al-hydroxy interlayering. However, the Fe$_o$/Fe$_d$ ratios of both Bt horizons remain relatively high. The ratio of total Fe (Fe$_t$) to clay (Table 7) further indicates differential migration of Fe to clay is not taking place, in that the ratio is nearly constant with depth. This is typical of Luvisols generally (Blume and Schwertmann, 1969).

Micromorphology

According to the Canadian System of Soil Classification (Agriculture Canada Expert Committee on Soil Survey, 1967) oriented clay must occupy 1% or more of thin section area to demonstrate clay illuviation. Using this criterion, both soils contain Bt horizons (Table 8). Under microscopic examination, the argillans were found to be associated with large channels and ped surfaces rather than with smaller micropores. Channel and normal void cutans are common, generally large and reddish (suggesting the presence of iron). The void pattern consists of mainly vughs and channels, although chambers and skew planes also are present. The presence of skew planes suggests desiccation of the material (Brewer, 1976). Micromorphological analysis also revealed the absence of calcitans within both pedons, suggesting carbonates have not been reprecipitated within the soil system.

In an attempt to establish the composition of the illuvial clay in these soils, an electron microprobe was used to obtain compositional analyses from several points within illuvial clay at the edges of voids and along channel walls. The argillans were found to comprise 30-40% silica, 18-21% aluminum and 9-11% iron. Compositional transects across individual cutans using the electron microprobe indicated little compositional change, despite the fact the argillans display conspicuous layering. This indicates, although illuviation leading to the formation of the argillans has been episodic, essentially the same clay mineral suite is involved at all times.

DISCUSSION

Evidence for Lithologic Discontinuities

Evidence presented from particle size distributions, soil chemistry and clay mineralogy suggests a lithologic discontinuity exists beneath the Ae horizons of the soils studied. The evidence also indicates a second discontinuity exists below the Bt horizons. The Ah and Ae horizons of these soils have substantially higher silt contents than the B and C horizons below them. The variability in sand content with depth in each of these horizons also suggests, even if the parent materials for each horizon were similar, their depositional environments were different. The presence of greater concentrations of easily weathered feldspars and chlorites in the silt and clay mineral fractions of the surficial horizons relative to the rest of the profile also suggests the presence of a discontinuity. The
presence of magnetite only in the Ck horizons supports the idea of a discontinuity existing below the Bt horizons. Magnetites are relatively resistant to weathering and, being heavy minerals, not likely subject to translocation within the profile. Therefore, the absence of these minerals in the A and B horizons, suggests different parent materials. Elemental ratios also substantiate the presence of lithologic discontinuities in these soils. Ratios that provide the clearest evidence for lithologic discontinuities in the soils studied here are Sr/Y, Sr/Cs, Zr/Y, Zr/Ti, Zr/Fe and Zr/Cs (Table 9). The distributions of these ratios indicate the presence of a lithologic discontinuity below the Ae horizon in both pedons and indicate a second discontinuity at the base of the Bt horizon in both soils. In most cases, a sharp break is observed immediately below the Ae horizon.

### Origin of the Deposits

It appears that both profiles are developed in at least two, and possibly three, parent materials. In particular, the presence of a lithologic discontinuity below the Ae horizon is indicated strongly in both soils. This may take the form of a discrete silt veneer or a surface deposit containing large but variable amounts of aeolian material. The presence of variable amounts of aeolian material would help explain the chemical and mineralogical differences between the Ah and Ae horizons (Tables 3, 5, and 10).

The presence of a second lithologic discontinuity below the Bt horizons is less conclusive. All indications are that the Ck horizons in both soils have developed from calcareous till parent materials. The presence of hydroxy-Al interlayers in the clay fractions at depth within the Ck horizons suggests that the till deposits were pre-weathered prior to the formation of the Luvisols. The Bt horizons in both soils appear to be different texturally but chemically similar to the Ck horizons, suggesting this layer resulted from weathering of the till. It is also possible some reworking

$. Table 6: Distribution of Selected Elements^a$

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<th>Cs</th>
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* Ti is reported in wt %; all other elements are reported in mg kg⁻¹

and redeposition of weathered till may have taken place locally. This would explain the apparent ambiguity of the lithologic discontinuity at the base of the Bt horizons.

The Role of Clay Translocation in the Development of the Bt Horizons

There is evidence to support the idea a significant amount of the clay in the Bt horizons is due to clay translocation. The distributions of total clay, fine clay and coarse clay fractions all show marked maxima within the Bt horizons, together with high ratios of fine clay to total clay and fine clay to coarse clay.

The absence of carbonates in the sola and their presence in the subsoil indicates the chemical preconditions required for silicate clay translocation are present; carbonates would otherwise tend to induce flocculation and inhibit translocation.

The majority of trace elements determined in this study, with the exceptions of Mg, K, Ti, Ca, Zr and Sr, show maximum concentrations within the Bt horizons (Table 7). This suggests a degree of co-migration with the clay-sized particles. Fe, Zn, Co, Mn, Cr, K, Y, Cs and AI all demonstrate significant high positive correlations with the clay fractions, especially the fine clay fractions (<0.2 μm) (Table 10). However, generally relatively weak positive correlation coefficients between

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Table 7: Selected Extracts* and Ratios of Fe, Al, Mn and Si

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<td>2</td>
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<td>6.3</td>
<td>9.28</td>
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BD - bulk density
* - illuvial clay was quantified under 100x magnification on a 25x25 mm area in thin section. Counts of at least 6,000 points were made on two areas per thin section at right angles to one another.
* * - illuvial clay (weight basis)
<sup>a</sup> = % illuvial clay (area of thin section)
<sup>b</sup> = % solid space
Solid space was calculated from bulk density measurements and by assuming a particle density of 2.65 g cm<sup>-3</sup>

Table 8: Quantification of Illuvial Clay within the Bt Horizons

specific trace elements and the various clay fractions suggest a large part of the compositional variations are non-pedogenic in origin. The only element showing a significant high negative correlation with any of the clay fractions, specifically the total and coarse clay fractions, is Zr.

Acid ammonium oxalate extractions of iron and aluminum also show maxima in the Bt horizons of the soils studied, which suggests that translocation has, or is, occurring. The translocation of iron and aluminum is supported by the relatively high Fe,Fe ratio in these horizons, indicating that the majority of the Fe engaged in translocation is in the form of amorphous and pedogenically more active forms (Blume and Schwertmann, 1969).

Thin sections from the Bt horizons indicate they contain 1% or greater cutanic material, which allows for these horizons to be designated as argillic. Brewer (1976) has indicated the presence of a large number of thick, layered argillans and ferriargillans can be taken as evidence for clay translocation. Thick, layered argillans were found easily in thin sections from the Bt horizons of both profiles. Compositional evidence from the electron microprobe suggests argillans do not vary from layer to layer. The layering and cracking observed in these argillans along with high concentrations of silica, iron and aluminum suggests they are composed of clay minerals, periodically deposited and subjected to desiccation for at least part of the year. Iron distribution within the argillans is not observed in discrete layers, suggesting iron and clay migrate together rather than separately.

On the other hand, an examination of the mineralogy of the fine and coarse clay mineral fractions suggests the evidence for clay translocation is weak. Hydrous mica (1.0 nm peak) and vermiculite (1.4 nm peak) distributions increase with depth in the profiles. Expanding layer clays (1.4 nm peak) also increase with depth. Nowhere, in either the fine or coarse clay fractions, is the concentration of one mineral greater in the Bt horizons than in the Ck horizons below. All of these minerals are also present in the Ck horizons, which suggests they are inherited from the till but that their distribution is little altered as a result of clay translocation.

Therefore, it appears clay translocation in general has played a significant role in the development of the soils investigated. Translocated illuvial clay, determined from point counting of cutanic material in thin section, was found to occupy 2.5 to 9.7 weight percent of the Bt horizon area.

**The Role of Weathering Within the Argillic Horizons**

Undoubtedly, many of the physical, chemical and mineralogic characteristics of these Luvisols could be attributable to in situ weathering, and specifically decalcification of the till. The distributions of alkaline and alkaline earth elements within these soils indicates these are relatively low in the A and B horizons, compared to the C horizons, suggesting that they have been depleted preferentially. This is supported by the mildly acidic pH values of some of the surficial horizons.

In order to examine the possible contribution of till decalcification to clay enrichment within the Bt horizons, samples of the Ck horizons from both pedons were leached separately with 1N sodium acetate (NaOAc) and 6N HCl (pH = 3.8). The sodium acetate pretreatment resulted in increases of 1% and 22% in total clay contents of Pedons 1 and 2, respectively. On the other hand, the more severe HCl pretreatment resulted in increases of 3% and 35% respectively. It is clear both partial and total till decalcification would have resulted in increases in the clay content of the weathering residue. However, only in Pedon 2 is the increase of a magnitude similar to the existing clay content in the Bt horizon.

The silt mineralogy of these soils indicates feldspar is enhanced at the surface, providing further evidence for the presence of recent aeolian additions to the surface horizons. In a typical weathering sequence, feldspar usually would be weathered from the surface. The large increase of pyroxenes in the Ck horizons of these soils suggests weathering of less resistant minerals occurs in the surface of these soils. Pyroxene and feldspar distributions may also provide evidence for lithologic
Table 9: Selected Elemental Ratios.

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Table 10: Elements Demonstrating Significant High Correlation Coefficients with Clay Fractions

<table>
<thead>
<tr>
<th>Clay fraction</th>
<th>Si</th>
<th>Mg</th>
<th>Ca</th>
<th>Zr</th>
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<tr>
<td>CC</td>
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<td>.7523</td>
<td>.7111</td>
<td>-.3674</td>
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<tr>
<td>Co</td>
<td>.6226</td>
<td>.6226</td>
<td>.5695</td>
<td>.5900</td>
</tr>
<tr>
<td>Cr</td>
<td>.6226</td>
<td>.6226</td>
<td>.5695</td>
<td>.5900</td>
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<tr>
<td>Ti</td>
<td>.6226</td>
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<td>.5695</td>
<td>.5900</td>
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<td>Mg</td>
<td>.6226</td>
<td>.6226</td>
<td>.5695</td>
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<tr>
<td>Clay</td>
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<td>.6226</td>
<td>.5695</td>
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<td>Al</td>
<td>.6226</td>
<td>.6226</td>
<td>.5695</td>
<td>.5900</td>
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</table>

Clay = Total clay (< 2 µm); CC = Coarse clay (2-0.2 µm); FC = Fine clay (< 0.2 µm)
* Pearson r value significant at either the 0.5 or 0.1 level using a two-tailed test and the appropriate degrees of freedom

discontinuities. A greater feldspar concentration in the surface horizons than is present at depth cannot be explained by decalcification alone. As well, the extreme increase in pyroxene content upon reaching the Ck horizons suggests the presence of a discontinuity. Alternatively, it simply may indicate that pyroxenes have been weathered almost completely from the solum. The presence in the surface horizons of small amounts of most minerals found in the Ck horizons tends to confirm a relatively mild weathering regime is operating.

The Role of Clay Neoformation

Peptizing of clay minerals in the surface horizons of soils and their transport in solution to horizons of accumulation requires a weathering regime not found in Canadian Luvisols (Agriculture Canada Expert Committee on Soil Survey, 1987). However, the possibility exists that older Luvisolic soils may progress to this stage in a pedogenic continuum of Brunisol-Luvisol-Podzol. For these reasons it is important to examine the data for evidence of clay neoformation.

A mineralogic analysis of the clay fractions indicates chlorite (0.4 nm) is relatively stable throughout the profile in both soils, although enhanced in concentration near the top of the profile. Mica appears to be transformed, through loss of potassium, to hydrous mica which in turn is transformed to vermiculite in surface horizons. Both clay mica and vermiculite contents increase with depth in the profile, indicating both are inherited from the parent material. Expanding layer minerals are present only in trace amounts in the Ah and Ae horizons of these soils, suggesting either they have been translocated into the lower horizons or have been destroyed in the mildly acidic surface horizons. Substantial Al-hydroxy interlayering occurs within vermiculite in the surface horizons. The resistance of this interlayered material to collapse upon heating to 550 °C and solvation with potassium ions suggests the interlayers are nearly completely occupied by islands of Al hydroxides. Chlorite present within these profiles is believed to have been inherited from the parent materials as the relative youth of these soils and their mildly acidic environments are not particularly conducive to the neoformation of chlorite. Clay mineral alteration in these soils appears to be due to gentle transformations in structure rather than to the destruction of existing minerals and resynthesis of new minerals from solution (neoformation).

The slight increase with depth in these profiles of oxalate-extractable silica (SiO₂) suggests that while amorphous silica may be translocated from the surface, it is absent in the horizons of clay accumulation. This indicates the neosynthesis of clay minerals from solution is very unlikely in the Bt horizon of these soils because one of the major constituents (amorphous silica) for clay synthesis is unavailable. As expected, the greatest concentration of non-silicate iron and aluminum occurs in the clay-rich horizons.

CONCLUSIONS

Two soils, both possessing the morphologically distinct clay-enriched B horizon (Bt) diagnostic of soils belonging to the Luvisolic Order and located on Late Quaternary moraines in the vicinity of London, Ontario are shown to have complex origins. Previous research on similar soils elsewhere has accounted for the accumulation of clays in the Bt horizons as a result of either clay translocation, clay neoformation from solution, alteration of other minerals to form clay minerals in situ, or the presence of lithologic discontinuities.

Multiple criteria, based on particle size, elemental and mineralogical data, indicate the presence of two lithologic discontinuities in each of the two soils examined. The basal deposit is interpreted as a calcareous silty clay till deposited during the final Wisconsin ice advance. This is overlain by a relatively thin, non-calcareous clay-rich deposit which grades upwards into a silty surficial veneer. The Bt horizon coincides with the clay-rich deposit.

Mineralogical evidence, in the form of the presence of clay-sized hydrous mica, vermiculite and other expanding phyllosilicates indicates some pre-weathering of the till prior to deposition. Simulated decalcification of the calcareous tills present in both soils resulted in
a clay-enriched residue. However, in only one case was the degree of clay-enrichment found comparable to the clay concentrations in the Bt horizons. Consequently, although weathering of the till has contributed to the clay contents of the Bt horizons, there are other contributing factors. The presence of a lithologic discontinuity at the base of the Bt horizons in both soils, as indicated by a marked inflection in plots of ratios of elements known to be resistant to weathering, suggests weathering of the till did not take place in situ. Instead, the weathering residue likely was transported and redeposited in its present location.

Clay translocation certainly has contributed to the clay content of the Bt horizons, as indicated by the presence of illuvial clay in the form of common channel and void argillans. Conspicuous layering in the argillans indicates episodic clay translocation, but electron microprobe transects across the argillans and ratios of extractable Fe and Al to clay fail to show compositional variations. Consequently, the illuvial material comprises significant amounts of Si, Fe, and Al, indicating a phyllosilicate composition, but with no significant variations over time.

Overlying the Bt horizons in these soils is an Ae horizon. Mineral weathering in the surface horizon is shown to be limited to minor mineral transformations under weakly acidic conditions of mica to hydrous mica, or vermiculite and the formation of Al-hydroxy interlayers. The presence of aeolian additions is indicated by feldspars within the coarse clay fraction and their absence at depth, the decrease of chlorites with depth, and the abundance of silt-sized particles in the surface horizons. Resistant element ratios with depth again show the presence of a lithologic discontinuity at the base of the Ae horizons which supports the aeolian origin of the surface horizons. The addition of aeolian material is probably a continuing process recharging the soil system with weatherable minerals.

The results of this study show at least some of the soils with Luvisolic characteristics in southern Ontario owe their morphological expression and their physical, chemical and mineralogical characteristics to a complex geologic history of deposition, to which has been added the effects of pedogenesis. In our judgement, the characteristic morphology of the two Luvisolic soils examined here is largely a function of the inherent stratification of the parent materials on which have been superimposed the effects of Holocene pedogenesis. Geomorphic activity, in the form of aeolian deposition likely continues to affect the characteristics of these soils. Consequently, previous interpretations of the nature and genesis of these and similar soils in southern Ontario probably have been overly simplistic in that they have attributed their distinctive morphologies essentially to Holocene pedogenesis.

ACKNOWLEDGEMENTS

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THE SUBURBANIZATION OF PORTUGUESE CANADIANS IN TORONTO 1

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This paper will examine Portuguese Canadian home buyers' relocation process, as well as the spatial aspects of their suburbanization, in the city of Mississauga, a western suburb of Toronto. Attention will be focused on their settlement patterns, housing choices/preferences and search behaviour. Data were obtained primarily from a questionnaire survey administered to a sample of 110 Portuguese in the city of Mississauga. Supplementary data were obtained from informal interviews with "key" members of Portuguese Canadian communities in the Toronto area. The empirical evidence indicates that Portuguese Canadian home buyers move to Mississauga in search of a single family dwelling located in a good neighbourhood in which to raise their children. Already there are indications that these Portuguese Canadians are more dispersed in the suburbs than they used to be in Toronto. Results indicate that resegregation is taking place in Mississauga with some Portuguese Canadian respondents who choose to live within, or in close proximity to, existing pockets or nuclei of Portuguese concentration; while for other respondents geographical dispersion became the most important outcome of their relocation process. Thus, two distinct and separate Portuguese communities seem to be evolving in Mississauga. The primary conclusion from this study is that Portuguese Canadian home buyers, and particularly those who decided to resegregate in the suburbs, may be defined as a culturally oriented group which relies on kinship/friendship ties as well as on housing information provided by "ethnic" sources - sources who share a common ethnicity, language and cultural values. Thus, the most important explanation for Portuguese resegregation in Mississauga rests on "cultural" forces, rather than on "economic" or "discriminatory" forces in the housing market.

INTRODUCTION

Canada is a country of immigrants, and its immigrant communities have long been influential within Canadian society and major factors in social differentiation. Research into the social ecology of Canadian metropolitan areas confirms the influence of ethnicity as a major factor in the stratification of urban populations (Davies and Murdie, 1993). Indeed, as Harney observes: "No great North American city can be understood without being studied as a city of immigrants..." (Harney, 1985, p. 6). One of the more recent ethnic groups to have come to Canada, who have contributed to the country's cultural mosaic and helped define its urban geography, are the Portuguese.

Since World War II, Canada has experienced profound changes in the ethnic and racial composition of its population and has now become a culturally heterogeneous society (Bourne et al., 1988; Herberg, 1989; Balakrishnan, 1991; Beaugot 1991; Davies and Murdie, 1994; Hiebert, 1994). In tandem with this evolution Toronto, and other major Canadian cities, experienced considerable changes in their urban geography during the past four decades. These include a) a decline of the central city, followed by inner-city revitalization; b) changes in neighbourhood social composition; and c) high levels of residential mobility and the subsequent growth of neighbouring cities and suburbs (Michelson, 1977; Goldberg and Mercar, 1986; Harris, 1991; Bunting, 1991; Ley and Bourne, 1993; Olson and Kobayashi, 1993; Miron, 1993). While residential mobility has been recognized as one of the most important processes at work in effecting these urban spatial changes (e.g., Clark, 1982, p. 8), the household search process, and the spatial implications of household's search strategies upon the internal structure of the city, have been less well understood (e.g., Smith et al., 1979; Huff, 1986).

Within this context, the tendency of certain ethnic and racial minorities to concentrate geographically and form ethnic neighbourhoods,
and the spatial patterns of immigrant assimilation, are of particular interest to Canadian social scientists given the large numbers of immigrants who continue to choose to settle in our major cities. It seems that, both in the USA and Canada, immigrants' residential behaviour in the post-War era differs significantly from that of their predecessors - those who arrived before World War II - rendering problematic the relevancy of the traditional spatial assimilation and invasion/succession models to an analysis of immigrant settlement and ethnic housing market.

The traditional spatial assimilation model (Gordon, 1964; Massey and Mullan, 1984; Massey, 1985) represents immigrants' residential mobility as being directly related to their socio-economic status and degree of acculturation. According to this paradigm, initial settlement will occur in an area of residential concentration, usually in the inner-city, among members of their own ethnic group. In this area rental costs per unit are comparatively inexpensive, and new immigrants can find goods, services and support networks - often with the help of previously arrived family and friends - in their own language. Sometimes they will supplant previous ethnic occupants of the "port of entry", ariving in a neighbourhood (invasion) and reshaping it to reflect their own particular cultural characteristics (succession).

The traditional assimilation model regards this spatial segregation of ethnic groups as a temporary stage in the gradual assimilation of minorities into the "majority" society. Inevitably newer arrivals will "invade" and "succeed" these immigrants in the inner-city. These immigrants will have, in the meantime, acquired facility with the host country's language, and improved their socio-economic condition to make possible their residential dispersal (diffusion) to the suburbs. This represents their spatial assimilation, which may probably be a precondition for eventual social assimilation (Allen and Turner, 1996).

A review of the current literature - both theoretical and empirical - regarding the spatial assimilation and invasion/succession models suggests that both are inadequate to completely represent the complex ethnic and geographic mosaic of multicultural North American cities. Immigrants of the post-World War II era differ from their pre-War predecessors in bringing higher levels of education and skills (and often money as well) with them upon migrating (Nash, 1994; Ray, 1994; Bourne, 1995; Balakrishnan and Hou, 1995; Allen and Turner, 1996). Consequently, they do not face the same economic constraints that limited the residential choice of earlier immigrants. As well, chain migration in the post-War period leads to new arrivals bypassing the area(s) of inner-city ethnic concentration and immediately dispersing to settle near already dispersed (and partially assimilated?) friends and relatives. Finally, changes to the physical infrastructure of North American metropolitan areas during the past four decades (improved transportation networks, public transit etc.) allows suburbanized minorities to easily return to their ethnic neighbourhoods to shop for special ethnic goods and participate in the institutional life of their community, rendering distance from the ethnic concentration less of a constraining factor to residential mobility than it was for their predecessors.

Thus, while the concept of assimilation remains an important theme in the study of racial and ethnic residential behaviour in North American cities, it has been both criticized and revised on theoretical and empirical grounds (Heisler, 1992; Fong, 1994; Darroch and Marston, 1994; Bonvalet, Carpenter and White, 1995; Allen and Turner, 1996). Similarly, Ray (1994) suggests that the heterogeneous nature of post-War immigration introduces complexities into the invasion/succession model and that the "contemporary social geography of Toronto immigrants mirrors this heterogeneity and complicated settlement...[The invasion /succession model ... is largely outdated" (Ray, 1996, p. 265).

Moreover, studies in the USA and Canada examining racial and ethnic residential behaviour demonstrate differences not only in the degree to which visible and non-visible minorities live separately from whites, but also with respect to the causes of residential segregation. Overall, the literature suggests that the search for underlying factors determining ethnic and racial segregation remains inconclusive (Balakrishnan and Selvanathan, 1990; Clark, 1992, 1993; Darden, 1994; Moghadam, 1994; Murdie, 1994; Farley, 1995; Phelan and Schneider, 1996). For
example, current research into the suburbanization of minority groups indicates differences between minority groups (e.g., both between non-visible minorities - Italians and Jews - and visible minorities - Chinese and Blacks) and even between subgroups with respect to the degree of assimilation (Logan and Alba, 1993). In addition, empirical evidence reveals that both voluntary (internal/choice) and involuntary (external/constraint - including discrimination) forces function, to varying degrees as major influences upon residential segregation (Turner and Wienk, 1993; Farley and Frey, 1994; Moghaddam, 1994; Teixeira, 1995; Frey and Farley, 1996).

It must be noted that, in addition to these above criticisms of the traditional models, a review of the literature points to gaps in the study of ethnic urban geography. In particular, the residential choice of Blacks in Canadian cities, and its relationship to their level of spatial segregation, has not been explored to the same extent as it has been in US cities (Murdie, 1994; Fong, 1994; Owusu, 1996). Similarly, in the context of non-visible minorities within the Canadian multicultural mosaic, the case of the Portuguese immigrant group - one of the most residentially concentrated ethnic groups in Toronto and Montreal (and their satellite bedroom suburbs of Mississauga and Laval respectively) despite their improved economic status and suburbanization - points not only to weaknesses of the model of spatial assimilation, but also to the need for further studies. It is this question as to whether or not the move of Portuguese in Toronto to Mississauga (suburbanization) represents spatial assimilation or resegregation which points to the main dilemma of the Portuguese Canadian communities - communities in transition - from isolation to residential integration?

The purpose of this paper is to examine the Portuguese Canadian home buyers' relocation process, as well as the spatial aspects of their suburbanization, in the city of Mississauga (a western suburb of Toronto). Attention will be focused on their settlement patterns, housing choices/preferences and search behaviour.

Data for the study were obtained primarily from telephone interviews administered in 1990 to a sample of 110 Portuguese home buyers in Mississauga. The study population was defined as follows: a) Portuguese ethnic origin and Portuguese as mother tongue (first language learned as a child, and can still speak at the time of the interviews); b) recent home buyers in Mississauga (purchased a home in 1989 or 1990, as close as possible to the time of the interviews); c) non-resident of Mississauga at the time of the purchase of the house; and d) purchased a single-detached, semi-detached or a townhouse type of house. The sample was drawn from TEELA Sales Records from February, 1989 to May 1990.

**ESTABLISHMENT OF PORTUGUESE CANADIAN COMMUNITIES: THE PORTUGUESE IN TORONTO**

Historical contact with Canada by Portuguese dates back to the fifteenth century when Portuguese sailors explored the Atlantic coast of Canada (Brazao, 1964; Mannion and Barkham, 1987). Portuguese immigration to this country, however, is relatively recent (Anderson and Higgs, 1976; Alpalhao and Da Rosa, 1980; Teixeira and Lavigne, 1992; Rocha-Trindade, 1993). During the 1950s and 1960s Canada, in an effort to meet the demand for agricultural and construction labour, encouraged Portuguese immigration. Later, in the 1960s and 1970s, the migration was accelerated as a result of the sponsorship and family reunification policies of the Canadian government.

It is difficult to estimate how many Portuguese immigrants and their descendants (second and third generation - "Luso-Canadians"), as well as illegal immigrants (Malarek, 1987), currently reside in Canada. The numbers range from 300,000 (Statistics Canada) to almost half a million (Portuguese Consular authorities in Canada). Regardless, according to the 1991 Canadian Census the Portuguese group is numerically important (246,890 - ethnic origin, single responses), and the Portuguese language is one of the most important non-official languages in Canada (211,040 - Mother Tongue). Figure 1 shows the distribution by province according to the 1991 Census. The majority of Portuguese (96.5%) are presently living in the two most important Canadian provinces - Ontario and Quebec. Approximately
two thirds of Portuguese living in Canada came from the islands of Azores, or are descendants of Azorean families in Canada, while other important contingents came from mainland Portugal or from the island of Madeira (Anderson, 1983; Da Rosa and Trigo, 1994).

An important characteristic of the Portuguese in Canada is their "urban nature" and high propensity to own homes and to cluster spatially (Lavigne, 1987; Teixeira, 1995). In the cores of major Canadian cities such as Toronto, Montreal and Vancouver, Portuguese Canadians have attained a remarkable level of community organization. However, despite the fact that Portuguese Canadians occupy an

important place within the ethnic "mosaic" of the country, the number of empirical studies dealing with this group is limited (Higgs, 1981; Teixeira and Lavigne, 1992).

Toronto: 'Port of Entry' for Portuguese Immigrants

Portuguese immigrants have, since the 1950s, increasingly chosen to settle in the province of Ontario. In Ontario approximately 176,300 people claimed Portuguese ethnic origin (single origin) for the 1991 Census. The majority of this group resided in the Toronto Census Metropolitan Area (Figure 2), but other large

Figure 2: Population of Portuguese Ethnic Origin for Census Metropolitan Areas in Ontario, 1991

Portuguese Canadian communities can be found in the Kitchener, Hamilton and London Census Metropolitan Areas.

Portuguese was one of the most frequently reported non-official language/mother tongue in the Toronto C.M.A. (95,305). Portuguese ranked third, after Italian (189,265) and Chinese (175,035), and the number of people reporting Portuguese as their mother tongue increased by approximately 22 percent between 1986 and 1991. Within Metropolitan Toronto the largest number of Portuguese (mother tongue) are located in the city of Toronto (44,955) where the Portuguese language is the most reported non-

official language. Outside Metropolitan Toronto but within the Greater Toronto area, the city of Mississauga (a western suburb of Toronto) is one of the most important cities in Ontario for the Portuguese.

Initial Settlement

The initial settlement of the Portuguese in Toronto in the 1960s and 1970s took place in the centre of the city of Toronto - Kensington Market and Alexandra Park (initial area of settlement in Figure 3). These working-class neighbourhoods were the common “port of entry” for earlier immigrant groups such as Jews, Ukrainians, Poles, Italians and Hungarians (Murdie, 1969; Neumann, Mezoff and Richmond, 1973; Brettell, 1981).

The Kensington area was, from the 1950s to the 1970s, one of the major commercial areas for the Portuguese in Toronto, and also an important area of residential concentration. Kensington was known for its affordable housing (for sale or rent - in terms of cost per unit) and was close to job sites and public transportation; all influential factors in residential choice at the time. For those Portuguese who came to Canada as sponsored immigrants, in the 1960s and 1970s, the choice was often made for them. Recently arrived Portuguese would often live with their sponsor, or in housing belonging to their sponsor.

In the early stages of this immigration, Portuguese were renters and roomers. Often residences were overcrowded, with two or three Portuguese families sharing the same house or apartment (Ferguson, 1964; Marques and Medeiros, 1980). The boarding house system was a transitional period for these immigrants (who usually planned to later become homeowners through rent savings) and for the Portuguese families who owned the boarding house and who used rent money to pay their own mortgages. It is no surprise to note that Portuguese home ownership increased considerably during the 1960s and 1970s in the Kensington area and surrounding neighbourhoods.

Portugal Village

During the mid 1960s and early 1970s important changes occurred in the settlement patterns as well as in the residential location of the Portuguese in Toronto. A shift away from the Kensington area to the south west took place (Figure 4a). The above mentioned overcrowding in this old area, an increase in Portuguese immigration to Toronto, and the aspiration of some Portuguese Canadian families to own a better house in a better neighbourhood, contributed to the movement out of the Kensington area and into adjacent neighbourhoods located west of Bathurst St. The area bounded mainly by College to the north, Bathurst to the east, King to the south and Ossington to the west, was their principal destination. At around this time, College St. and Dundas St. gradually became important Portuguese commercial strips. The establishment of these “Portuguese neighbourhoods” was an important stage in the “life cycle” of the ethnic community in their new country (Nankivell, 1973; Anderson and Higgs, 1976).

The questionnaire survey of Portuguese Canadian recent home buyers indicated that a majority of the respondents (72.0%) were “sponsored” by a member of their nuclear or extended family. Moreover, the results reveal that information provided by friends and relatives already established in Ontario was crucial in assisting these respondents to become established themselves. Over 70% of the Portuguese respondents indicated that friends and relatives were “very important” or “important” in helping them find a job and housing, as well as in the choice of the city/neighbourhood in which they settled after arrival. Guided by these networks of information, the new immigrants demonstrated preference for Portuguese areas of the city. Through “chain migration” the Portuguese were able, in a short period of time, to reconstitute their families (nuclear as well as extended members of the family) in Canada (Teixeira, 1992; Anderson, 1974, 1978).
Figure 3: The Portuguese in Toronto

Among several rural-culture traits transplanted from Portugal by Portuguese immigrants was the one related to home ownership. Portuguese possess great pride in housing. Houses in the Kensington area and surrounding neighbourhoods (west of Spadina), and particularly in the area known today as "Portugal Village" (located within the "core" of the community), were bought at low prices. Extensive renovations were often made by the new owners; most of them true "amateurs" in the construction trade - although many would later acquire skills in home building from working with Italian immigrants.

Most home renovations were done with the help of family and friends, and with little or no financial assistance from the government. Within the context of this study, it is important to note how mutual help and co-operation among Portuguese Canadian immigrants was an important factor in their "rejuvenation" of older neighbourhoods in the downtown areas of major Canadian cities (Anderson and Higgs, 1976; Krohn, Fleming and Manzer, 1977; Alpalhao and Da Rosa, 1980; Marois, 1988). Home ownership and housing are still seen today, by the majority of Portuguese Canadian immigrants, as a steady/secure economic investment and the realization of a "dream" on Canadian soil (Lavigne, 1987; Lavigne and Teixeira, 1990; Teixeira, 1992). Results from the questionnaire survey revealed that for first-time Portuguese home buyers, housing and home ownership are synonymous with security; a symbolic security for the immigrant and his family in the new world. The majority (more than 90%) of the respondents indicated "very important" or "important" to the following reasons why home ownership was so

important for them: "to have something of my 'own'"; "as a symbol of security to the family"; "home ownership as an investment"; "it brings greater privacy to the family"; "brings a feeling of having succeeded in this country (Canada)"; and "accomplishment of a 'dream'". Therefore, for Portuguese Canadians, a house becomes more than just a commodity or a physical structure. It

is the physical embodiment of these immigrants’ desire to find a secure “home” for their families, for their children and grandchildren, in a new land.

The Portuguese Canadian Community Today

The distribution of the Portuguese in the Toronto area in 1991 (Figure 4b) confirms the gradual dispersion of the group. Meanwhile, the major concentration of Portuguese Canadians continues to be located in the west-central part of the city of Toronto.

By 1991, the number of Portuguese Canadians living in the city of Toronto declined - 68% (44,955) compared to 78% (49,360) in 1981. Within the city of Toronto, the area bounded by Spadina, King, Landsdowne/Canadian National Railways and St. Clair Ave. formed the major area of concentration for the Portuguese (shown as the Portuguese residential concentration in Figure 3). There were about 38,000 Portuguese in this area in 1991, accounting for approximately 86% of the total of all the Portuguese Canadians living in the city of Toronto, and 60% of the Portuguese Canadians in Metro area. Within this larger area there is a "core" area of settlement, which includes most of the social, cultural and religious institutions, as well as the two most important Portuguese Canadian commercial strips - Dundas and College (core of the Portuguese community in Figure 3).

In recent years, two areas of new Portuguese settlement have emerged: a) north-west of the core in the traditional immigrant corridor, where Portuguese are replacing Italians; and b) the western suburbs, especially the city of Mississauga (Figure 4b). Responses to the questionnaire survey indicate some of the major factors governing the decision of Portuguese to move from their old residence (usually in Toronto) to their new home (Mississauga): 34% of the respondents mentioned the wish to live in a modern/larger house with backyard; 20.3% mentioned housing prices/investment; 16.1% indicated they wanted to become homeowners; and 13.6% mentioned the wish to live in a better area/neighbourhood with good schools for their children. Those families who remain in the city of Toronto, and particularly within the "Portuguese neighbourhood" ("Portuguese Village"), are largely first generation Portuguese (the least assimilated?), to whom the "suburbs" are not a priority. The "Portuguese neighbourhood" is the place where they feel "comfortable", where they can live a Canadian life in a "Portuguese way" - their "own way" - among those who share similar cultural values, lifestyle orientation and the same language. "Portuguese Village", and the surrounding neighbourhoods, may therefore be seen as something of a recreation of Portugal - its atmosphere and ambience - in the New World.

In 1993, one finds in Ontario an appreciable number of Portuguese businesses and organizations (Table 1). The majority of these are located within the "core" of the Portuguese community of Toronto, as well as in adjacent neighbourhoods. The high degree of "institutional completeness" of the Portuguese community in Toronto is well demonstrated by its numerous social, religious institutions, its ethnic businesses - stores, bakeries, travel and real estate agencies, and restaurants - which service the group in their own language.

By 1981, the Portuguese were among the most segregated groups in Toronto. In the Toronto Census Metropolitan Area, the Portuguese had the second highest indices of dissimilarity in residential patterns (65.2) after the Jews (74.1) (Boume et al., 1986). These indices of dissimilarity measure the unevenness in the spatial distribution of each ethnic group as compared to the distribution of the balance of the census metropolitan area population. The high index of dissimilarity for the Portuguese is not a surprise because the majority of them are relatively recent immigrants (first generation). Factors such as language barriers, socioeconomic status, cultural values and lifestyle orientation, and heavy reliance on "ethnic" sources of information (e.g., friends, relatives, Portuguese real estate agents) in looking for and locating a new dwelling, may explain the concentration of the Portuguese group in particular neighbourhoods of Toronto. Moreover, the many commercial, social and religious organizations within the Portuguese Canadian community may provide a focus for the residential concentration of the group in Toronto (Brettell, 1977; Anderson and Higgs, 1976;
Table 1: Portuguese Organizations / Institutions and Ethnic Businesses, Ontario / Canada - 1993

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<th></th>
<th>Ontario</th>
<th>Canada (Total)</th>
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<td>Portuguese Businesses</td>
<td>3,500*</td>
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<td>Portuguese Clubs / Associations</td>
<td>111</td>
<td>198</td>
</tr>
<tr>
<td>Portuguese Community Schools</td>
<td>32</td>
<td>47</td>
</tr>
<tr>
<td>Churches</td>
<td>25**</td>
<td>38</td>
</tr>
</tbody>
</table>

* Federacao Luso-Canadiana de Empresarios e Profissionais
** Guia Comercial Portugues (Portuguese Telephone Directory), 1993
Source: Portuguese Consulate in Toronto and the Portuguese Embassy in Ottawa


Portuguese Canadian cultural institutions and ethnic businesses play a prominent role both in the life of the community and within Toronto's multicultural society in general. These ethnic businesses and institutions not only mark the presence of the Portuguese Canadian community in the city, but also help ensure the survival of the ethnic group by functioning as a promoter of Portuguese culture, customs and traditions in Canada.

THE SUBURBANIZATION OF THE PORTUGUESE CANADIANS IN TORONTO - THE MOVE TO MISSISSAUGA

The gradual dispersal of the Portuguese Canadian community from the “core”, in the city of Toronto, to suburbs such as Mississauga occurred primarily during the last two decades (see Figure 4a and 4b). Within this context lies the dilemma of the Portuguese Canadian community in Toronto: “a community in transition from isolation to residential integration?”. With a population of approximately 463,000, Mississauga is an important bedroom suburb of Toronto. The Portuguese community in Mississauga expanded from about 1,500 in 1971 to approximately 14,000 in 1991 (Statistics Canada 1971 and 1991). According to “key” persons in the Portuguese community that I interviewed in Mississauga, the number of Portuguese of first generation and descendants (second and third) living in Mississauga is approximately 40,000. Within Mississauga, the majority of Portuguese Canadians are concentrated in the area bounded by Highway 403, the Credit River, the Etobicoke Creek and Lake Ontario. The Portuguese are not evenly distributed within this area and pockets or nuclei of Portuguese can be identified (Figure 5). This area contains approximately 6,000 Portuguese or approximately 71% of all Portuguese (by mother tongue) living in Mississauga in 1986 (Census of Canada, 1986). It is within this area that the most important commercial, cultural, and religious institutions of the Portuguese community are located. This area also corresponds to the oldest and most urbanized area of the city of Mississauga.
Most of the Portuguese living in Mississauga came from Toronto. Results from the questionnaire survey with recent Portuguese home buyers in Mississauga show that 35.1% of the respondents mentioned the size of the house as the most important reason for choosing their present residence; 19.3% mentioned the area/neighbourhood; 15.8% indicated the costs of the houses/good investment; 14% indicated the type of housing; and 6.1% mentioned "proximity to relatives and/or friends" as important reasons for choosing their present residence. The wish to acquire the modern "dream" house, preferably a single family dwelling with certain amenities such as basement, backyard, garden in front of the house, garage, modern kitchen, and located in a quiet place with pleasant surroundings and good schools for their children, represents the ultimate goal for Portuguese families relocating to Mississauga.

Even if we verify a continuous and gradual movement out of the "core" of the Portuguese community in Toronto, this movement has not yet affected noticeably the vitality of the ethnic institutions, commercial establishments and community services. Even if people move to different parts of the city, and to suburbs such as Mississauga, a significant number of them (92 out of 110 respondents) return regularly to the "core" of the community to visit relatives and friends, to shop in the...
Percentage of Home buyers Mentioning
Source: Portuguese

N=110

<table>
<thead>
<tr>
<th>Information Sources</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Agents</td>
<td>43</td>
<td>39.1</td>
</tr>
<tr>
<td>Friends/Relatives</td>
<td>17</td>
<td>15.5</td>
</tr>
<tr>
<td>Non-Ethnic Agents</td>
<td>16</td>
<td>14.5</td>
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<td>Signs on Property/</td>
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<td></td>
</tr>
<tr>
<td>Open house</td>
<td>11</td>
<td>10.0</td>
</tr>
<tr>
<td>Newspapers</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>Driving Around</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Source: Questionnaire Survey

Table 2: Most Important Information Source Used to Find Present Residence

Portuguese ethnic businesses, to go to church, and/or to participate in cultural events.

With respect to the housing search process, Portuguese home buyers relied extensively on "ethnic" sources of information in looking for and locating their present residence in Mississauga (Table 2). For Portuguese, ethnic real estate agents were by far the most important source in locating the present residence, with approximately 39.0% of all Portuguese home buyers mentioning this source as the most time in their housing search, and inspected a limited number of dwellings before the final decision was made. 62.6% of Portuguese home buyers spent two months or less searching for a new residence, with 41.5% inspecting only 1 to 5 dwellings in their search.

The search strategies undertaken by Portuguese Canadian households ultimately led them to different final destinations within the boundaries of the city of Mississauga (Figure 6). Already there are indications that Portuguese Canadian are more dispersed in the suburbs than they used to be in Toronto. Results indicate that resegregation in Mississauga becomes apparent for some Portuguese respondents (particularly Azoreans) who choose to live within or in close proximity to existing pockets or nuclei of Portuguese concentration, while for other respondents geographical dispersion became the most important outcome of their relocation process. Thus, two distinct and separate Portuguese communities seem to be evolving in Mississauga.

CONCLUSION

Results from this study indicate that Portuguese Canadian home buyers, and particularly those who decided to resegregate in the suburbs, may be defined as a culturally oriented group which
Thus the most important explanation for Portuguese Canadian resegregation in Mississauga may be that of "cultural" forces within the community, rather than the "economic" or "discriminatory" forces in the housing market.

One of the major implications of this study, that the resegregation of Portuguese Canadians in Mississauga has become a characteristic of this group and is likely to continue, reflects the varying loyalties Portuguese feel for their cultural heritage while integrating into Canadian society. While the Portuguese Canadian community is only four decades old, it has become firmly rooted in Canadian soil. In this context, this move to the suburbs (in this case Mississauga) should not be seen as a step in the assimilation process, but rather as an aspect of the group's gradual integration. In spite of this suburbanization, Portuguese Canadians have frequent contact with the "core" of the older Portuguese Canadian community in Toronto. They return to visit relatives and friends, shop in ethnic businesses and attend social and religious events in their old neighbourhoods.

It would be difficult to predict the future development of the Portuguese community in Canada. For the second and third generations, raised in Canada, the dilemma of cultural identification will become a crucial defining conflict. Almeida, 1984-1987; Horta, 1989; Dias, 1990; Meintel, 1992). For these future generations the question of being "Canadian", "Portuguese-Canadian" or "Portuguese", will often remain unanswered. Nonetheless, this study suggests that one fact is certain. Portuguese Canadians control their own mobility as reflected in their patterns of residential housing choice and resegregation, and will probably continue to play an important role in shaping the social geography of Canadian cities.

NOTES

1. The author would like to thank Robert Murdie, Department of Geography, York University, for his helpful comments on an earlier version of this paper.

2. Of the 110 Portuguese who participated in the questionnaire survey, almost all (97.3%) were born in Portugal and 70 per cent spoke Portuguese most of the time at home. Of the "first generation" respondents who were born in Portugal, almost sixty one percent (60.7%) were born in the Azores islands. Most of the respondents (57.3%) arrived in Canada during the period 1966-1976 and emigrated mainly for economic reasons (43.0%), and to join members of the family already living in Canada (40.2%). Of the 110 Portuguese respondents, the majority (79.1%) were already homeowners as of 1989, which lived in the city of Toronto before moving to Mississauga. Almost all of these lived in the heart of the Portuguese community in Toronto. For further details concerning the methodology and the socio-demographic characteristics of the Portuguese sample see, Carlos Teixeira 1992, "The Role of 'ethnic' Sources of Information in the Relocation Decision-Making Process: A Case Study of the Portuguese in Mississauga". Ph.D Thesis, Department of Geography, York University.

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THE EARNINGS AND OCCUPATIONAL STRUCTURE OF BUSINESS AND PROFESSIONAL SERVICES IN ILLINOIS

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University of Arkansas
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The majority of nonmetropolitan workers are now employed in the service sector. At issue is whether service industries can provide nonmetro workers with the jobs needed to replace manufacturing and natural resource employment. This research focuses on the wage and occupational structure of nonmetro business and professional services in Illinois to assess the potential of these services to provide high wage employment for nonmetro workers. The results indicate that employment in business and professional services (SIC codes 73, 87 and 89) expanded rapidly from 1980 to 1990 in nonmetro counties of Illinois. However, wages in business and professional services are significantly lower in nonmetropolitan locations than in urban ones. The findings also indicate that the nonmetro business and professional service sector is dominated by low paying sales, clerical, and blue collar occupations.

INTRODUCTION

In the later half of the twentieth century the nonmetropolitan economy of the United States has undergone a complete transformation. Where once employment was based primarily on agriculture it is now predominantly in the service sector (Brown and Deavers 1988; Fugitt, Brown and Beale 1989; Mazie and Killian 1991; Phillips and Miller 1991; Summers, Horton and Gringeri 1990). This shift from agriculture to service employment is evident throughout nonmetropolitan areas and is exemplified by the changes that have taken place in Illinois during the last four decades. In 1950, agriculture accounted for 39 percent of nonmetropolitan employment in the state; by 1990 it was only 7 percent (Figure 1). Over the same time period, jobs in service industries increased from 35 percent of the total in rural Illinois to approximately 70 percent. There can be little doubt that such major changes in the employment structure of these economies has had a deep and lasting impact on nonmetropolitan communities and their populations. The crucial question being - how has this transformation impacted the ability of nonmetropolitan populations to support themselves under these new circumstances.

It is important to understand whether the expanding service sector can provide the nonmetropolitan population with highly paid employment prospects. The highest wage rates in the service sector are found in producer services, particularly in business and professional services, and attention has been drawn to the potential for growth in these services in nonmetropolitan areas (Beyers 1994, Glasmeier and Howland 1994, Kassab and Luloff 1993, Smith 1993 and 1981). It has been argued that business and professional services may be able to take advantage of advanced telecommunications to unbundle operations to low cost nonmetropolitan areas (Miller and Bluestone 1988; Parker, Hudson, Dillman, and Roscoe 1989). If this is the case then policies to modernize telecommunications systems in nonmetropolitan areas are essential to attract business and professional service firms (Dillman, Beck, and Allen 1989).

However, the availability of advanced
telecommunications may simply enable nonmetropolitan customers to take delivery of business services from remote urban locations, reinforcing the existing urban concentration of these services (Kirn, Conway and Beyers 1990; Coffey 1993).

Even if unbundling does occur, evidence suggests that such back office operations do not necessarily provide the well-paid, full-time, high-benefit jobs that would be so beneficial to nonmetropolitan areas (Nelson 1986). Indeed, Glaesmeier and Borchard (1989) indicate that there are no high-level services with obvious potential for growth in nonmetropolitan areas. Thus, the possibility of business and professional services providing a growth sector for high quality employment opportunities for nonmetropolitan residents remains unproven.

The purpose of this paper is to describe the growth of business and professional services in nonmetropolitan Illinois and to analyze the earnings and occupational structure of nonmetropolitan business and professional services. The first part of the paper is a brief review of the literature pertaining to nonmetropolitan development with regard to business and professional services. This section is followed by an analysis of the growth of business and professional service employment in nonmetropolitan Illinois; and then a comparison of the earnings and occupational structure of nonmetropolitan business and professional services.

PRODUCER SERVICES AND THE METROPOLITAN / NONMETROPOLITAN EARNINGS GAP

A long standing feature of economic life in nonmetropolitan areas is the fact that rural workers earn less than metropolitan workers. In 1973 wages among nonmetro workers were 78% of their metropolitan counterparts; moreover the metro/nonmetro earnings gap increased during the 1980s. By 1986, nonmetropolitan workers earned 66% of the average metropolitan wage (Henry 1993, Barancik 1990). Although work effort is high, much larger proportions of nonmetropolitan workers have earnings that put them at or below the poverty line (Crump 1995).

In 1979 nearly one-third of nonmetropolitan workers had annual earnings less than $12,000; in constant terms, by 1987 this number had increased to over forty percent (Gorham 1993).

Several explanations have been advanced for the growing metropolitan/nonmetropolitan earnings differential. These include: 1) the economic restructuring hypothesis; 2) individual earnings attainment models; and 3) structural theories that posit significant differences in the operation of metropolitan and nonmetropolitan labor markets (Horan and Tolbert 1984, McLaughlin and Perman 1991, Tolbert and Lyson 1992).

The restructuring hypothesis is based on the idea that the loss of high-paying manufacturing jobs and the growth low-wage service employment are responsible for declining earnings (Crump 1995). However, in contrast to the predictions of the restructuring hypothesis, several studies indicate that earnings differentials are more

Figure 1: Structure of Rural Employment in Illinois, 1950 - 1990

the result of differences in occupational structure than changes in industrial composition (Tigges 1994).

An alternative explanation rests on the neo-classical assumption that individual characteristics such as age and education determine an individual's occupation, and therefore, their earnings (Beck, Horan and Tolbert 1978). The individual earnings attainment model is partially supported by the results of several recent studies. Increases in earnings-education differentials have been evident in studies on the growing level of income inequality in the United States (Blackburn, Bloom and Freeman 1993). Recent economic and technological changes clearly appear to favor skilled workers, particularly those with computer skills (Gottschalk and Danziger 1993). Since educational levels tend to be lower among nonmetro workers, changing returns to education are likely to increase the earnings differential between metro and nonmetro workers.

In contrast to individual earnings attainment models, structural theorists take the position that earnings differentials are determined by social and economic structures which assign workers to positions according to factors such as gender, age and race (Farkas, England and Barton 1994). Structural constraints do not operate uniformly across locations; some labor markets are more restrictive than others (Reilly 1992). For example, many rural labor markets are dominated by a single large employer. Workers in such areas are faced with a limited set of employment opportunities, thus lowering their potential earnings. Nonmetropolitan labor markets may also have greater levels of racial or gender segregation, a structural constraint that helps to maintain low wage rates (Tickamyer 1992). In a test of the individual attainment model vs. structural theory, Tolbert and Lyson (1992) found that metropolitan/nonmetropolitan earnings differentials were more closely related to local opportunity structure than they were to individual characteristics such as education.

Having indicated that there are a variety of explanations for the overall differences in metropolitan/nonmetropolitan earnings there is also the issue of the earnings structure of the producer services sector to consider. There is currently a great deal of debate concerning the impact of service sector growth on the fortunes of communities and workers. Some researchers have a relatively optimistic view of this transformation. According to Brown and Deavers (1988), wages in service industries are the same or even higher than those of low paying manufacturing jobs; therefore, the growth of services should have a positive impact on income. Christopherson and Noyelle (1993) make the point that service employment in the 1980s is very different from earlier time periods and is not necessarily equivalent to low-wage, low-skill, peripheral employment.

In contrast, other findings indicate that the decline of manufacturing and expansion of services is linked to the growing number of poor and working poor in nonmetropolitan America (Tickamyer and Duncan 1991). By 1987, 42.1 percent of workers had annual wages below the poverty line and four of the five fastest growing nonmetropolitan industries in the U.S. (all in services) have low wage structures (Gorham 1993; Porterfield 1990). In labor markets of the rural Southeast, producer service workers had the highest poverty rates among rural households (Tickamyer 1992). The low earnings evident in rural locations is not due to lack of work effort by nonmetropolitan residents; rather, the basic problem is an insufficient number of jobs with wages high enough to raise workers above the poverty line (Tickamyer and Duncan 1991). The indications are that the growth of services may be accentuating the problem.

DATA SOURCES AND METHODOLOGY

The county-level data used here were obtained from the CD-ROM version of summary tape file 3-A (STF-3A) (U.S. Bureau of the Census 1992a, 1992b). One noteworthy aspect of the STF-3A data, is that, unlike sources such as County Business Patterns, employment information is by residence not by workplace.

The data used to analyze the earnings of service workers in nonmetropolitan areas were obtained from the 5 percent Public Use Microdata Sample (PUMS) for Illinois (U.S. Bureau of the Census 1993). The PUMS data are individual responses to the long form of the
1990 U.S. Census and contain detailed individual-level information. The most important characteristic of these data is that, in order to protect confidentiality, the individual level data were assigned to Public Use Microdata Areas (PUMAs), each containing a minimum of 100,000 residents. In densely populated urban areas, the Census Bureau combined census tracts to reach the population threshold. For the purposes of this study these were aggregated into county units.

To reach the 100,000 population criterion in sparsely populated nonmetropolitan areas, the Census Bureau needed to group several counties in a single PUMA. Unfortunately, some nonmetropolitan PUMAs are composed of noncontiguous counties and in other cases, metropolitan and nonmetropolitan counties are combined in a single PUMA. To conduct the analysis of earnings in business and professional services for nonmetropolitan PUMAs, those containing only nonmetropolitan counties were used. These ten nonmetropolitan PUMAs contain 54 of the 74 nonmetropolitan counties in Illinois.

For comparative purposes, the state of Illinois was subdivided into four regions; the city of Chicago (Cook County), the collar counties surrounding Chicago; smaller metropolitan areas (e.g. Peoria and Springfield); and nonmetropolitan Illinois (Figure 2). Only individuals of working age (16-64) were included. For the city of Chicago the large number of observations was reduced by selecting a random 50 percent of the samples from the PUMS data set. The total number of working age respondents used in the analysis was 162,547. There were 47,772 observations in Chicago; 42,798 in the collar counties; 30,992 in the small metro counties; and 40,985 in the nonmetropolitan counties. Of this sample, 12,144 persons (7.5 percent) were employed in business and professional services; 4,632 in Chicago; 3,585 in the collar counties; 1,834 in the small metropolitan counties; and 2,113 in the nonmetropolitan counties.

One of the goals of this paper is to compare the earnings of business and professional services in metropolitan and nonmetropolitan counties. In order to accomplish this the high level of part-time and seasonal work in nonmetropolitan areas has to be taken into account. To allow comparisons to be drawn between full and part-time workers, wage and salary earnings were converted to an annualized figure, using the following equation:

\[ AW\text{SIBP} = (( wsi89 \div hr89 ) \times wk89 ) \times 2,080 \]

where:
\[ wsi89 = \text{wage and salary income in 1989} \]
\[ hr89 = \text{average hours per week in 1989} \]
\[ wk89 = \text{number of weeks worked in 1989} \]
\[ 2,080 = \text{number of hours a full-time worker would work in a year (40x52 = 2,080 hours)} \]

The resulting figure is annualized wage and salary income for workers employed in business and professional services (AWSIBP) and allows salary comparisons to be drawn, irrespective of full or part-time status (Gorham 1993).

Location quotients were also calculated for 1980 and 1990 using the following equation:

\[ LQ = \frac{X_i}{N_i} \div \frac{\Sigma X_i}{\Sigma N_i} \times 100 \]

where \(X_i\) and \(\Sigma X_i\) comprise employment in business and professional services in a particular location (e.g. Chicago, collar counties, small metropolitan and nonmetropolitan) and the state total of business and professional services. \(N_i\) and \(\Sigma N_i\) are total employment by location type and total state employment, respectively. The location quotients are used to indicate the relative concentration of employment in business and professional services around the state, and to assess whether the locational concentration of this employment has changed over time. Thus it will be possible to ascertain whether business and professional services are decentralizing to nonmetropolitan locations.

To determine whether there are significant differences in AWSIBP, a dummy variable regression model was used (Fedhauer 1982).
BUSINESS AND PROFESSIONAL SERVICES IN NONMETROPOLITAN ILLINOIS, 1980-1990

Employment in Business and Professional Services

During the 1980s employment in business and professional services increased rapidly in Illinois (Table 1, Figure 3). For the state as a whole, this employment group gained 51.7 percent, resulting in an estimated increase of more than 200,000 jobs. The most rapid growth took place in the collar counties, with an increase of 65.4 percent. However, there was also a high growth rate in nonmetropolitan areas (59.3 percent) where employment growth in business and professional services was faster than in any other sector (Table 1).

Furthermore, the estimated increase of 26,515 jobs accounted for almost half (46.8 percent) of the new jobs created in nonmetropolitan Illinois during the decade. By 1990, business and professional services accounted for 8.2 percent of nonmetropolitan employment, lower than the state average of 12.0 percent, but significantly higher than the 1980 nonmetropolitan figure of 5.1 percent. The indications of a slight decentralization of business and professional services employment to nonmetropolitan areas is supported by the location quotients which declined in Chicago and the collar counties and increased in counties dominated by small metropolitan and nonmetropolitan areas (Figure 4).

Figure 2: County Classifications

In the models tested here, the dependent variable is AWSIBP, and the independent variables are categorical, coded to represent business and professional workers in the four locations around the state. A dummy variable regression model is designed to test for significant differences in the dependent variable across a variety of categorical variables. In this case the nonmetropolitan counties are left uncoded and become the constant, and the model estimates the degree of difference between AWSIBP for workers in these counties and each of the three other locations.

Figure 3: Business and Professional Service Employment in Illinois, 1980 - 1990

Figure 4: Location Quotients for Business and Professional Services in Illinois, 1980 - 1990
<table>
<thead>
<tr>
<th>Chicago (Cook County)</th>
<th>1980</th>
<th>1990</th>
<th>absolute change</th>
<th>% change 1980-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Resource</td>
<td>10,445</td>
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<td>23.01</td>
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<td>1747418</td>
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<td>13.64</td>
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<td>324,675</td>
<td>99,125</td>
<td>43.95</td>
</tr>
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<td>165,034</td>
<td>173,668</td>
<td>8,634</td>
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<td>200,377</td>
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<tr>
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<td>204,223</td>
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<td>-1.64</td>
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<td>226,071</td>
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<tr>
<td>Personal</td>
<td>76,848</td>
<td>104,404</td>
<td>27,556</td>
<td>36.21</td>
</tr>
<tr>
<td>Wholesale/Retail</td>
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<td>514,000</td>
<td>23,322</td>
<td>4.75</td>
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<tr>
<td>Public Administration</td>
<td>103,833</td>
<td>92,527</td>
<td>-11,311</td>
<td>-10.89</td>
</tr>
<tr>
<td><strong>Total (Chicago)</strong></td>
<td>2,249,579</td>
<td>2,320,619</td>
<td>71,040</td>
<td>3.16</td>
</tr>
</tbody>
</table>

**Collar Counties**

| Natural Resource                      | 12,775  | 14,795  | 2,020           | 15.81           |
| Construction                          | 48,840  | 74,672  | 24,832          | 49.82           |
| Manufacturing                         | 253,049 | 238,398 | -14,651         | -5.79           |
| Services                              | 588,001 | 811,930 | 223,929         | 38.08           |
| Business and Professional             | 85,642  | 141,817 | 56,175          | 65.36           |
| Education                             | 67,497  | 78,748  | 11,251          | 16.67           |
| Health                                | 56,981  | 89,811  | 32,830          | 41.82           |
| TCU                                   | 68,309  | 88,828  | 20,519          | 30.04           |
| FIRE                                  | 60,465  | 97,002  | 36,537          | 60.43           |
| Personal                              | 26,631  | 40,785  | 14,154          | 53.15           |
| Wholesale/Retail                      | 183,639 | 252,786 | 69,147          | 30.54           |
| Public Administration                 | 28,837  | 31,353  | 2,516           | 8.72            |
| **Total (collar)**                    | 863,865 | 1,136,795 | 236,130         | 26.13           |

**Small metro Counties**

| Natural Resource                      | 26,842  | 22,874  | -3,968          | -14.78          |
| Construction                          | 44,791  | 48,620  | 3,829           | 8.55            |
| Manufacturing                         | 235,865 | 186,268 | -49,597         | -21.03          |
| Services                              | 630,863 | 719,843 | 88,980          | 14.10           |
| Business and Professional             | 63,199  | 96,281  | 35,092          | 55.53           |
| Education                             | 89,066  | 96,498  | 7,432           | 7.22            |
| Health                                | 74,577  | 88,855  | 14,278          | 19.15           |
| TCU                                   | 68,230  | 68,785  | -555            | -0.82           |
| FIRE                                  | 56,058  | 67,440  | 11,382          | 20.30           |
| Personal                              | 33,411  | 37,918  | 4,507           | 13.49           |
| Wholesale/Retail                      | 194,109 | 213,276 | 19,167          | 9.87            |
| Public Administration                 | 52,213  | 51,780  | -433            | -0.83           |
| **Total (Small metro)**               | 938,361 | 977,605 | 39,244          | 4.18            |

Table 1: Employment in Illinois, 1980 - 1990
## Nonmetro Counties

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
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<td>95,409</td>
<td>59,255</td>
<td>-36,154</td>
<td>-37.89</td>
</tr>
<tr>
<td>Construction</td>
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<td>48,636</td>
<td>1,331</td>
<td>2.72</td>
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<td>Manufacturing</td>
<td>206,257</td>
<td>179,484</td>
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</tr>
<tr>
<td>Business and Professional</td>
<td>44,769</td>
<td>71,284</td>
<td>26,515</td>
<td>59.23</td>
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<td>Education</td>
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<td>-0.28</td>
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<tr>
<td>Health</td>
<td>68,431</td>
<td>76,847</td>
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<td>60,704</td>
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<td>41,170</td>
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<td>Personal</td>
<td>29,748</td>
<td>32,085</td>
<td>2,337</td>
<td>7.96</td>
</tr>
<tr>
<td>Wholesale/Retail</td>
<td>168,744</td>
<td>178,000</td>
<td>9,256</td>
<td>5.48</td>
</tr>
<tr>
<td>Public Administration</td>
<td>323,410</td>
<td>35,634</td>
<td>3,293</td>
<td>10.18</td>
</tr>
<tr>
<td><strong>Total (nonmetro)</strong></td>
<td>872,985</td>
<td>866,522</td>
<td><strong>-6,463</strong></td>
<td><strong>-0.74</strong></td>
</tr>
</tbody>
</table>

## State

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
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<tbody>
<tr>
<td>Natural Resource</td>
<td>145,471</td>
<td>110,159</td>
<td>-35,312</td>
<td>-24.27</td>
</tr>
<tr>
<td>Construction</td>
<td>230,904</td>
<td>280,997</td>
<td>50,093</td>
<td>21.69</td>
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<tr>
<td>Manufacturing</td>
<td>1,307,999</td>
<td>1,055,047</td>
<td>-252,952</td>
<td>-19.34</td>
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<tr>
<td>Services</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Business and Professional</td>
<td>418,160</td>
<td>635,867</td>
<td>218,707</td>
<td>51.80</td>
</tr>
<tr>
<td>Education</td>
<td>404,755</td>
<td>430,842</td>
<td>26,087</td>
<td>6.45</td>
</tr>
<tr>
<td>Health</td>
<td>382,048</td>
<td>446,890</td>
<td>64,842</td>
<td>16.97</td>
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<tr>
<td>TCU</td>
<td>404,882</td>
<td>421,035</td>
<td>16,153</td>
<td>3.99</td>
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<tr>
<td>FIRE</td>
<td>342,392</td>
<td>431,683</td>
<td>89,291</td>
<td>26.08</td>
</tr>
<tr>
<td>Personal</td>
<td>166,438</td>
<td>215,192</td>
<td>48,754</td>
<td>29.29</td>
</tr>
<tr>
<td>Wholesale/Retail</td>
<td>1,047,170</td>
<td>1,158,062</td>
<td>110,892</td>
<td>10.59</td>
</tr>
<tr>
<td>Public Administration</td>
<td>217,229</td>
<td>211,254</td>
<td>-5,035</td>
<td>-2.73</td>
</tr>
<tr>
<td><strong>Total (state)</strong></td>
<td>5,068,428</td>
<td>5,397,068</td>
<td>328,640</td>
<td>6.48</td>
</tr>
</tbody>
</table>


### Table 1: (Continued). Employment in Illinois, 1980 - 1990

<table>
<thead>
<tr>
<th>Location</th>
<th>Median AWSIBP</th>
<th>Mean AWSIBP</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>$22,171.46</td>
<td>$25,982.10</td>
<td>$16,544.52</td>
<td>0.637</td>
</tr>
<tr>
<td>Colar</td>
<td>$24,151.20</td>
<td>$28,495.57</td>
<td>$17,991.00</td>
<td>0.631</td>
</tr>
<tr>
<td>Small Metropolitan</td>
<td>$16,000.00</td>
<td>$19,446.09</td>
<td>$13,226.44</td>
<td>0.680</td>
</tr>
<tr>
<td>Nonmetropolitan</td>
<td>$13,042.85</td>
<td>$16,592.25</td>
<td>$12,128.85</td>
<td>0.731</td>
</tr>
</tbody>
</table>


### Table 2: Descriptive Statistics for Business and Professional Services in Illinois, 1990

Table 3: Dummy Variable Regression Results

The evident growth of nonmetropolitan business and professional services is encouraging for residents of those areas. However, from an economic development perspective, a more important issue than mere growth in business and professional services is whether those employment opportunities provide nonmetropolitan workers with adequate incomes to keep them above the poverty level.

Earnings in Business and Professional Services

Thus, the second section of results examines the earnings of business and professional service workers in Illinois. Statewide median AWSIBP in 1990 was $20,000; business and professional service workers in the collar counties had the highest median AWSIBP ($24,151), followed closely by those in Chicago ($22,171) (Table 2). Business and professional service workers in the nonmetropolitan areas had the lowest earnings with a median AWSIBP of just $13,043, 54 percent of the median in the collar counties.

The dummy variable regression model indicates that there were statistically significant differences in business and professional service employee wages across the four tested regions (Table 3). The most significant differences were found between median AWSIBP in the nonmetropolitan and collar counties (t=23.53, p=<.01) and between nonmetropolitan counties and Chicago (t=19.34, p=<.01).

In fact, among all employment categories, the metro/nonmetro wage gap is largest in the business and professional services sector. In 1990, nonmetro workers in business and professional services earned only 52.8 percent of the annual median earnings of collar county workers and just 58.6 percent of those employed in Chicago (Table 4). These results indicate that expansion of business and professional services may be accentuating the pre-existing metro/nonmetro wage differentials.

Another indication of the low wages in nonmetropolitan business and professional services is the large number of such workers (42.4 percent) who earned annual salaries less than $12,000, a figure below the poverty line for a family of four. In contrast, only 22.9 percent of business and professional service workers in collar counties had earnings below the poverty line. Such disparities were also found in the high-wage brackets; in the collar counties over 35 percent of the business and professional service workers had annual earnings in excess of $30,000, compared to only 8.4 percent in the nonmetropolitan areas.

The reasons for the wage disparities between metropolitan and nonmetropolitan service workers are probably found in the spatial division of labor of such services. It is likely that...
<table>
<thead>
<tr>
<th>Sector</th>
<th>Cook County (Chicago)</th>
<th>Collar Counties</th>
<th>Small Metropolitan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>65.8%</td>
<td>70.8%</td>
<td>73.6%</td>
</tr>
<tr>
<td>Services</td>
<td>64.3%</td>
<td>63.7%</td>
<td>84.2%</td>
</tr>
<tr>
<td>Business and Professional</td>
<td>58.6%</td>
<td>52.8%</td>
<td>81.8%</td>
</tr>
<tr>
<td>Education</td>
<td>74.8%</td>
<td>77.7%</td>
<td>93.5%</td>
</tr>
<tr>
<td>Heath</td>
<td>64.0%</td>
<td>62.8%</td>
<td>80.0%</td>
</tr>
<tr>
<td>TCU</td>
<td>83.0%</td>
<td>75.6%</td>
<td>60.7%</td>
</tr>
<tr>
<td>FIRE</td>
<td>62.5%</td>
<td>62.5%</td>
<td>80.4%</td>
</tr>
<tr>
<td>Personal</td>
<td>66.5%</td>
<td>68.8%</td>
<td>64.0%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>66.7%</td>
<td>58.3%</td>
<td>76.2%</td>
</tr>
<tr>
<td>Retail</td>
<td>69.1%</td>
<td>68.8%</td>
<td>80.9%</td>
</tr>
<tr>
<td>Legal</td>
<td>54.7%</td>
<td>68.4%</td>
<td>94.0%</td>
</tr>
<tr>
<td>Social</td>
<td>68.6%</td>
<td>79.4%</td>
<td>86.0%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>72.0%</td>
<td>80.0%</td>
<td>83.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72.2%</strong></td>
<td><strong>67.0%</strong></td>
<td><strong>86.7%</strong></td>
</tr>
</tbody>
</table>

Source: Calculated from U.S. Bureau of the Census, 1990

Table 4: Metro/Nonmetro Earnings Ratios

High-level business and professional services are concentrated in the collar counties and Chicago while the nonmetropolitan operations concentrate on more routine functions. Thus, nonmetropolitan firms require less-skilled employees and pay lower salaries (Testa 1992).

**Occupational Structure of Business and Professional Services**

To facilitate the analysis of occupational structure, business and professional service jobs were divided into four occupational categories, managerial and professional; technical, sales and clerical; service; and blue collar. Those business and professional service employees engaged in managerial and professional occupations are skilled and well-paid, (e.g. CEOs or electrical engineers.) Technical, sales and clerical employees are engaged in more routine tasks such as sales representatives or data entry operators. Service workers are janitors, maids or security personnel. Blue collar occupations within business and professional services are office machine repair personnel, locksmiths or machine operators.

Statewide, 34.0 percent of business and professional service workers were in managerial and professional occupations (table 5), with the highest proportion of these workers found in Chicago (40.2 percent) and the collar counties (40.1 percent). Managerial and professional workers average roughly the same earnings in both Chicago and the collar counties, with annual median salaries in excess of $30,000 (Table 5). Clearly, business and professional services provide highly paid employment opportunities for the urban workforce.

In contrast, only 16.4 percent of business and professional service workers in nonmetropolitan PUMAs were in the managerial and professional occupations. Moreover, with annual median earnings of $19,578, nonmetropolitan managerial and professional workers had annual median earnings almost 35 percent lower than those in Chicago.

The proportion of technical, sales and clerical workers varied little among Chicago,
<table>
<thead>
<tr>
<th></th>
<th>number of workers in sample</th>
<th>% of business &amp; professional services employment</th>
<th>median AWSIBP, 1990</th>
<th>Mean AWSIBP, 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chicago</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managerial &amp; professional</td>
<td>1,861</td>
<td>40.18%</td>
<td>$30,000.00</td>
<td>$33,349.92</td>
</tr>
<tr>
<td>technical, sales &amp; clerical</td>
<td>1,568</td>
<td>33.85%</td>
<td>$20,000.00</td>
<td>$22,915.90</td>
</tr>
<tr>
<td>service</td>
<td>436</td>
<td>9.41%</td>
<td>$13,866.67</td>
<td>$16,180.15</td>
</tr>
<tr>
<td>blue collar</td>
<td>767</td>
<td>16.56%</td>
<td>$18,000.00</td>
<td>$20,326.43</td>
</tr>
<tr>
<td><strong>Total (Chicago)</strong></td>
<td>4,832</td>
<td>100.00%</td>
<td>$22,171.46</td>
<td>$25,962.10</td>
</tr>
<tr>
<td><strong>collar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managerial &amp; professional</td>
<td>1,429</td>
<td>40.08%</td>
<td>$33,600.00</td>
<td>$36,683.69</td>
</tr>
<tr>
<td>technical, sales &amp; clerical</td>
<td>1,248</td>
<td>35.01%</td>
<td>$20,444.44</td>
<td>$24,635.38</td>
</tr>
<tr>
<td>service</td>
<td>311</td>
<td>8.72%</td>
<td>$13,000.00</td>
<td>$16,839.43</td>
</tr>
<tr>
<td>blue collar</td>
<td>577</td>
<td>16.19%</td>
<td>$20,000.00</td>
<td>$22,828.65</td>
</tr>
<tr>
<td><strong>Total (collar)</strong></td>
<td>3,585</td>
<td>100.00%</td>
<td>$24,151.20</td>
<td>$28,495.57</td>
</tr>
<tr>
<td><strong>small metro</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managerial &amp; professional</td>
<td>406</td>
<td>27.04%</td>
<td>$24,152.00</td>
<td>$27,271.24</td>
</tr>
<tr>
<td>technical, sales &amp; clerical</td>
<td>624</td>
<td>34.02%</td>
<td>$14,285.71</td>
<td>$17,559.55</td>
</tr>
<tr>
<td>service</td>
<td>289</td>
<td>14.67%</td>
<td>$10,954.67</td>
<td>$14,147.96</td>
</tr>
<tr>
<td>blue collar</td>
<td>445</td>
<td>24.26%</td>
<td>$14,444.44</td>
<td>$16,880.95</td>
</tr>
<tr>
<td><strong>Total (small metro)</strong></td>
<td>1,834</td>
<td>100.00%</td>
<td>$13,042.85</td>
<td>$19,445.09</td>
</tr>
<tr>
<td><strong>nonmetro</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managerial &amp; professional</td>
<td>346</td>
<td>16.37%</td>
<td>$19,577.78</td>
<td>$22,343.23</td>
</tr>
<tr>
<td>technical, sales &amp; clerical</td>
<td>562</td>
<td>26.60%</td>
<td>$12,422.22</td>
<td>$15,046.14</td>
</tr>
<tr>
<td>service</td>
<td>418</td>
<td>19.78%</td>
<td>$11,557.28</td>
<td>$14,563.48</td>
</tr>
<tr>
<td>blue collar</td>
<td>787</td>
<td>37.25%</td>
<td>$13,551.00</td>
<td>$16,187.77</td>
</tr>
<tr>
<td><strong>Total (nonmetro)</strong></td>
<td>2,113</td>
<td>100.00%</td>
<td>$13,042.85</td>
<td>$16,592.25</td>
</tr>
<tr>
<td><strong>state</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managerial &amp; professional</td>
<td>4,132</td>
<td>34.03%</td>
<td>$29,865.33</td>
<td>$32,951.36</td>
</tr>
<tr>
<td>technical, sales &amp; clerical</td>
<td>4,002</td>
<td>32.95%</td>
<td>$18,181.82</td>
<td>$21,584.05</td>
</tr>
<tr>
<td>service</td>
<td>1,434</td>
<td>11.81%</td>
<td>$12,480.00</td>
<td>$15,487.15</td>
</tr>
<tr>
<td>blue collar</td>
<td>2,576</td>
<td>21.21%</td>
<td>$16,098.36</td>
<td>$19,227.40</td>
</tr>
<tr>
<td><strong>Total (state)</strong></td>
<td>12,144</td>
<td>100.00%</td>
<td>$20,000.00</td>
<td>$24,263.53</td>
</tr>
</tbody>
</table>


Table 5: Occupational Structure and Median Annual Wages for Business and Professional Service Workers in Illinois, 1990

collar and smaller metropolitan areas. In each this occupational group accounted for a little more than a third of the business and professional workforce. The annual median earnings of this group, as expected, were less than those of the managerial and professional occupations. In the collar counties, technical, sales and clerical workers had annual median earnings of $20,444 or 39 percent less than managerial and professional employees. Nonmetropolitan business and professional service firms employed a smaller proportion of technical, sales and clerical workers (26.6 percent), however, the earnings gap is similar to the other regions (37 percent lower than managerial and professional occupations).

In Chicago and the collar counties, service occupations made up less than 10 percent of
the jobs in business and professional services. However, almost 20 percent of the nonmetropolitan business and professional service workers were employed in service occupations.

Blue collar occupations accounted for only 16 percent of those employed in business and professional services in Chicago and the collar counties. However, in nonmetropolitan counties this was the largest occupational segment in business and professional services, accounting for over 37 percent of these jobs. These jobs had extremely low wages, with median annual earnings of just $13,551. It appears that most of the difference between the business and professional services sector in nonmetropolitan counties and in other areas was occupational structure.

Our findings indicate that nonmetro business and professional service workers have lower earnings than those in metro areas and that many nonmetro workers earn annual incomes that put them below the poverty line. Furthermore, in contrast to business and professional services in metro locations, the occupational structure of this sector in rural areas primarily consists of low skill occupations. These results mirror those of others (e.g. Tickamyer 1992; Gorham 1993); many studies have found that there is a significant and growing metro/nonmetro wage gap. Will the continued growth of producer services ameliorate or exacerbate the problem? To address that question, we now turn to some comparisons among sectors in nonmetro Illinois.

Nonmetro Comparisons: Producer Service Workers in Context

Although metro/nonmetro comparisons are interesting and important, also relevant are comparisons among the types of nonmetro employment. How do nonmetro producer service workers fare compared to other nonmetro residents? Clearly the best jobs in nonmetro locations are found in manufacturing, where the median annual earnings of $19,136 are 23 percent over the overall nonmetro median. By comparison, nonmetro business and professional service workers had lower earnings than nonmetro workers in general with annual wages of just 84 percent of the nonmetro median. Certainly, priority should be placed on retaining existing manufacturing jobs.

Even though business and professional service workers fare poorly in contrast with those in manufacturing, they do rather well in comparison to retail, personal and social services employees. For example, nonmetro retail sector workers had annual median earnings of just $10,083.22; 23 percent lower than the earnings among those holding jobs in the rural business and professional service sector. These findings indicate that although employment in business and professional services is not comparable to the manufacturing sector it is considerably better than other nonmetro service jobs. Therefore, while we mourn the loss of manufacturing jobs, growth in business and professional services is a better alternative than expansion of the retail sector.

DISCUSSION

This paper was intended to indicate the potential and problems in linking nonmetropolitan development to the growing producer services sector. The results indicate that there is considerable potential for nonmetropolitan areas to gain jobs in this sector. There has been employment growth in business and professional services throughout Illinois, with the fastest growth rates found in the collar and nonmetropolitan locations. The location quotients indicate that there has been some decentralization of employment in business and professional services in particular from the collar counties and into the nonmetropolitan counties.

However, there is no guarantee that increased employment in business and professional services will necessarily provide high-quality employment opportunities for the nonmetropolitan population (Kassab and Luloff 1993). There is a variety of occupational groups, and therefore a variety of skill and wage levels, involved in business and professional services. It is clear from this paper that the occupational structure of business and professional services in nonmetropolitan areas
is quite different from that in urban Illinois. Nonmetropolitan counties are dominated by employment in the lower skilled categories of service and blue collar jobs, these occupations have significantly lower wages than the managerial and technical/sales/clerical occupations that dominate in the urban areas. Thus, growth of business and professional services employment in the nonmetropolitan areas may not be as beneficial to the population of these areas as we might expect. In fact, the growth of business and professional services in these areas may only be reinforcing the traditional low-wage economy of the nonmetropolitan areas.

The reasons for the differential structure can only be inferred. It is possible that the declining manufacturing base in nonmetropolitan areas has removed some of the impetus for the growth of higher-level service occupations. At the same time, with the expansion of high technology communications and information systems it is easier for those manufacturing concerns that have survived to obtain their high-level services from metropolitan areas. The growth in nonmetropolitan areas is then explained by the expansion of lower level employment opportunities with producer service firms in the metropolitan areas using these same advanced communications systems to unbundle their low level activities to rural areas.

Even within occupational categories there are wage differences between metropolitan and nonmetropolitan areas - this study shows clearly that nonmetropolitan populations receive lower wages within the categories of business and professional services occupations. However, it cannot be determined from this study whether that wage differential is a result of structural factors within the population, factors such as education levels and gender composition of the workforce; or whether it is a result of different proportions of employment in occupations within the broad groups of occupations examined here.

However, our findings do indicate that wages among nonmetro business and professional services workers are higher than in many other nonmetro service industries. Furthermore, the local availability of business and professional services such as advertising, computer programming or accounting may significantly improve the competitiveness of other local firms. Therefore, we would argue that policies that seek to foster the growth of local business and professional service firms, provided that they are carefully targeted, may prove beneficial.
REFERENCES


METRO-NONMETRO COMPARISONS OF SATISFACTION IN THE RURAL-URBAN FRINGE SOUTHERN ONTARIO

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Department of Humanities
Rural Research Centre
Nova Scotia Agricultural College
Truro, Nova Scotia

The purpose of this paper is to present a preliminary discussion of comparative research assessing resident satisfaction with life and community in contrasting rural-urban fringe areas in Southern Ontario. The focus is on a comparison of responses from surveys undertaken in the fringe northwest of Toronto and in the rural-urban fringe of Peterborough, representing metropolitan and nonmetropolitan regions respectively. The analysis concentrates on descriptive accounts of satisfaction with life and community in the two regions, including comparative mean satisfaction scores, and models of life and community satisfaction. The results are interpreted in light of the hypothesis that a metropolitan effect contributes to metropolitan-nonmetropolitan differences, that is, that the scale of life in the metropolitan region makes both positive and negative contributions to life in the metropolitan fringe. At the same time, similarities between the two regions reflect the notion that life on the fringe, regardless of scale, is a satisfactory experience for most fringe residents.

INTRODUCTION

Current research on satisfaction in the rural-urban fringe emphasizes individual assessments of life and community in the fringe environment. This research contributes toward a better understanding of the social geography of the rural-urban fringe and approaches questions such as What does it mean to live on the fringe of an urban place? Are there differences in satisfactions between those who live on the fringe of a major metropolitan area compared to those who live on the outskirts of a smaller city? and What are the major contributors to satisfaction with life and community in the rural-urban fringe? This paper represents a preliminary discussion of these concerns based on research undertaken in the metropolitan Greater Toronto Area and in the nonmetropolitan Peterborough urban region.

This discussion is part of a larger research program which explores three main themes a) satisfaction with life and community in urban regions (Beasley 1988; Beasley and Macintosh 1994; Beasley and Walker 1990a; Macintosh and Beasley 1993); b) local community issues in rural-urban fringe areas (Beasley, 1994b; Beasley and Walker 1990b); and c) the growth of the elderly population in rural and urban fringe environments (in planned and naturally occurring retirement communities) (Beasley 1989; Beasley, Bowles and Johnston 1993; Bowles, Beasley and Johnston 1994). The larger conceptual context for this work is associated with understanding change in the countryside, in near urban and in more rural locations, and incorporates social and land use considerations and analyses (Beasley 1991a, 1991b, 1993, 1994a; Beasley and Bowles 1991, 1993; Beasley and Russwurm 1989; Bowles and Beasley 1991; Walker 1994).

STUDY AREAS AND METHODOLOGY

Study Areas

The areas under study are parts of the rural-urban fringe of Metropolitan Toronto and the City of Peterborough. The Toronto fringe area includes the Oak Ridges Moraine, the
### Table 1a: Life Satisfaction, Rural-Urban Fringe of Metropolitan Toronto

<table>
<thead>
<tr>
<th>Satisfaction With:</th>
<th>Completely Dissatisfied</th>
<th>Neutral</th>
<th>Completely Satisfied</th>
<th>Standard</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life as a Whole</td>
<td>0.2</td>
<td>1.1</td>
<td>2.5</td>
<td>16.5</td>
<td>39.1</td>
<td>20.0</td>
<td>608</td>
</tr>
<tr>
<td>Standard of Living</td>
<td>0.2</td>
<td>1.8</td>
<td>3.1</td>
<td>9.2</td>
<td>20.1</td>
<td>20.1</td>
<td>608</td>
</tr>
<tr>
<td>Financial Security</td>
<td>1.2</td>
<td>2.7</td>
<td>4.8</td>
<td>13.0</td>
<td>25.0</td>
<td>33.0</td>
<td>600</td>
</tr>
<tr>
<td>Job</td>
<td>3.5</td>
<td>2.2</td>
<td>5.2</td>
<td>16.0</td>
<td>20.0</td>
<td>24.8</td>
<td>536</td>
</tr>
<tr>
<td>Personal Income</td>
<td>2.6</td>
<td>4.0</td>
<td>6.0</td>
<td>17.1</td>
<td>24.8</td>
<td>26.2</td>
<td>568</td>
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<tr>
<td>Housing</td>
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<td>2.0</td>
<td>2.3</td>
<td>8.2</td>
<td>16.8</td>
<td>32.5</td>
<td>607</td>
</tr>
<tr>
<td>Local Community</td>
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<td>1.3</td>
<td>2.6</td>
<td>9.7</td>
<td>20.2</td>
<td>41.5</td>
<td>910</td>
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<tr>
<td>Own Health</td>
<td>1.5</td>
<td>2.5</td>
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<td>9.2</td>
<td>10.8</td>
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<tr>
<td>Family Life</td>
<td>0.7</td>
<td>1.6</td>
<td>1.3</td>
<td>4.6</td>
<td>11.8</td>
<td>33.7</td>
<td>608</td>
</tr>
<tr>
<td>Spare Time Activities</td>
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<td>3.6</td>
<td>5.3</td>
<td>15.2</td>
<td>18.3</td>
<td>26.7</td>
<td>605</td>
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<tr>
<td>Friends</td>
<td>1.3</td>
<td>1.8</td>
<td>1.3</td>
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<td>14.3</td>
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<td>609</td>
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<td>Independence</td>
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<td>1.8</td>
<td>3.8</td>
<td>8.1</td>
<td>13.9</td>
<td>29.8</td>
<td>605</td>
</tr>
</tbody>
</table>

### Table 1b: Life Satisfaction, Rural-Urban Fringe of Peterborough

Albion Hills, the Peel Plain, and the Town of Woodbridge, all to the northwest of Metropolitan Toronto. In this study area a total of 610 interviews were collected, largely from people resident in nucleated settlements (e.g. Bolton, Nobleton, Palgrave, and Woodbridge). In the Peterborough fringe a total of 232 interviews were gathered from a series of nucleated community areas north and west of the city (i.e., the Village of Lakefield, Bridgenorth, Fife's Bay, Woodland Acres).

Methodology

Data were gathered through face-to-face interviews with fringe residents, and response rates were high (in excess of 80%). Sampling was spatially stratified and used a random cluster approach. Overall, there is confidence that the data sets are reasonably accurate representations of the study areas.

The interview questionnaire consists of three main parts. First, is a section dealing with housing and residential history. The next section asks about satisfaction with life and community. Satisfaction is measured using a seven point scale where 1 = completely dissatisfied, 4 = neutral or equally satisfied and dissatisfied and 7 = completely satisfied. This scale is used for a global measure (life as a whole) and eleven major life elements or domains, and for nineteen community focused elements. The third section of the questionnaire collects information on demographic and socioeconomic variables.

Analysis emphasizes descriptive assessments of life and community satisfaction scores within the two study areas, and multiple regression models which examine life and community...
satisfaction. Conclusions focus on the patterns of life and community satisfaction, and policy implications emerging from the research.

RESEARCH FINDINGS

Descriptive Assessment of Life Satisfaction

Empirical patterns of life satisfaction are presented in Tables 1A and 1B, and summarized in Figure 1. In general, several patterns are identifiable. First, overall life satisfaction is strong, few are particularly dissatisfied with life as a whole or the domains of life in either of the Toronto or Peterborough fringe areas. Secondly, satisfaction is lowest for the more economic domains (financial security, job, and personal income), while it is highest for the personal social domains of family life, friends, independence and own health. These patterns are consistent with much of the life satisfaction literature, and are largely related to the presence/absence of an individually comparable metric (e.g. average income) (Beesley 1985, 1988; Beesley and Macintosh 1994; Beesley and Russwurm 1989; Filson and McCoy 1993; Pacione 1980, 1982). Thirdly, respondents from the Toronto fringe were slightly more satisfied than the Peterborough fringe respondents along six domains, i.e. the more economic and environmental domains. However, the Peterborough fringe residents were more satisfied on three of the personal/social domains (Figure 1). This finding is consistent with the notion that the metropolitan area offers a higher standard of living and a stronger economic environment, while the smaller urban region allows individuals to focus more of their lives on personal and social activities (Beesley 1988; Bowles and Beesley 1991; Macintosh and Beesley 1993).

Descriptive Assessment of Community Satisfaction

Community satisfaction results are displayed in Tables 2A and 2B, and summarized in Figure 2. In this case there is more variability in the satisfaction scores, indeed there is genuine dissatisfaction evident for a few of the community satisfaction elements. Satisfaction levels are high in both study areas for three elements, i.e. the community as a place to live, the community as a place to raise children, and people seen socially. These have been consistent contributors in recent satisfaction studies (Beesley and Macintosh 1994; Macintosh and Beesley 1993), and serve to exemplify common social ties found in communities. Low scores in both areas include local government activity, local taxes, and services received for local taxes. Residents in the Toronto fringe remain generally satisfied with two of these low scores registering in the low range of 'satisfied'. Only 'local taxes' had a mean score below 4.0 (out of 7.0) in the Toronto fringe. However, the nonmetropolitan residents of Peterborough were dissatisfied with local taxes, services received for local taxes, road maintenance services and local government activity. Relative dissatisfaction with the activities of local government and taxes consistently appear in studies of community satisfaction (Beesley and Macintosh 1994; Macintosh and Beesley 1993).

In the Toronto fringe community satisfaction scores were higher along thirteen of the nineteen measures used, including for six of the nine direct service measures. In the Peterborough fringe, respondents articulated a higher level of satisfaction along five community elements, especially for goods and services available and ease of getting around (Figure 2). These findings provide some evidence in support of the idea that smaller urban regions are generally more manageable for the individual resident, while larger urban regions have more resources available for the provision of services and facilities (Beesley, 1994b; Joseph and Smit, 1983, 1985).

The Domain to Whole Life Model

The domain to whole life model, operationalized through multiple regression, serves two main purposes a) it identifies those major domains of life which are important contributors to satisfaction with life as a whole, and b) it
### Table 2a: Community Satisfaction, Rural-Urban Fringe of Metropolitan Toronto

<table>
<thead>
<tr>
<th>Satisfaction With:</th>
<th>Completely Dissatisfied</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Neutral</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Completely Satisfied</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Skewness</th>
</tr>
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<td>Community as a Place to Live</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>7.02</td>
<td>16.2</td>
<td>40.3</td>
<td>32.0</td>
<td>610</td>
<td>5.6</td>
<td>1.2</td>
<td>-1.5</td>
<td></td>
</tr>
<tr>
<td>Goods and Services Here</td>
<td>2.6</td>
<td>6.9</td>
<td>11.8</td>
<td>17.9</td>
<td>25.0</td>
<td>22.0</td>
<td>13.8</td>
<td>629</td>
<td>4.8</td>
<td>1.6</td>
<td>-0.4</td>
<td></td>
<td></td>
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<tr>
<td>Ease of Getting Around</td>
<td>5.9</td>
<td>9.4</td>
<td>10.6</td>
<td>17.3</td>
<td>19.1</td>
<td>20.5</td>
<td>17.2</td>
<td>609</td>
<td>4.6</td>
<td>1.8</td>
<td>-0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People in the Community</td>
<td>0.8</td>
<td>1.2</td>
<td>2.6</td>
<td>10.7</td>
<td>23.2</td>
<td>40.6</td>
<td>20.7</td>
<td>608</td>
<td>5.6</td>
<td>1.2</td>
<td>-1.1</td>
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<tr>
<td>Local Government Activity</td>
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<td>10.6</td>
<td>20.9</td>
<td>24.2</td>
<td>14.8</td>
<td>4.0</td>
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<td>4.2</td>
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<td>-0.4</td>
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<tr>
<td>Community as a Place to Raise Children</td>
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<td>8.0</td>
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<tr>
<td>People Seen Socially</td>
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<td>2.0</td>
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<td>8.6</td>
<td>21.2</td>
<td>35.5</td>
<td>29.6</td>
<td>605</td>
<td>5.7</td>
<td>1.3</td>
<td>-1.4</td>
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<tr>
<td>Local Taxes</td>
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<td>12.2</td>
<td>12.5</td>
<td>27.9</td>
<td>18.5</td>
<td>11.7</td>
<td>5.8</td>
<td>691</td>
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<td>n.e</td>
<td>-0.1</td>
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<tr>
<td>Schools In the Area</td>
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<td>20.3</td>
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<td>17.5</td>
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<td>27.0</td>
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<td>600</td>
<td>5.2</td>
<td>1.5</td>
<td>-0.7</td>
<td></td>
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<tr>
<td>Fire Protection Services</td>
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<td>1.7</td>
<td>4.3</td>
<td>14.8</td>
<td>18.0</td>
<td>30.2</td>
<td>29.6</td>
<td>596</td>
<td>5.6</td>
<td>1.3</td>
<td>-0.8</td>
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<td></td>
</tr>
<tr>
<td>Medical Services and Facilities</td>
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<td>6.3</td>
<td>8.1</td>
<td>17.2</td>
<td>22.7</td>
<td>18.6</td>
<td>21.6</td>
<td>603</td>
<td>4.9</td>
<td>1.7</td>
<td>-0.6</td>
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<tr>
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<td>5.0</td>
<td>15.0</td>
<td>30.3</td>
<td>51.3</td>
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<td>3.5</td>
<td>3.6</td>
<td>10.5</td>
<td>15.0</td>
<td>31.6</td>
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<td>1.6</td>
<td>-1.3</td>
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<tr>
<td>Road Maintenance Services</td>
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<td>9.1</td>
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<td>18.0</td>
<td>27.7</td>
<td>19.5</td>
<td>608</td>
<td>5.0</td>
<td>1.7</td>
<td>-0.7</td>
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<tr>
<td>Recreational Services and Facilities</td>
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<td>4.5</td>
<td>7.5</td>
<td>21.1</td>
<td>21.5</td>
<td>25.8</td>
<td>16.8</td>
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<td>5.0</td>
<td>1.5</td>
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<td></td>
</tr>
<tr>
<td>Cultural Services and Facilities</td>
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<td>8.0</td>
<td>9.4</td>
<td>31.1</td>
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<td>17.8</td>
<td>9.9</td>
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<td>4.5</td>
<td>1.5</td>
<td>-0.2</td>
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</tr>
<tr>
<td>Overall Quality of Local Services</td>
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<td>20.3</td>
<td>26.0</td>
<td>28.2</td>
<td>11.8</td>
<td>600</td>
<td>5.0</td>
<td>1.3</td>
<td>-0.6</td>
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<td></td>
</tr>
<tr>
<td>Services Received for Local Taxes</td>
<td>7.5</td>
<td>9.5</td>
<td>12.2</td>
<td>23.1</td>
<td>23.6</td>
<td>16.6</td>
<td>7.5</td>
<td>569</td>
<td>4.3</td>
<td>1.6</td>
<td>-0.3</td>
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### Table 2b: Community Satisfaction, Rural-Urban Fringe of Peterborough

'explains' some proportion of the variance in satisfaction with life as a whole. For each area the domain to whole life model operates with satisfaction with life as a whole as the independent variable and the measures for the eleven domains of life serve as independent variables (Pacione 1980, 1982). The community satisfaction model uses satisfaction with one's community as a place to live as the dependent variable and the eighteen community based measures as independent variables.

The findings for the two study areas are quite similar (Table 3). In each case three domains emerge as important contributors to satisfaction with life as a whole: standard of living, family life and local community. Further, in each case the R-squared value indicates that about 50% of the variance is explained, a finding consistent with much research on life satisfaction (Andrews and Withey 1976; Campbell 1981; Beesley 1988; Beesley and Russwurm 1989; Pacione 1980, 1982). In the Greater Toronto Area, however, standard of living ranks as the most important contributor, followed by family life and then local community. In the Peterborough fringe standard of living is tied with local community for importance, followed by family life and financial security. Thus, it can be suggested that in the metropolitan region economic concerns are paramount while in the smaller urban region there is relatively more influence attributed to the local community environment (Beesley 1988; Beesley, Bowles and Johnson 1993).

The Community Satisfaction Model

The community satisfaction model, also a multiple regression model, uses satisfaction
<table>
<thead>
<tr>
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<th>Rural-Urban Fringe of</th>
<th>Rural-Urban Fringe of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metropolitan Toronto</td>
<td>Peterborough</td>
</tr>
<tr>
<td>Beta</td>
<td>(t)</td>
<td>Beta</td>
</tr>
<tr>
<td>Standard of Living</td>
<td>0.345</td>
<td>(6.753) ***</td>
</tr>
<tr>
<td>Financial Security</td>
<td>0.039</td>
<td>(0.747)</td>
</tr>
<tr>
<td>Job</td>
<td>0.086</td>
<td>(1.940)</td>
</tr>
<tr>
<td>Personal Income</td>
<td>-0.082</td>
<td>(1.667)</td>
</tr>
<tr>
<td>Housing</td>
<td>0.006</td>
<td>(0.133)</td>
</tr>
<tr>
<td>Local Community</td>
<td>0.113</td>
<td>(2.739) **</td>
</tr>
<tr>
<td>Own Health</td>
<td>0.003</td>
<td>(0.081)</td>
</tr>
<tr>
<td>Family Life</td>
<td>0.259</td>
<td>(5.899) ***</td>
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<tr>
<td>Spare Time Activities</td>
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<td>(1.038)</td>
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<td>Friends</td>
<td>0.021</td>
<td>(0.474)</td>
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<tr>
<td>Independence</td>
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</tr>
<tr>
<td>Constant</td>
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</tr>
<tr>
<td>R</td>
<td>0.693</td>
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</tr>
<tr>
<td>R-squared</td>
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<tr>
<td>F</td>
<td>42.643 ***</td>
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*p<.05; **p<.01; ***p<.001

Table 3: Domain To Whole Life Model

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<tr>
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<th>Rural-Urban Fringe of</th>
<th>Rural-Urban Fringe of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metropolitan Toronto</td>
<td>Peterborough</td>
</tr>
<tr>
<td>Beta</td>
<td>(t)</td>
<td>Beta</td>
</tr>
<tr>
<td>Goods and Services</td>
<td>0.174</td>
<td>(3.518) ***</td>
</tr>
<tr>
<td>Ease of Getting Around</td>
<td>-0.022</td>
<td>(0.046)</td>
</tr>
<tr>
<td>People in the Community</td>
<td>0.385</td>
<td>(6.832) ***</td>
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<td>Local Government Activity</td>
<td>-0.008</td>
<td>(0.203)</td>
</tr>
<tr>
<td>Community as a Place to Raise Children</td>
<td>0.273</td>
<td>(5.581) ***</td>
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<td>People Seen Socially</td>
<td>0.169</td>
<td>(4.236) ***</td>
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<td>Local Taxes</td>
<td>0.002</td>
<td>(0.054)</td>
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<td>Schools in the Area</td>
<td>0.022</td>
<td>(0.529)</td>
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<td>Fire Protection Services</td>
<td>-0.105</td>
<td>(2.379) *</td>
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<td>Medical Services and Facilities</td>
<td>-0.059</td>
<td>(1.427)</td>
</tr>
<tr>
<td>Welfare Services</td>
<td>-0.003</td>
<td>(0.234)</td>
</tr>
<tr>
<td>Garbage Disposal Services</td>
<td>0.033</td>
<td>(0.762)</td>
</tr>
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<td>Road Maintenance Services</td>
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<td>(1.307)</td>
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<td>Recreational Services and Facilities</td>
<td>0.146</td>
<td>(3.217) **</td>
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<td>Cultural Services and Facilities</td>
<td>-0.079</td>
<td>(1.806)</td>
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<tr>
<td>Overall Quality of Local Services</td>
<td>0.111</td>
<td>(2.089) *</td>
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<td>-0.063</td>
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<tr>
<td>R</td>
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<tr>
<td>R-squared</td>
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</tr>
<tr>
<td>F</td>
<td>29.921 ***</td>
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</table>

*p<.05; **p<.01; ***p<.001

Table 4: Community Satisfaction Model

CONCLUSIONS

In conclusion, it is evident that there are patterns to life satisfaction in rural-urban fringe areas. These patterns emphasize the importance of economic, social, personal, and environmental domains, where economic concerns are evidently more important in the metropolitan fringe and environmental concerns (local community) are of greater importance in the smaller nonmetropolitan urban region. Satisfaction is generally higher for those domains of life for which there does not exist a strong measure for comparison, and thus lower levels of satisfaction are found for the more economic domains.

Community satisfaction is characterized by higher satisfaction levels for the more socially defined community elements, and low satisfaction levels for local government and tax related variables. Clearly the goods and services available to residents of fringe localities play an important role in evaluations of the community as a place to live. At the same time, especially in the metropolitan fringe, social elements are also important. Some evidence is available to suggest that local municipalities can have an influence on satisfaction with community as a place to live, i.e. through supporting improvements to the quality of local services and facilities. Local policy, however, must be geared toward meeting local needs, and local needs vary from place to place. Thus, detailed research of this nature can contribute to local policy development in an effective way by allowing for direct input from residents to the policy making process.

Finally, life in the rural-urban fringe is not simply a matter of satisfaction with various elements of life and community rather it is a complex web of interrelated and interdependent connections between urban and rural, the individual and society, environment and economy. It is within this broader context which locality studies — urban, rural, and fringe — can contribute not only to a better understanding of change, but also to a direction for change. Insofar as it is incumbent on the researcher to add to knowledge, so is it appropriate to

influence positive developments within social and spatial contexts.

ACKNOWLEDGEMENTS

I want to acknowledge the financial support of the Social Science and Humanities Research Council of Canada, the Frost Centre for Canadian Heritage and Development Studies (Trent University), and the Committee on Research (SSHRC) (Trent University). Valuable support for this research has also been received from Dr. Gerald Walker (York University), Dr. Roy Bowles (Trent University), and Pamela J. Macintosh (NSAC), all of whom have served as collaborators in this research program. Research assistance was provided by Ms. Anita Frank, to whom I express my sincere thanks.

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WORKING FOR THE WAR EFFORT: WOMEN AND MANUFACTURING INDUSTRY IN ONTARIO, 1939-1945

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University of Guelph 
Guelph, Ontario N1G 2W1

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McMaster University 
Hamilton, Ontario L8S 4L8

World War II was a defining period in the employment of women in manufacturing industry. In Ontario the number of women wage-earners more than doubled between 1939 and 1942 and increased further to a peak in 1944. Many traditional barriers were temporarily dismantled in the quest for more workers in the factories. The mobilization of women made a vital contribution to the war industries producing aircraft, guns and munitions. Life cycles for these industries are developed at the sectoral and community levels. In a case study of de Havilland aircraft, oral histories are used to give a sense of women’s work at the plant scale. The longer-term implications for women’s work in industry are outlined.

INTRODUCTION

Ontario industry was transformed by the war. Existing businesses, devastated by the Depression, were revitalized and the manufacture of new products such as aircraft, munitions and synthetic rubber was established on a substantial scale. The multiplier effects of war demand permeated into practically every branch of manufacturing activity. In mobilizing resources for total war, the state assumed new powers of direction in organizing production and the supply of labour (Bothwell, 1981). New industrial complexes were built, many of them owned and managed by federal crown corporations. Many work patterns for men and women were altered, lives were changed, and new landscapes were created. While many of the effects were temporary shifts which lasted only for the duration of the war, others had a longer influence in shaping the province after 1945.

The overwhelming demand for labour during World War II gave a new emphasis to the role of women in manufacturing. From 1941 until the end of the war, women were actively recruited for factory employment. Research in the past two decades has not only rediscovered the significance of the war period but has also added new perspectives on women and work (Phillips and Phillips, 1993). This paper has two objectives. The first is to interpret elements of the regional middle-ground, largely overlooked in the national generalizations (Pierson, 1983, 1986) and the detailed case studies of particular war industries (Judge, 1984) and industrial communities in wartime (Milson, 1994; Scheinberg, 1994). Reports of the Dominion Bureau of Statistics are used to illustrate the scale and nature of women wage-earners in Ontario manufacturing industry, first at the provincial level and then by sector of industry. Wartime change in women’s employment is also explored in relation to selected industrial communities. Oral histories from interviews with former employees at the de Havilland aircraft factory in Toronto are used to provide a perspective on women’s war work at the plant scale.

A second objective is to highlight the role of war in creating new industrial space and new geographies. Cunningham (1951) described the very intense life cycle of the U.S. aircraft industry during World War II, and recent historical atlases have provided an added sense of the spatial dimensions of the war effort on the home front (Garrett, 1988, 152-
163; Sharpe and Marks, 1990, Plate 48). For Midwestern cities, earlier fears of industrial decline were forgotten as war contracts brought renewed prosperity (Teaford, 1993, 186). Processes of urbanization and suburbanization were heightened during the wartime boom (Lottin, 1984, 224-225). One consequence of the huge arsenals built on the urban periphery, distant from existing residential areas and public transit, was a lengthening of the journey-to-work. Despite the restrictions on fuel, private cars were a vital mode of transport to and from work. Wider use of the automobile and trucks often required the construction of new expressways. Such highways and the development of mass-produced emergency housing laid the foundations for large-scale suburban expansion after the war (Fairbanks and Miller, 1984; Carr and Stermer, 1977). Wartime suburbanization of industry in Ontario is examined in relation to Toronto and its suburbs, a region which had the largest concentration of war industries.

WOMEN AND WARTIME INDUSTRY

In the mobilization of the labour force, women were hired to do "men's work" during World War II on a scale unprecedented before or since (Milkman, 1987). Their contribution included a greater participation in manufacturing industry as well as in a greatly expanded voluntary sector (Piersen, 1983, 1986). While there was a substantial increase in the number of women working in factories, detailed studies of the occupations within various types of factories have also shown that the gendered division of labour did not disappear but was only temporarily disrupted (Milkman, 1987, Sugiman, 1994). The role of women not only varied between sectors of manufacturing but also from one community to another (Parr, 1990). Scheinberg (1994) contrasts the well-publicized metropolitan images of the "Bren Gun Girl" (Toronto) or the American "Rosie the Riveter" with the limited wartime opportunities for women in the textile mills of Cornwall, Ontario. The war experience for women was, as for men, variable and ambiguous. Some women had to retreat from the industrial environment confused and defeated by a different way of life. Others found the war years a time of exhilaration and achievement (Clive, 1979, 203).

As the war effort intensified and all previous reserves of labour were exhausted, active national recruitment of women began. Young "girls" and single women were the first groups to be targeted, then childless married women and married women with children. Employment of married women with children was most actively encouraged in the larger urban centres where day nurseries, community kitchens and laundries could be provided (Dominion Bureau of Statistics, 1942). Measures to facilitate the needs of working women, such as day care and tax concessions, were however limited to the duration of the war (Pierson, 1986, 22-23). The short duration of women's contribution in replacing men and providing labour for mass production of weapons and munitions gives credence to the "reserve army of labour" theory (Connelly, 1978). From the longer perspective of women's industrial work, most of the jobs were "... temporary, a war-induced aberration" (Phillips and Phillips, 1993, 31).

In many recent studies of women during World War II, the use of oral histories has added new depth about attitudes to work and the range of individual experiences. The significance of work was, for many women, more than mere survival or improving their material conditions; it also provided a special opportunity to prove their competence in a male world (Gluck, 1987, 265). Even if the war experience was only a temporary feature for a generation of women, wartime work was a defining period in their lives. In the extended environments of industrial work, the social and spatial boundaries of women's lives became less circumscribed. Young women from different social and ethnic backgrounds not only worked together but spent recreation time together in company-sponsored clubs (Gluck, 1987, 264). For women workers in the big new plants on the urban periphery, the longer journey-to-work also extended their sense of changing spatial boundaries.

CONVERSION TO A WAR ECONOMY

When Canada declared war against Germany
on 10 September 1939, most industrial indicators still showed levels below the peak set a decade earlier. Over the next five years, the total value of industrial output in Ontario more than doubled, while output in the iron and steel products sector tripled in value.

Industrial production in Canada during World War II had to serve several different and sometimes conflicting demands. The civilian population and armed forces required foodstuffs and basic supplies. Equipping the Canadian military forces was a major task, given the enormous increase in personnel from 9,000 in March 1939 to 790,000 by the end of 1943 (Stacey, 1970). From the beginning of the war, and increasingly after the capitulation of France in June 1940, Canada also served as a distant supply base for the United Kingdom – producing aircraft, guns and munitions in addition to the traditional raw materials. In fulfilling these roles, Canadian industry depended on close relationships with the United States, especially for supplies such as machine tools and aircraft engines and some raw materials like petroleum. When the war production effort was tallied at the end of 1945, about 34 percent of industrial output was used in Canada and by Canadian forces, 53 percent was exported to the UK and other Commonwealth countries, and 12 percent went to the United States (Stacey, 1970, 488).

The transformation of the industrial economy into a war machine depended on a complex of military strategies, material production and labour mobilization policies organized by the federal government. Canada’s important war role, as the “aerodrome of democracy” for the training of air crew, began with the signing of the British Commonwealth Air Training Plan agreement in December 1939 (Hatch, 1983). Fulfilling this plan required the expansion of the aircraft industry and the construction of airfields and training centres in various parts of the country.

Direction of war production was centralized in the Department of Munitions and Supply formed in April 1940. Under the leadership of the Minister, C.D. Howe (M.P. for Port Arthur), the Department controlled material supplies, organized the conversion of civilian plants into war producers, and created new production facilities, many of them under the management of crown corporations (Kennedy, 1950). During the course of the war, the Department invested about $706 million in new plant, of which $369 million was in Ontario (Sharpe and Marks, 1990).

Some military demands could be satisfied by the conversion of existing industrial facilities. Auto manufacturers in Windsor and Oshawa, for example, made military trucks and armoured vehicles, while the Great Lakes shipyards built small naval vessels such as convoy escort ships and minesweepers. For other products such as aircraft, guns and munitions, which were not part of the existing industrial base, small factories had to be expanded and new facilities constructed. Demand for military weapons and explosives created multiplier effects in a whole range of material supplies ranging from copper and brass to rubber and chemicals. New synthetic materials, particularly rubber produced at the Polymer Corporation plant in Sarnia (opened in 1943), made an important contribution to the war effort as traditional sources of supply were closed off. The increasing relationships between science and industry during World War II may be observed in the close collaboration between Munitions and Supply and the National Research Council. Major examples included the radar development work at Research Enterprises Ltd. in Toronto and the secret atomic energy establishments at Chalk River in the Ottawa Valley (Kennedy, 1950).

The National Resource Mobilization Act, passed on 21 June 1940, provided the state with powers to order conscription for military service at home and eventually to direct the civilian labour force. National Registration of all persons, male and female, over 16 years of age, was carried out in August 1940 over a three-day period (Stacey, 1970, 123). Throughout the war period, there were serious conflicts between the demands for military personnel and the requirements for civilian and war industry production. Many new agencies were created in the attempt to resolve the conflicts. The National War Labour Board, established in October 1941, administered wage stabilization policies to curb inflationary pressures and to maintain employment in less
well-paid work which was nevertheless important to the war effort. Full control of the civilian labour market began in March 1942 with the introduction of National Selective Service (Stacey, 1970, 404). All workers were "categorized", labour priorities by firm and industry were set, and full recognition of trade unions was established. Local employment offices became the centres through which most labour transactions were conducted.

WOMEN IN THE ONTARIO WARTIME INDUSTRIAL LABOUR FORCE

Meeting the complex demand for wartime supply required not only a substantial investment in new types of plant but a major increase in the industrial labour force. The number of waged or production workers in Ontario increased from 256,000 in 1939 to a peak of 474,000 in 1943, when virtually all the available labour resources had been tapped (Table 1). Annual net changes in the industrial workforce show different trends for men and women (Figure 1).

Numbers of men in industry expanded substantially in 1940 and 1941 as industry was first revitalized and then expanded. By the end of 1941, the pool of unemployed workers remaining from the Depression had been exhausted. Many of the men taken into industry during 1942 were from other occupations outside manufacturing. For the next two years there was a small net decrease, as mobilization for the Allied campaigns in North Africa and Europe took away some less essential workers.

The trend for women's employment shows a different pattern, with a later peak year (1944) from that for men (1942). In the early years of the war, women tended to join the traditional sectors of female employment. From late 1941, as new munitions plants opened, women were in strong demand to staff the production lines. Active national recruitment of women into the industrial workforce began in 1942, as National Selective Service was introduced (Piersen, 1983). During that year the net increase in women was slightly larger than that for men (Figure 1). The substitution of women for men in other sectors of the economy also helped to release men for essential industrial work and military service. During 1943 and 1944, women contributed the only net increase in the waged industrial labour force. As a result of these changes, the proportion of women in the Ontario industrial labour force increased from 20.9 percent in 1941 (unchanged from 1939), to 25.2 percent in 1942, 28.7 percent in 1943, and a peak of 29.7 percent in 1944.

From 1942 until the end of the war, virtually every employee and employer was affected by state direction. Decisions of federal agencies not only influenced the type of work and the rates of pay but also, very significantly, precisely where people worked. The substantial migration of workers, especially from rural to urban areas, created new stresses in housing accommodation. Wartime Housing Ltd, a crown corporation established in 1941, built hostels and houses at munitions plants and in cities where overcrowding was severe (Wade, 1986). Windsor, where some 2,000 war houses were built, had one of the biggest clusters of wartime housing in the province (Kennedy, 1950, 1, 483).

The recruitment of women slowed down during 1944, as planned production levels were achieved and the end of the war could be predicted. The peak of 139,500 women workers in Ontario manufacturing was not surpassed until 1973. During 1945 and 1946 there was a substantial net decrease in the number of women employed, as war contracts were terminated and men returned from the armed forces to the factories. A sense of women as a "reserve army of labour" is evident from the data (Scheinberg, 1994, 155).

WOMEN'S EMPLOYMENT BY SECTOR OF INDUSTRY

Before the war, women's waged employment in Ontario manufacturing industry was concentrated in four sectors - vegetable products, animal products, textiles and textile products, and wood and paper products (Table 2). These sectors included industries such as footwear, textile yarn and cloth, hosiery and knitted goods, clothing, paper boxes and bags, printing and bookbinding — activities where women's "nimble fingers" and low wages had
<table>
<thead>
<tr>
<th>Year</th>
<th>WOMEN No.</th>
<th>Index No. (1939=100.0)</th>
<th>MEN No.</th>
<th>Index No. (1939=100.0)</th>
<th>TOTAL No.</th>
<th>Index No. (1939=100.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1938</td>
<td>51,157</td>
<td>96.1</td>
<td>199,062</td>
<td>98.3</td>
<td>250,219</td>
<td>97.9</td>
</tr>
<tr>
<td>1939</td>
<td>53,231</td>
<td>100.0</td>
<td>202,399</td>
<td>100.0</td>
<td>255,630</td>
<td>100.0</td>
</tr>
<tr>
<td>1940</td>
<td>61,721</td>
<td>115.9</td>
<td>241,212</td>
<td>119.2</td>
<td>302,933</td>
<td>118.5</td>
</tr>
<tr>
<td>1941</td>
<td>81,031</td>
<td>152.2</td>
<td>306,368</td>
<td>149.9</td>
<td>387,399</td>
<td>151.5</td>
</tr>
<tr>
<td>1942</td>
<td>113,941</td>
<td>214.0</td>
<td>338,862</td>
<td>167.4</td>
<td>452,823</td>
<td>177.1</td>
</tr>
<tr>
<td>1943</td>
<td>136,262</td>
<td>256.0</td>
<td>337,710</td>
<td>166.8</td>
<td>473,972</td>
<td>185.4</td>
</tr>
<tr>
<td>1944</td>
<td>139,511</td>
<td>262.1</td>
<td>330,502</td>
<td>163.3</td>
<td>470,013</td>
<td>183.9</td>
</tr>
<tr>
<td>1945</td>
<td>119,199</td>
<td>223.9</td>
<td>304,570</td>
<td>150.5</td>
<td>423,769</td>
<td>165.8</td>
</tr>
<tr>
<td>1946</td>
<td>97,691</td>
<td>183.5</td>
<td>310,972</td>
<td>153.6</td>
<td>408,663</td>
<td>158.9</td>
</tr>
<tr>
<td>1947</td>
<td>100,170</td>
<td>188.2</td>
<td>342,988</td>
<td>166.5</td>
<td>443,158</td>
<td>173.3</td>
</tr>
<tr>
<td>1948</td>
<td>98,293</td>
<td>186.4</td>
<td>354,044</td>
<td>174.9</td>
<td>453,337</td>
<td>177.3</td>
</tr>
<tr>
<td>1949</td>
<td>97,368</td>
<td>182.9</td>
<td>351,955</td>
<td>173.9</td>
<td>449,323</td>
<td>175.7</td>
</tr>
<tr>
<td>1950</td>
<td>98,443</td>
<td>181.2</td>
<td>355,536</td>
<td>175.7</td>
<td>453,979</td>
<td>176.8</td>
</tr>
</tbody>
</table>

Sources: Compiled from Dominion Bureau of Statistics Cat. Nos. 31-D-26, 31-D-22, 31-206.

**Table 1: Labour Force Change in Ontario Manufacturing Industry 1938-1950**

![Graph showing waged workers in thousands, with a bar for men and a bar for women, indicating an increase and decrease over the years 1939 to 1946.]

**Figure 1: Ontario: Waged Industrial Labour Force Net Change from Previous Year 1939-1946**
Women Wage-earners by sector and selected industries

<table>
<thead>
<tr>
<th>Sector</th>
<th>1939</th>
<th>% of total sector workforce</th>
<th>1944</th>
<th>% of total sector workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable products</td>
<td>10,976</td>
<td>28.3</td>
<td>19,222</td>
<td>36.4</td>
</tr>
<tr>
<td>Animal products</td>
<td>3,781</td>
<td>17.8</td>
<td>7,589</td>
<td>29.6</td>
</tr>
<tr>
<td>Textiles &amp; textile products</td>
<td>23,497</td>
<td>54.5</td>
<td>31,802</td>
<td>62.2</td>
</tr>
<tr>
<td>Wood &amp; paper products</td>
<td>5,423</td>
<td>12.5</td>
<td>12,688</td>
<td>22.5</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td>43,677</td>
<td>29.8</td>
<td>71,201</td>
<td>38.4</td>
</tr>
<tr>
<td>Iron &amp; steel products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Aircraft</td>
<td>2,368</td>
<td>3.7</td>
<td>33,424</td>
<td>18.3</td>
</tr>
<tr>
<td>- Automobiles</td>
<td>145</td>
<td>1.3</td>
<td>296</td>
<td>1.5</td>
</tr>
<tr>
<td>- Automobile parts</td>
<td>1,704</td>
<td>11.2</td>
<td>4,085</td>
<td>23.8</td>
</tr>
<tr>
<td>- Misc. iron &amp; steel products</td>
<td>15</td>
<td>1.5</td>
<td>8,010</td>
<td>39.8</td>
</tr>
<tr>
<td>Non-ferrous metal products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Electrical apparatus</td>
<td>3,580</td>
<td>15.6</td>
<td>18,279</td>
<td>34.0</td>
</tr>
<tr>
<td>- Non-metallic mineral products</td>
<td>2,459</td>
<td>22.9</td>
<td>11,387</td>
<td>43.6</td>
</tr>
<tr>
<td>Chemicals &amp; chemical products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Misc. chemical products</td>
<td>1,627</td>
<td>23.2</td>
<td>8,993</td>
<td>41.6</td>
</tr>
<tr>
<td>- Miscellaneous products</td>
<td>186</td>
<td>23.7</td>
<td>5,266</td>
<td>52.3</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td>9,554</td>
<td>8.7</td>
<td>63,310</td>
<td>22.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>53,231</td>
<td>20.8</td>
<td>139,511</td>
<td>29.7</td>
</tr>
</tbody>
</table>

Source: Compiled from Dominion Bureau of Statistics Cat. No. 31-D-26.

Table 2: Ontario: Manufacturing Industry in 1939 and 1944

long been factors in the gendered organization of work. Newer assembly-line production in biscuits and confectionery and the canning of fruit and vegetables had also taken on large numbers of women. In 1939 the four sectors combined accounted for 82 percent of all women waged workers in industry.

There were few women in the sectors of metals, non-metallic minerals products (e.g. bricks, pottery, glass, petroleum refining), chemicals and miscellaneous products. The exceptions tended to be in industries where fine motor skills and flexible work patterns had opened up opportunities for women (Glucksman, 1990). Particular industries with significant numbers and proportions of women in 1939 included auto parts, sheet metal products, electrical apparatus, jewellery, medicines, toilet preparations and scientific instrument making. Women were employed in “light” industries and men in “heavy” industry. Apart from women employed on salaries in the offices, there were no women production workers at all in industries such as boiler-making, bridge work, railway rolling stock and shipbuilding.

Wartime necessity dismantled many of the traditional gender barriers. By 1942 the representation of women was evident in all sectors including traditional men’s work in railway workshops and shipyards. Indeed the only significant industry without any women production workers was the manufacture of fertilizers. Labour shortages and the direction
of workers under National Selective Service opened opportunities in all sectors of manufacturing, especially metals and chemicals where demands for war material were intense. Numbers of women in these sectors rose from 9,500 in 1939 to 63,000 in 1944. Women's participation rates increased substantially in every sector and most types of industry. The only major exception was in the automobile industry, where the female proportion rate increased only from 1.3 percent in 1939 to 1.5 percent in 1944 (Table 2). Even shipbuilding employed more women than the auto industry in 1944. An explanation of the anomaly in the automobile industry has to be sought in the complexity of union politics and issues well beyond the scope of this paper (Sugiman, 1994). Gender flexibility in the labour force during World II was limited to particular tasks and only some types of industry.

The variability of women's work between one industry and another during the war can be observed in Figure 2 which presents profiles of employment for selected industries. The first three examples were old-established industries where women were employed in substantial numbers. Hosiery showed little change during the war, while men's factory clothing experienced a 50 percent increase in the employment of women. Electrical apparatus was, in contrast, a high-growth industry with demand for radio and communications equipment as well as electric motors and transformers. The number of women in this industry grew threefold to a peak in 1944, when they formed 43.6 percent of all employees. Women's employment after the war in these three industries was sustained at high levels.

The three other profiles show the distinctive life-cycle characteristic of war industries. Women's employment only appeared in significant numbers in 1941 as production of the new plants got under way. All grew very rapidly to a peak and then fell to almost zero as the industries closed down at the end of the war. In these new mass-production industries, the organization of work was designed at the outset for workers with limited skills and industrial experience. After a short period of training, a person could operate a machine with a clearly defined task. New recruits such as women could be readily accommodated into the factory production process. Gun manufacturing, which in 1943 employed 12,000 women workers was the biggest single employer of women in Ontario during that year. Female proportions in the three war industries peaked at 42.8 percent in gun-making (1943), 41.3 percent in explosives (1942) and 31.6 percent in aircraft (1944).

The rapid growth in numbers of women employed in the war industries was not only promoted by the direction of workers under National Selective Service but also by the attraction of high wages (Table 3). Each of the high-growth profile industries illustrated in Figure 2 had above-average weekly wage rates for women. Rates for women in gun-making were 50 percent above the industry average. Hosiery and knit goods rates were 15 percent below the average.

WOMEN'S WORK AND INDUSTRIAL COMMUNITIES

Gendered work by industry also produced gendered communities. Ontario, with a complex base of industrial communities, provided examples of every type. Before the war, 40 percent of Ontario's women workers were employed in the City of Toronto and its three industrial suburbs, with the remainder distributed through the urban hierarchy (Table 4). The City of Toronto, with a diversified range of manufacturing industries, had higher levels of women in the workforce (28.8 percent of waged workers in 1939) compared with the Ontario average of 20.8 percent (Table 2). In the Toronto suburbs, the female proportion of industrial workers varied from 19.3 percent in Leaside, where electrical products and wire-making employed women, to only 8.5 percent in New Toronto and Weston, where men's work in tire-making and metals predominated.

The role of women in industrial work varied considerably in all the urban size-classes (Table 4). Among the large cities, Hamilton and London had rates slightly above the provincial average. Windsor, dominated by the auto industry, had a low rate of 7.3 percent. In the medium-sized cities, the range extended from Kitchener, with a female proportion of 31.9
Figure 2: Employment of Waged Women in Selected Ontario Industries 1938-1945
Table 3: Canada: Average Weekly Wage Rates in Selected Industries 1942 ($ per week)

<table>
<thead>
<tr>
<th>Size classes (based on 1941 population)</th>
<th>1939</th>
<th>%</th>
<th>1944</th>
<th>%</th>
<th>Net change 1939-44</th>
<th>Relative Change index (1939=100.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto - City</td>
<td>21,113</td>
<td>39.7</td>
<td>48,447</td>
<td>34.7</td>
<td>27,334</td>
<td>229.5</td>
</tr>
<tr>
<td>- Suburbs</td>
<td>514</td>
<td>0.9</td>
<td>5,980</td>
<td>4.3</td>
<td>5,466</td>
<td>1163.4</td>
</tr>
<tr>
<td>Large Cities &gt; 50,000</td>
<td>9,370</td>
<td>17.6</td>
<td>25,826</td>
<td>18.5</td>
<td>16,456</td>
<td>275.6</td>
</tr>
<tr>
<td>Medium Cities &gt; 20,000</td>
<td>7,591</td>
<td>14.3</td>
<td>19,157</td>
<td>13.7</td>
<td>11,566</td>
<td>252.4</td>
</tr>
<tr>
<td>Small Cities &gt; 10,000</td>
<td>5,719</td>
<td>10.7</td>
<td>10,343</td>
<td>7.4</td>
<td>4,624</td>
<td>180.8</td>
</tr>
<tr>
<td>Large Towns &gt; 5,000</td>
<td>2,510</td>
<td>4.7</td>
<td>6,449</td>
<td>4.6</td>
<td>3,939</td>
<td>256.9</td>
</tr>
<tr>
<td>Small Towns &lt; 5,000</td>
<td>5,256</td>
<td>9.9</td>
<td>8,085</td>
<td>5.8</td>
<td>2,829</td>
<td>163.8</td>
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<td>Urban not reported by place</td>
<td>1,158</td>
<td>2.2</td>
<td>4,604</td>
<td>11.0</td>
<td>14,056</td>
<td>1,214.7</td>
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<tr>
<td>Rural</td>
<td>10,620</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
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<td>100.0</td>
<td>139,511</td>
<td>100.0</td>
<td>86,280</td>
<td>262.1</td>
</tr>
</tbody>
</table>

Notes:
1. Leaside, New Toronto and Weston.
2. Excludes Oshawa. Noted in the unreported section.
3. Includes Oshawa, Fort Colborne, Delhi, Swansea, Tilbury which had significant numbers of women employed.

Source: Compiled from Dominion Bureau of Statistics Cat. No. 31-D-26.

Table 4: Ontario Women Wage Earners in Industry by Urban Size Class

percent, to Sault Ste. Marie with only 0.6 percent. Some urban places were dominated by "women's work," such as fruit and vegetable canning, tobacco preparation, footwear and textiles. The highest proportions, over 40 percent, were in small towns with populations under 5,000 such as Kingsville, Almonte, Paris and Dunnville. At the other end of the scale were cities and towns where pulp and paper, primary metal smelting, engineering or agricultural implements were the predominant industry. In places like Chippawa, Fort Frances, Smiths Falls, Thorold and Fergus, women's share of the workforce was less than 5 percent.

What was the effect of war on gendered
industrial communities? In practically all cases there was a significant increase in absolute numbers and in the proportions of women in the industrial workforce. Opportunities for women improved almost everywhere, even in Sault Ste. Marie where their share increased to 7.4 percent by 1944. Wallaceburg, traditionally dominated by men's work in sugar refining and the glass works, showed a substantial increase of women in the workforce from 5.6 percent in 1939 to 30.2 percent in 1944.

The variations between industrial communities during the war are illustrated by the data in Figure 3. Cornwall's profile of women's employment is typical of the specialized textile centres. With women's share of the workforce at 30.5 percent in 1939, Cornwall exhibited only limited growth and change during the war. While some industrial expansion took place, Cornwall tended to lose workers to other industrial centres (Scheinberg, 1994). The town also had high rates of enlistment in the armed forces (Senior, 1983). Guelph, in contrast, had a more diversified industrial base and women increased their share of the workforce from 25.5 percent in 1939 to 34.9 percent in 1944. The growth of women's employment peaked as early as 1941, stabilised and declined from 1944. Fort William shows all the characteristics of a wartime boom. Before and after the war, Fort William was a classic working men's town dominated by processing industries (Dunk, 1991). Wartime development of aircraft-building and gun-making transformed the industrial base and provided spectacular growth opportunities for women's employment. By 1944 women accounted for one-third of the industrial workforce. This was in sharp contrast to its twin city, Port Arthur, where the female proportion rate only increased to 11.8 percent. Many women could, of course, travel across the municipal boundary to work in the aircraft and gun plants. Growth at the Lakehead was not sustained and the "wartime economy was ultimately an aberration" (Tronrud and Epp, 1995, 115).

Fort Erie, a much smaller town with a population of 5,500 in 1941, also experienced a rapid growth rate of women when the aircraft plant expanded. The number of women employed in industry grew from 67 in 1939 to 939 in 1944 and their share of the workforce increased from 13.0 percent to 37.6 percent over the same period. In a few places the relative significance of women in the workforce declined. Collingwood in 1939 had a female proportion of 38.3 percent but by 1944 this had declined to 15.9 percent, as male employment in the shipyard boomed with wartime orders.

One important feature noted in Table 4 is the substantial number of women employed in "rural" areas by 1944, the first year for which these data are tabulated. The principal explanation for this growth is the development of new war industries beyond the urban limits, particularly in the Toronto area. Among the many features of change during World War II was a new wave of industrial decentralization.

WOMEN'S WORK IN TORONTO

As the largest industrial centre in Ontario and second largest in the country after Montreal, Toronto had a very diversified industrial base which was important both for conversion to war material supply and for the development of new war industries.

The Department of Munitions and Supply had a major role, not only as the source of all the purchase contracts but also as the principal investor in new plant and as the manager of crown corporations. Large investments in the Toronto area included $25 million in John Inglis Co., $11.0 million in the Ajax shell-filling plant and $7.2 million in the Malton aircraft factory (Kennedy, 1950). When private companies failed to perform to government expectations they could be expropriated or new managers appointed. National Steel Car's aircraft plant, for example, was taken over by the state in late 1942 and renamed Victory Aircraft Ltd. When production quotas at de Havilland fell behind the planned schedule in mid-1943 the government appointed a new management team (Hotson, 1978, 26).

Toronto's distinctive role in making war material covered a range of final products including guns, ammunition, aircraft and special optical and radar equipment (Table 5). War industries depended on a complex of regional suppliers and subcontractors. York Arsenals,
for example, used brass strip produced in the rolling mills of Anaconda American Brass in New Toronto for making cartridge cases. Shell cases for the filling plants in Scarborough and Pickering were produced in machine shops all over the province. De Havilland aircraft depended on Massey-Harris in Weston for wing assemblies and on other subcontractors in the local area as well as firms in Oshawa, Orillia and Brantford. Engines came from the parent company in Britain and later from the Packard Motor Company in Detroit.

Only two of the large establishments noted in Table 5 were located in the City of Toronto. The nature of specialized war production demanded new plants with flexible horizontal layouts and therefore large sites. Research Enterprises, when formed in 1940, acquired a site of 55 acres (22.3 ha) in Leaside for its complex of buildings. Aircraft-building required not only large production structures but also access to runways for testing and flight delivery. National Steel Car had 207 acres (89.4 ha) at the new Malton airport. Shell-filling required the most extensive sites for dispersal of buildings, so that if one exploded the potential damage could be limited. The Ajax site in Pickering, with 444 buildings, occupied an area of 2,505 acres (1,013.7 ha) and was well separated from existing urban areas (Kennedy, 1950, I, 301).

By late 1941 when all the new war industry plants were in operation, the spatial pattern of industry in the Toronto area had been significantly extended (Deacon, 1944; Harris, 1996). The traditional northwest corridor along the railway tracks from Toronto to Weston had been revitalized and extended to Malton airport. Along the lakeshore the industrial zone in New Toronto had been expanded to include the arsenal at Long Branch. Research Enterprises and other factories in Leaside created a significant cluster in the northeast. De Havilland at Downsview and the GECO plant in Scarborough Township were the most distant from existing industrial zones (Figure 4).

Wartime demands for labour had major effects on the industrial employment of women. In the City of Toronto the number of women wage-earners more than doubled from 21,000 in 1939.
Table 5: Principal War Industries in the Toronto Area

<table>
<thead>
<tr>
<th>Product</th>
<th>Year of first production</th>
<th>Name</th>
<th>Location</th>
<th>Peak employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bren guns (machine guns)</td>
<td>1938/39</td>
<td>John Inglis Co.</td>
<td>Toronto</td>
<td>10,000</td>
</tr>
<tr>
<td>Rifles</td>
<td>1941</td>
<td>Small Arms Ltd.</td>
<td>Long Branch (Toronto Twp.)</td>
<td>5,500</td>
</tr>
<tr>
<td>Ammunition</td>
<td>1942</td>
<td>York Arsenal Ltd.</td>
<td>York Twp.</td>
<td>n/a</td>
</tr>
<tr>
<td>Fuses/ammunition</td>
<td>1941</td>
<td>General Engineering Co. (Canada) Ltd.</td>
<td>Scarborough Twp.</td>
<td>n/a</td>
</tr>
<tr>
<td>Shell fitting</td>
<td>1941</td>
<td>Defence Industries Ltd.</td>
<td>Ajax (Pickering Twp.)</td>
<td>n/a</td>
</tr>
<tr>
<td>Aircraft</td>
<td>1939</td>
<td>National Steel Car Co. Dec. Haviland</td>
<td>Malton (Toronto Twp.)</td>
<td>9,500</td>
</tr>
<tr>
<td>Aircraft</td>
<td>1940</td>
<td>Dufferin Shipbuilding/ Toronto Shipbuilding Co. Ltd.</td>
<td>Downsview (North York Twp.)</td>
<td>7,000</td>
</tr>
<tr>
<td>Naval minesweepers</td>
<td>1940</td>
<td>Dufferin Shipbuilding/ Toronto Shipbuilding Co. Ltd.</td>
<td>Toronto</td>
<td>&gt;3,000</td>
</tr>
<tr>
<td>Specialized optical equipment/radar</td>
<td>1941</td>
<td>Research Enterprises Ltd.</td>
<td>Leaside</td>
<td>7,500</td>
</tr>
</tbody>
</table>

* Crown corporations
Source: Partly based on Kennedy (1950).

to 48,000 in 1944 (Table 6). Employment in the traditional sectors of women's work such as food preparation, footwear, clothing, printing and bookbinding increased significantly in total numbers and proportions of the labour force. The highest rates of growth were in the metalworking sectors. In 1939 only 10.4 percent of Toronto women wage-earners were employed in iron and steel products and non-ferrous metal products; by 1944 the proportion had risen to 32.6 percent. While the manufacture of electrical apparatus remained the largest industry in these sectors, gun making (miscellaneous iron and steel products) became a major new activity. Small numbers of women were also employed in the Massey-Harris farm implements plant and the shipyard.

The case of the John Inglis Company typifies the revitalizing effects of war work on an old-established engineering firm and the significance of new work organization in breaking the gender barriers. Inglis began manufacturing the Bren gun, a light machine type, for British and Canadian military contracts in 1938/39. Five women were taken on in 1940 as part of the build-up towards high-volume production. By 1943 Inglis was the largest employer of women in the country (Sobel and Meurer, 1994, 61). The publicity photograph of Veronica Foster as the "Bren Gun Girl" (Armstrong, 1983, 176) symbolized the shift in emphasis in women's factory work, away from the sewing machines of clothing factories to the machine shop lathes of an armaments plant.

Rapid expansion of suburban industrial employment was an important feature of the wartime period in Toronto, as space for expansion in the city was largely exhausted. In 1939 New Toronto, Leaside and Weston were already significant manufacturing places. At that time, New Toronto ranked 9th among Ontario urban centres by value of output. Leaside ranked 21st and Weston 58th. By 1944 Leaside had risen to 5th position, outranking Samia and Kitchener. New Toronto, in 8th position, was larger in value of output than London or Peterborough. Weston had also risen in rank to 21st. There were comparable gains in employment over the same period as the total number of wage-earners in these three suburbs grew from 4,400 in 1939 to 19,000 in 1944. Women wage-earners increased in number from 500 to nearly 6,000, the growth rates in the suburbs far
exceeding those of the city (Figure 5). Industrial growth in the townships was equally substantial, although comparable statistical data are unavailable. Wartime employment of men and women— at Victory Aircraft, Small Arms Ltd (Toronto Township); de Havilland (North York Township); York Arsenals and Kodak (York Township); and GECO (Scarborough Township)— exceeded 30,000 by 1944. The life cycle of these major employers was, for the most part, very short. Toronto at the beginning of the war was still a streetcar city in its urban structure and workers’ use of public transport (Harris, 1996). The Toronto Transportation Commission (TTC) had an extensive network of streetcar lines and bus routes which served the city area and adjacent urban municipalities (Figure 4). Semi-rural areas had few scheduled services, since the legislation of the early 1930s had tended to restrict the issue of new operators’ licences.

The general growth of employment in manufacturing and other sectors of the metropolitan economy and the dispersal of new industrial plants created major problems in public transport. In 1941 the TTC system carried 268.6 million passengers, a rise of 26.4 percent since 1939, and a figure just short of the 1929 peak. Gasoline and tire rationing from early 1942 restricted the use of private cars and increased the ridership levels of public transport. By 1943 the TTC was carrying 299 million passengers, an increase of 44.7 percent in two years. Since new vehicle supply and manpower were tightly controlled, this wartime traffic growth created major capacity problems especially at peak hours. Programs were introduced to stagger the hours of major employers and the TTC began recruiting women in 1943 (Filey, 1996, 63).

War industries within the TTC service area were adequately served by public transport (Figure 4). John Inglis and the shipyard, for example, were located in traditional industrial areas near the core of the streetcar system. The growth of wartime passenger traffic in the suburban areas may be illustrated by an example from Leaside. In 1939 the TTC’s Leaside route carried 90,000 passengers per month and could be operated with six buses. By May 1944, 48 buses were required to carry the 635,000 passengers each month (TTC, 1944, 2).

A lengthening of the journey-to-work in distance and travel time was most evident at the big aircraft plants and shell-filling factories which were located well beyond the outer limits of the TTC system (Bloomfield, 1995). Malton was linked to the streetcar line at Weston and the Bloor Street terminus by the services of an independent bus line. Similar arrangements linked the GECO and de Havilland plants with the nearest points on the TTC network.

The car pool was a significant mode of transport for getting to and from work at the more distant locations. By sharing gasoline coupons and tire allocations, workers were able to keep some cars on the road. Such arrangements together with the use of chartered buses were also very important in facilitating the daily flow of workers, not only from Toronto but also from small towns and rural areas into the big peripheral war plants. New highways such as the Queen Elizabeth Way provided good access from the southwest and the wartime building of Highway 2A (later part of Highway 401) east of Toronto improved accessibility to Ajax and Oshawa.

Problems of transportation and the housing crisis in the region prompted the provision of various forms of emergency accommodation. A hostel for 430 women was built adjacent to the Long Branch arsenal. Wartime Housing Ltd built an estate of 600 houses at Ajax and a new similar-sized settlement at Malton. Private entrepreneurs developed trailer camps in various parts of Toronto Township to cope with the influx of new workers (Riendeau, 1985, 83). Wartime work in the Toronto area meant long hours on the job, long journey-to-work times and often overcrowding at home.

WOMEN’S WAR EXPERIENCE AT DE HAVILLAND AIRCRAFT

De Havilland is the only survivor of the principal war industries of the Toronto area, listed in Table 3. All the other plant complexes have lost their former identity, or have closed, or their sites have been cleared away for other uses. The continuity of de Havilland owes much to the ability of the company to develop new
Figure 4: Selected Wartime Factories in Toronto 1939-1945
Table 6: City of Toronto: Manufacturing Industry

products after the war. Maintaining the continuity of memory owes much to a strong retirees' association (Ellis, 1993).

In 1939 de Havilland employed about 200 workers in a plant of 100,000 sq. ft. (9,290m²). The factory site had been chosen ten years earlier as a place to assemble aircraft from parts made in the British parent plant. There was direct access to the railway for inputs, and the airfield had ample space for expansion and all test flights. Downsview remained a rural fringe area until after World War II (Hart, 1968). The nearest residential areas, in Weston and Willowdale, were at least 5 km away. Manufacturing began to supersede assembly in 1937, when the Royal Canadian Air Force ordered 25 Tiger Moth single-engined biplanes for flight training.

Major contracts for Tiger Moth planes began in 1940 as the British Commonwealth Air Training Plan gathered momentum. By August 1940 the plant was employing 500, a figure which was more than doubled to 1,200 by the early part of the next year. During 1942 there were 4,000 employees; numbers grew to 6,000 in 1943 and a peak of 7,000 in 1944. Factory floor space was expanded to 500,000 sq. ft. (46,451 m²) in 1941 and 1,100,000 sq. ft. (102,193 m²) in 1944 (Hoitson, 1978, 55). The Downsview plant built 3,028 aircraft between 1940 and 1945.

There were only three women working in the plant in 1939. By early 1941 there were 80, about 6.5 percent of the total workforce. Numbers grew steeply thereafter to reach a peak of 1,775 in 1944, a figure which represented about 25 percent of all employees. Family connections were important for the early women employees. Fathers or brothers were already working in the plant. Later recruits were attracted by the better pay rates or were “categorized” into this essential work. Beryl left the office of a lumber company for de Havilland in 1941, her weekly wage rising to $25.00 from $18.00. Edith, previously a live-in helper in a North Toronto home, joined the aircraft production line in 1942.

The earliest work for women at Downsview
drawing the material together at the end of the wing until taut, "... we then pinned and sewed it and doped it with two coats". Covering wings with the weather-proofing dope was unpleasant work; the fume problem was always serious and the dope was a fire hazard (Ellis, 1993, 65). Applying the final coats of paint on the wings was men’s work.

Work organization changed very quickly during the war period. In 1939 most of the tasks were craft work using simple tools. As the plant expanded and the aircraft became more complex, the tasks became increasingly codified and mechanized. By June 1944 mosquito aircraft were being assembled on specially designed work carriages which moved along a 2,400 ft. (730.7 m) track through the plant (Hoiston, 1978, 26). The finer subdivision of work allowed more semi-skilled workers, particularly women, to be taken on at the plant. Edith, for example, went straight to the assembly line as a riveter after only a few weeks of training at the Central Technical School. Other women worked on wiring assembly. The vital role of "nimble fingered girls" was noted in the Weston plant which supplied wing assemblies to de Haviland (Massey-Harris, 1945). Only a few women moved a little way up the supervisory hierarchy. Kate, after four years' experience, became a lead hand in 1942 with eight women in her group.

The daily rhythm of the plant was governed by the three-shift operation. Most workers preferred the 8AM-4PM shift, while the 12AM-8AM shift was the hardest. Working conditions in the plant improved when a staff of nurses was added to cope with accidents on the job (Ellis, 1993, 36). A 1,000 - seat cafeteria replaced the earlier canteen which in 1940 had been operated by the Blind Institute. The plant was unionized in 1942 when UAW-CIO Local 112 was formed (Endicott, 1991). According to Kate, one of the benefits of the union was "better wages". Since all the women interviewed in the 1994-5 survey were unmarried at the time of their war work, they had no recollections of day care provision for women with children.

Despite incessant calls for more output, Phyllis recalled the "homey atmosphere" in many of
the shops. Women often became close friends with co-workers and "...suffered together when loved ones were killed". The women always had to prove themselves against the men in the same or adjacent workshops. Throughout the war there was a good company spirit with summer picnics and Christmas parties at Eatons.

The Mosquito assembly line was shut down on 27 August 1945 and most of the labour force was laid off. Kate, with seven years' seniority, was one of the few women to stay on, remaining at de Havilland until she retired in 1972. Edith was transferred to Canadair, Montreal as a riveter in 1945. For a few months after the war she worked at General Electric making electric plugs, then moved to Simpson's mail order warehouse in Toronto. She also returned to school to learn typing and office skills. Then in 1951, she went back to de Havilland as an office worker. She remained with the firm until her retirement thirty years later.

De Havilland's isolation well beyond the built-up area always posed problems for the workforce. When Henry joined the company in 1928, at age 18, he was able to walk from his home in Mount Dennis across the railway tracks to the factory in less than 10 minutes. After the plant moved to Downsview the following year he bought a car and carried four other men to work each day. The journey time in summer was about 25 minutes, but the winter drive over 10 km of unploughed township roads could take an hour.

Kate travelled to work in her brother's car when she began in the fabric shop during 1938. It was only a short (3 km) trip from Bathurst and Sheppard, close enough to return home for lunch some days. Family transportation was also the rule when Phyllis started work at de Havilland. She travelled with her brothers in what was regarded as the family busline.

Many of the women recruited into aircraft work in 1941/42 also depended on car pools for getting to work. Most were informally organized; a few were arranged by the company. The time taken on the journey could be very variable. Deidre's trip to and from work rarely took more than 20 minutes for the 7 km route. Edith's journey to work, in contrast, took at least an hour. Although she lived about 10 km on a direct road to the plant, her car pool route was very circuitous and she was always the last person to be dropped off.

As employment expanded rapidly in 1941/42, the earlier arrangements of travel to work by car or car pool were insufficient to move the workers being drawn from all over the city. In September 1941, de Havilland began chartering buses from Danforth Bus Lines to carry workers to the nearest streetcar route, about 7 km from the plant. From this point on Eglinton Avenue, workers could use the TTC network to reach their homes. The charter-bus system was later extended to cover a wider labour shed. Beryl recalls travelling on the "Smokey Joe" bus which picked up workers at Danforth and Coxwell and carried them to Downsview. The 22-km journey took at least an hour.

For most women workers, the journey to work at peripheral plants such as de Havilland was very much longer than to previous employment in the city centre. The company paid extra for some journeys. Beryl, for example, received an extra $1.25 per week to cover bus travel. Long journeys on top of busy work shifts made the days very tiring, a common feature of war work on the home front.

War work at de Havilland was a powerful experience for those who worked at Downsview, and is still remembered over 50 years later. This case study shows some of the benefits of oral histories not only in providing a sense of "what it was like at the time" but also in raising questions for analyzing other forms of evidence. The official history of the Department of Munitions and Supply, for example, has very little reference to women's war work and its significance in the industrial labour force (Kennedy, 1950, II, 360-62).

**WOMEN IN INDUSTRY AFTER 1945**

The postwar recession which had concerned earlier policy makers did not happen and the number of waged industrial workers remained well above the levels of the late 1930s. Numbers of men in industry passed the 1942 war peak in 1947 (Table 1). For women, jobs in the war industries had all disappeared by 1946 and those in replacement positions faced
Figure 6: Ontario: Changing Structure of Waged Women Workers by Sector of Industry

Strong competition from demobilized servicemen. Numbers of waged women in industry showed no growth after the war and women's share of the industrial workforce declined sharply from 29.7 percent in 1944 to 21.3 percent in 1950.

With the rapid contraction of women's employment in aircraft, gun-making and munitions production, the old predominance of the traditional sectors had returned by 1950 (Figure 6). Despite the contraction there was more diversification in women's industrial employment than in 1939. The electrical industry in the non-ferrous metal sector continued to expand as a major employer of women. In radio manufacturing, for example, women accounted for 55.9 percent of the waged workers by 1950. New industries in the miscellaneous products sectors, such as plastics products, also had a high representation of women. Although the aircraft industry was revived on a large scale with the Korean War rearmament, the role of women on the production floor was minimal. At the peak of the revival in 1954, women only represented

2.9 percent of the production workforce, a very small proportion compared with 31.6 percent a decade earlier. Most women in the aircraft industry were employed in the offices, a feature common to most of the non-traditional sectors in manufacturing after the war.

Postwar adjustments in women's industrial employment had variable effects at the community scale. While most places in 1950 showed a substantial decline in numbers of waged women from the 1944 peak, a few places such as Barrie, Belleville and Oakville experienced a significant increase. One reason for this growth was the establishment of new decentralized plants in the electrical products industry. In Belleville, for example, Northern Electric began building a new plant as early as 1947 (Mika and Mika, 1983, 362). The advantages of women workers in some industries, such as auto parts and glass-making, were well recognized in Windsor and Wallaceburg where the numbers employed were substantially larger than in 1939. For the specialized pieces dominated by war industries in 1944, the postwar period saw a return to the past. In Fort William, for example, the number of waged women dropped from 2,340 in 1944 to only 65 in 1950. Fort Erie also lost heavily as the aircraft plant contracted. Women workers there declined from 939 to 27 in the same period. The closure of most of the war industry plants and the contraction of employment in many industries also resulted in a spatial retreat of women's industrial work, back to the older industrial zones. In metropolitan Toronto, for example, industrial employment in the suburbs declined between 1945 and 1950 as manufacturing adjusted to new market conditions (Kerr and Spelt, 1958). Over the next few years, however, the position was reversed as industry
began decentralizing again on a significant scale. New industrial zones were developed, sometimes on the site of former wartime factories. In Scarborough, the GECO lands became the core of the “Golden Mile” industrial zone. Accessibility for women workers continued to be a practical problem in the early stages of development of suburban industrial areas. In Rexdale, a new zone between Weston and Malton in north Etobicoke (Figure 4), manufacturers were hiring taxis and sponsoring car pools to bring in women workers (Kerr and Spelt, 1958, 18).

CONCLUSIONS

In the historical evolution of the industrial labour force, the substantial expansion of women’s employment during World War II was a temporary phenomenon. The role of women in industry was extended during the war into branches of manufacturing and industrial communities where they had previously played little part. As new women workers were recruited into industry, some barriers were temporarily removed but many inequalities remained. Proportions of women varied in the sectors of industry and across the range of Ontario’s industrial communities. The intensity and brevity of women’s employment in some types of manufacturing were sharply defined in the profiles of the three war industries (Figure 2). Selected community profiles of women’s industrial work also show marked differences (Figure 3). Oral histories cited here and elsewhere note the contrasts between the publicity images of the “Bren Gun Girl” and “Rosie the Riveter” and the more mundane realities of wartime factory work. Few of the high hopes of lasting changes in women’s participation in the workforce were realized in the return to normality after 1945.

As in most periods of rapid development, World War II left a legacy of continuity and change on the home front. For women’s industrial employment in the longer term, there was more continuity than change. More generally in industrial relations, there was significant change during the war. The incessant demands for maximum output created new stresses in the workplace which were partly reflected in a sharp increase in strikes activity between 1940 and 1943. In a virtual command economy, the state was closely involved in creating new relationships between capital and labour (Gonick et al, 1995; McInnis, 1996). The tripartite co-operation forged in industrial relations at this time became, in the postwar period, a social, economic and political compromise later described by the Regulation School theorists as Fordism (Gertler, 1994). For women in the Fordist era, their role in manufacturing continued to be dominated by traditional sectors such as textiles, clothing and electrical supplies. The major growth of women’s industrial work was in the offices associated with manufacturing enterprises.

World War II was a powerful catalyst in the decentralization of industry at various spatial scales. Major contracts and new wartime investment transformed some places previously on the periphery of manufacturing industry. The extensive rise of subcontracting, very evident in aircraft production, affected an even broader range of places. While much of the wartime development was short-lived, the experience of firms in operating complex production systems over much longer distances helped to create a framework for greater locational flexibility after the war. Electrical products manufacturing was one of the earliest industries to decentralize on a significant scale after 1945. Many redundant wartime plant facilities also had some lasting value as sites for postwar industrial activity.

Although the long economic boom after 1945 quickly overshadowed World War II in statistics of industrial production and employment in Ontario, the later war period was an important time for the formulation of policies for modernization, reconstruction and expansion (Rea, 1985, Schull, 1978). The 1943 master plan for Metropolitan Toronto recognized all the contemporary elements – peripheral industrial zones, huge demand for housing and extensive use of the motor vehicle which would become part of the postwar outer city (Lemon, 1985). World War II was therefore a defining period in the evolution of metropolitan cities ‘... total enough to assure that once normal growth and expansion of the metropolis resumed, it would
do so with a clear break from the past” (Vance, 1990, 455).

ACKNOWLEDGEMENTS

The authors wish to express their thanks to Bert Ellis and members of the de Havilland Canada Retirees' Association for sharing their experiences of World War II. Ted Wickson, TTC Archivist at the Metropolitan Toronto Archives, was very helpful in locating material for the war period. An earlier version of this paper was presented by Victoria Bloomfield at the 1995 Meeting of the Canadian Association of Geographers, Montreal. She wrote the first draft of the paper but died in an auto accident before she could revise it for publication.

NOTE

1 All names changed to preserve privacy.

APPENDIX: A NOTE ON STATISTICAL SOURCES

The Dominion Bureau of Statistics continued to publish a full range of reports and the Year Book through the war. Industrial data used in this paper were compiled from the following DBS publications:

- Manufacturing Industries of the Province of Ontario, 1936-1946. (Catalogue No. 31-D-26).

Sub-provincial data in these publications are limited to summary statistics for urban municipalities with more than three establishments. Full details of all sectors and individual industry groups were only published for the cities of Hamilton, Toronto and Windsor. County summaries were only published from 1949. (Cat. No. 31-209).

Passengers carried on the Toronto Transportation Commission system were derived from:


Further background on the range of statistical publications can be found in:


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Thus the most important explanation for Portuguese Canadian resegregation in Mississauga may be that of "cultural" forces within the community, rather than the "economic" or "discriminatory" forces in the housing market.

One of the major implications of this study, that the resegregation of Portuguese Canadians in Mississauga has become a characteristic of this group and is likely to continue, reflects the varying loyalties Portuguese feel for their cultural heritage while integrating into Canadian society. While the Portuguese Canadian community is only about 40 years old, it has become firmly rooted in Canadian soil. In this context, this move to the suburbs (in this case Mississauga) should not be seen as a step in the assimilation process, but rather as an aspect of the group's gradual integration. In spite of this suburbanization, Portuguese Canadians have frequent contact with the "core" of the older Portuguese Canadian community in Toronto. They return to visit relatives and friends, shop in ethnic businesses and attend social and religious events in their old neighbourhoods.

It would be difficult to predict the future development of the Portuguese community in Canada. For the second and third generations, raised in Canada, the dilemma of cultural identification will become a crucial defining conflict (Almeida, 1984-1987; Horta, 1989; Dias, 1990; Meintel, 1992). For these future generations the question of being "Canadian", "Portuguese-Canadian" or "Portuguese", will often remain unanswered. Nonetheless, this study suggests that one fact is certain. Portuguese Canadians control their own mobility as reflected in their patterns of residential housing choice and resegregation, and will probably continue to play an important role in shaping the social geography of Canadian cities.

NOTES

1. The author would like to thank Robert Murdie, Department of Geography, York University, for his helpful comments on an earlier version of this paper.

2. Of the 110 Portuguese who participated in the questionnaire survey, almost all (97.3%) were born in Portugal and 70% per cent spoke Portuguese most of the time at home. Of the "first generation" respondents who were born in Portugal, almost sixty one percent (60.7%) were born in the Azores islands. Most of the respondents (65.3%) arrived in Canada during the period 1966-1975 and emigrated mainly for economic reasons (43.0%), and to join members of the family already living in Canada (40.2%). Of the 110 Portuguese respondents, the majority (73.1%) were already homeowners at 65 (59.1%) lived in the city of Toronto before moving to Mississauga. Almost all of these lived in the heart of the Portuguese community in Toronto. For further details concerning the methodology and the socio-demographic characteristics of the Portuguese sample see, Carlos Teixeira 1992, "The Role of "ethnic" Sources of Information in the Relocation Decision-Making Process: A Case Study of the Portuguese in Mississauga". Ph.D Thesis, Department of Geography, York University.

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