

## **SPATIAL DIMENSIONS OF RURAL, GENDER SPECIFIC LABOUR FORCE COMMUTING PATTERNS<sup>1</sup>**

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**ABSTRACT** Participation in urban labour markets, through commuting, is an important component of the set of alternatives facing the rural labour force. Received theory on commuting does not address the importance of the trade centre structure and spatial labour market areas in explaining commuting patterns of a rural labour force. In this paper the role of space in determining the participation of the rural labour force in urban employment centres is refined to include consideration of the hierarchical position of the centre of employment and of intensity of commuting interaction. It is shown that commutes (by male and female, farm and nonfarm commuters) are longer to higher level centres, that commutes are longer for farm than nonfarm commuters, and that females do not consistently commute shorter distances than males. Females made up the majority of the increase in number of commuters observed between 1981 and 1991. Further, the more remote the LMA, the more prominent were females in the gender composition of commuters. Positive income impacts of commuting by both males and females on rural areas were observed. The magnitude of these impacts varied directly with the intensity of commuter interaction with the urban centre. Commuting to urban places of employment by rural labour force members is a complex form of urbanisation. The context of empirically defined Labour Market Areas and consideration of hierarchical levels of centres, of gender, and of farm/nonfarm status of commuters proved important in refining the understanding of commuting patterns.

### **I. INTRODUCTION**

Many rural areas of North America and Australia continue to experience negative effects of restructuring as population and economic growth concentrate in urban areas and traditionally rural industries decline in relative terms and/or adopt labour-saving technologies. Rural areas near metro areas represent a notable exception, and in fact, may experience more rapid growth than the metro/urban centre to which they are near. With an imperfectly mobile rural labour force, and

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economic activity concentrating in urban centres, commuting serves as an equilibrating mechanism. This positive influence of urban centres diminishes, however, with distance and with the size and functional complexity of the urban centre.

Received theory does not address the specification of space in a way that recognises the central place structure of the commuting destinations and the geographic labour market areas (LMAs) surrounding urban centres. Yet the type and number of employment opportunities available in employment centres and the accessibility of the place of employment from the place of origin will be defined by the trade centre structure and geographic extent of LMAs. The proper specification of space in examining the commuting patterns thus requires consideration of this broader framework, rather representing space only by distance travelled by commuters.

Rural areas benefit from urban economic activity to the extent that the rural labour force participates in the urban labour market through commuting. For some rural areas or for a segment of the rural population, this represents a viable strategy for income enhancement and population growth or stability. Expectations derived from received literature include: women commute shorter distances than men; longer distance commutes are associated with households characterised by immobility with respect to residential location (such as involvement with a farm); income levels will reflect the success of commuting as an equilibrating mechanism. It is anticipated that testing these hypotheses in rural space adds substantially to our understanding of commuting behaviour.

The objectives of this paper are:

- (1) to make explicit the role of the functional position of centres (in the central place hierarchy) in their attractiveness as a commuting destination;
- (2) to refine the specification of space in the commuting patterns of the rural labour force to urban places of employment;
- (3) to test for differences between male and female commuters, and farm and nonfarm; and
- (4) to examine the impact of commuting on rural area incomes.

Empirically defined spatial Labour Market Areas (LMAs), and an empirically estimated trade centre structure, provide the context for the testing of hypotheses regarding commuting patterns.

## 2. BACKGROUND

### 2.1 Gender and Spatial Impacts of Industrial and Occupational Restructuring

The industrial and occupational restructuring that has characterised the North American economy for the past 15 years has had both a gender and a spatial bias. Generally, metro areas have benefited disproportionately from the growth in service-type *industries*, and females have captured the majority of the net increases

in this employment in both metro and nonmetro areas. Female employment has, however, also increased in most other industries, while (more modest) increases in male employment have been concentrated primarily in the service sector (Bernat and Frederick, 1992; Statistics Canada 1988, 1990, 1995; Olfert and Stabler, 1994a).

Employment change by *occupation*, which focuses on the implications of restructuring for skill and education requirements, reflects both the industrial restructuring and the changing skill requirements in every industry. Occupations experiencing the most rapid increases are the professional, managerial, administrative, and service occupations (Statistics Canada 1989, 1995; Parker, 1993; Hamrick, 1994; Olfert and Stabler, 1994b). Again, females have captured a disproportionate share of the employment increases in these occupations, and while these gains have been concentrated in metro areas, employment in the slower growing nonmetro areas has also been heavily concentrated in these occupations. The nonmetro labour force has benefited from economic growth in metro areas through the income redistribution associated with commuting to jobs in metro areas.

## 2.2 Off-farm Employment

In many rural areas, agriculture remains an important, if not the dominant, industry. Even when agriculture is the most important industry, however, farm families increasingly receive more income from nonfarm employment sources than from net farm income. Labour-saving technological change and the long-term downward trend in real commodity prices have led to large absolute reductions in the farm population. The combining of nonfarm employment income with farm income, which is becoming the norm rather than the exception, may be seen as a means of *partially* exiting from the sector or, alternatively, as a means of diversifying the use of labour resources.<sup>2</sup> If successful, this strategy may raise incomes and slow population losses in rural, agriculture-dependent areas. Commuting may serve as a partial substitute for rural to urban migration.

The gender disaggregation of nonfarm employment in the Canadian Prairies shows that about two-thirds of the nonfarm employment of farm family members is held by women (Olfert, Taylor, and Stabler, 1993). The empirical literature has addressed the question of determinants of nonfarm labour market participation of women, finding that age, education levels, nonfarm participation of male spouse, and number of children are important explanatory variables (Bokemeier, Sachs, and Keith, 1983; Buttel and Gillespie, 1984; Furtan, Van Kooten, and Thompson, 1985; Gunter and McNamara, 1990; Olfert, Taylor, and Stabler, 1993).

The conventional use of distance as a measure of access to employment

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<sup>2</sup> On-farm diversification (of the commodities produced) is often urged as a means of stabilising (and potentially increasing) farm incomes. For those living near centres of urban employment, however, diversification of the farm family's labour resource becomes an alternative strategy (Olfert, 1992).

opportunities is clearly inadequate. Several empirical studies have come to the counterintuitive conclusion that distance to employment centres does not have a consistently significant influence on rural dwellers' participation in urban-based economic activity (Sumner, 1982; Bokemeier, Sachs, and Keith, 1983; Godwin and Marlowe, 1990; Olfert, Taylor, and Stabler, 1993). One reason why this relationship has not been well defined is that distance alone is a poor proxy for access to employment opportunities. Access would be better represented by distance to employment centres among hierarchically defined spatial labour markets. These labour market areas provide the appropriate context for comparing commuting distances, as well as the relevant bases for examining the influence of other labour market characteristics.

### **3. LITERATURE REVIEW**

Spatial variations in the labour force participation and unemployment rates of males and females are frequently discussed, although more often for metro than nonmetro areas. In a study based on five metropolitan areas in the United States, Lillydahl and Singell (1985) identified significant differences in the spatial pattern of the labour force participation rate of males and females. In general, distance from the city centre (employment site) did not negatively affect the labour force participation of males, but it had a consistently negative impact on female participation. Regression results indicated that for each additional five minutes of commuting time, female participation rates decreased by 1 percent.

That women commute shorter distances than men in a metro setting is a common finding (Madden, 1981; Hanson and Johnston, 1985; Lillydahl and Singell, 1985; Gordon, Kumar, and Richardson, 1989; Preston and McLafferty, 1993). Explanations for shorter commuting distances include lower wages, a higher probability of part-time work, and a higher opportunity cost in terms of household production, suggesting that shorter work trips are economically rational.

In a study of differences in labour force participation between metro and nonmetro women in Kentucky, Bokemeier, Sachs, and Keith (1983) found that women are concentrated in the professional and clerical occupations in peripheral (service) industries. Farm and metro women fared better than nonmetro (excluding farm) women in terms of income and occupation. For farm women, education level was the most important explanatory variable for labour force participation; for other women, marital status, and number of children was more important.

The affect of local labour market conditions, in terms of expected growth or decline, was used as an explanatory variable for the nonfarm labour market participation decisions of farm and nonfarm couples in the United States in a study by Togle and Huffman (1991). The results of this study include the findings that higher local employment growth raises the market wage of both males and females and increases the probability of wage work for farm males but not for farm females. The relationship between nonfarm employment and commuting by farm men and women was examined by Deseran (1989) for Louisiana farm couples. He found that farm men travel greater distances (10 miles farther) to off-farm jobs

than do farm women, with occupation being the key determinant of commuting distance for men, while individual characteristics such as age were more important for women.

A 1989 study by Leslie Whitener identified the average labour market conditions facing farm operators relative to those facing the U.S. labour force as a whole. The investigation was undertaken in the context of a continuing decline in the number of farmers and the increasing reliance on the nonfarm labour market of those who remained in farming. The competitiveness of farm labour force members in their LMAs, and the conditions in those markets were examined. The author reported that farmers may be disadvantaged in their search for off-farm employment both because their personal characteristics (age and education) make them weak competitors for good jobs and because their local (rural) labour markets offer relatively few good jobs.

While these empirical studies offer macro insights into spatial aspects of labour market participation by gender and farm/nonfarm status, they are inadequate for a rural development context because:

- (a) they are heavily reliant on studies of metro commuting which is quite different in nature from rural-to-urban commuting, and
- (b) none develop a comprehensive analysis of the determinants in a consistent framework based on actual hierarchically centred LMAs.

#### 4. THEORETICAL FRAMEWORK

Commuting behaviour is analysed in the context of a hierarchical system of trade centres, and empirically estimated labour market areas. Hypotheses are derived from, but represent modifications of, general conclusions from previous studies.

The conceptual framework within which this analysis is conducted is that of central place theory. Specifically, the primary hypothesis relates to the way in which the labour market participation of rural dwellers, and their resulting income levels, are affected by their location relative to centres of employment. *It is hypothesised that commuting distances to LMA focal points will vary directly with the hierarchical level of the focal point.* Posing the problem in this way assumes that location of residence is relatively fixed, at least in the short run. There are still many rural areas in North America and Australia where agriculture is the major, or one of the major, activities. For that segment of the population that is involved in primary agriculture, this attachment is likely to impose some immobility. That is, labour resources are less mobile if ownership and operation of a farm enterprise are an important source of income for the economic unit. Longer distance commutes to higher level centres would reflect the presence of higher order (higher salary) functions, as well as availability of a wider range of occupations/

industries<sup>3</sup>.

*A second hypothesis is that commuting distances will be shorter for females than males and for the nonfarm versus the farm labour force.* The underlying assumption is that the quantity and type of employment are demand driven. Final and intermediate demands will be reflected in the industrial structure of the focal point which, in turn, will determine its occupational structure. Further, the success of rural labour force members in competing in spatially distinct labour markets is, in part, dependent on their location relative to sources of employment. Since women on average earn less, work in different occupations and industries, work shorter hours, and have higher household productivity, it is hypothesised that the geographic extent of their commutes will be shorter than for men. With regard to the farm population, the immobility (in terms of residential location) that is imposed by participation in an agricultural operation is expected to result in greater commuting distances.

A third assumption is that the income benefits of urban-based activity to the rural population will reflect their employment participation (Mitchelson and Fischer, 1987a,b; Parr, 1987; Bollman, 1991). The growth industries and high-tech, high-wage occupations are typically found in the largest centres. *Therefore, it is hypothesised that incomes of rural labour force members in LMAs with higher-level focal points will be higher than incomes in LMAs with lower level focal points, reflecting the industrial and occupational structure of their accessible employment opportunities.*

## 5. DATA AND METHODOLOGY

An examination of commuting *decisions* by individual labour force members (as opposed to commuting *patterns*) would require a multivariate analysis considering as explanatory variables personal characteristics (such as age, number of children, work status of spouse, availability of public transportation), as well as characteristics of the commuting origins and destinations (employment growth, unemployment rates, wage rates, etc.). In this paper, however, the focus is not on the determinants of the behaviour of individuals but rather on the influence of the position of communities in the central place hierarchy on observed incidence of commuting and distance travelled. To capture the potentially different commuting patterns of males and females, and of commuters with farm and nonfarm status, commuting patterns of these groups are examined separately. Finally, the income impact is inferred not from income levels of individual commuters, but rather from average income levels of geographic areas with more or less intensive commuting patterns.

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<sup>3</sup> This approach would be applicable in other types of rural areas as well, e.g., resource extraction, but might be more focused on female commuting patterns because resource industries have traditionally produced proportionately few jobs for females.

## 5.1 Data

The primary data source for this analysis was a special tabulation of the 1981 and 1991 Censuses of Population in Canada. The Census data permitted identification of place-of-residence and place-of-work, as well as of gender and farm/nonfarm status of approximately 39 and 45 thousand commuters in 1981 and 1991 respectively. Sixty-two pre-selected communities in Saskatchewan were identified as potential focal points of commuting behaviour.<sup>4</sup> These centres make up the top four tiers of the central place hierarchy in Saskatchewan in 1990 (Stabler, Olfert, and Fulton, 1992).

This analysis extends previous research to incorporate the influence that the trade centre hierarchy has on commuting patterns. In the context of the intertemporal work on the trade centre hierarchy in Saskatchewan (Stabler, 1987; Stabler, Olfert and Fulton, 1992; Stabler and Olfert, 1992, 1996; Stabler, Olfert and Greuel, 1996), community-level multipliers (Olfert and Stabler, 1994c), and off-farm employment (Olfert, 1992; Olfert, Taylor and Stabler, 1993), this paper is part of ongoing research into how commuting may affect both people's incomes and the selective survival of small communities.

Rural space is divided into rural municipalities (RMs) and distances were measured as straight lines between origins and destinations.<sup>5</sup> Labour market areas (LMAs) for 1991 are shown in Figure 1.

Previous work by Stabler, Olfert, and Greuel (1996) provided the delineation of the spatial labour markets that represent the geographic units for the examination of labour market characteristics in this paper.<sup>6</sup>

## 5.2 Methodology - Defining Spatial Labour Market Areas

In a study of commuting patterns in Saskatchewan, spatial LMAs were delineated based on bi-directional commutes between the province's 62 largest centres and its 298 rural municipalities in 1981 and 1991 (Stabler, Olfert, and Greuel, 1996). In this study, Statistics Canada data on place-of-work and place-of-residence for the

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<sup>4</sup> Origins for commuters include all rural locations as well as the 62 pre-selected communities.

<sup>5</sup> While rural municipalities (RMs) vary in size, the standard is an area 18 by 18 miles.

<sup>6</sup> Each village, town, or city has a unique Census Subdivision (CSD) number. In addition, the unorganised space within each of the province's 298 RMs is also identified as a CSD. Because of confidentiality, however, labour force characteristics are not available for the smallest CSDs. For the province, there were 229 CSDs out of a total of 953 for which labour force data were unavailable. These include all CSDs with populations of less than 250 persons. In total, these CSDs represent 2.8 percent of the provincial labour force. Inferences drawn from the analysis assume that the populations of the smallest centres are not unlike those of the CSDs for which data were available. Except for the largest 62 centres, CSDs are aggregated to the RM level.

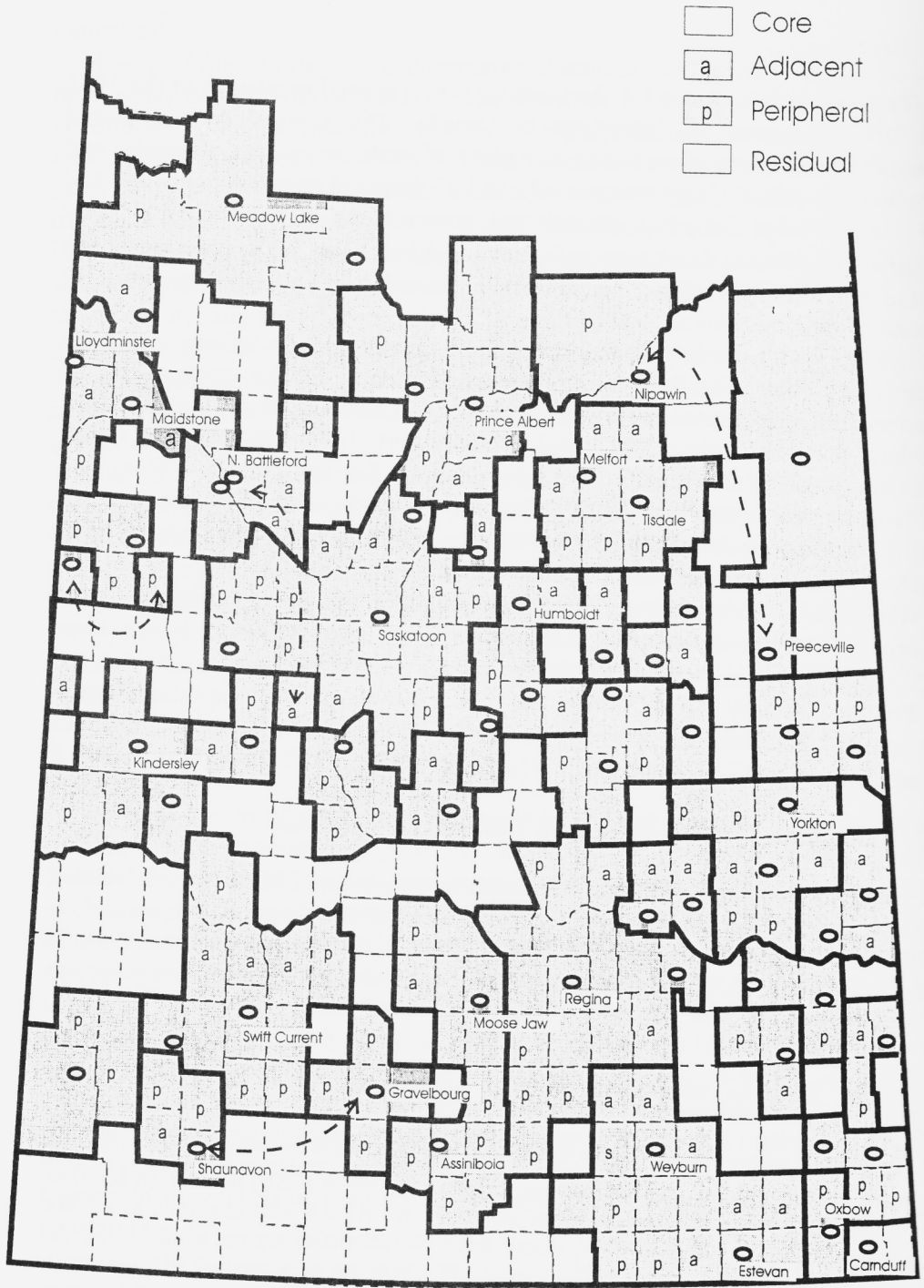


Figure 1. Labour Market Areas in Saskatchewan, 1991



experienced<sup>7</sup> labour force were used. A total of 38 distinct LMAs intensity and geographic extent of commuting flows. The two largest LMAs formed around the province's two metropolitan centres (with 1990 populations of 186,058 and 179,178). Thirteen mid-sized LMAs formed around smaller urban centres (average population of 11,870). The third set of (23) LMAs contained the smallest centres (average population of 1,680), most of which had a very limited geographic range and relatively small numbers of commuters associated with them. A final category of rural municipalities (about 30 percent of all municipalities) remained unattached to any of the pre-selected focal points and were therefore classified Remote, that is, outside the commuting sheds of the identified employment centres.

Within each LMA, the absolute intensity of commuting between rural municipalities and urban focal points defined municipalities as Core, Adjacent, and Peripheral, in descending order of association.<sup>8</sup>

### 5.1 Tests for Significant Differences

Differences between average commuting distances are tested for statistical significance between male and female and farm and nonfarm commuters, and between LMA focal points at different levels in the central place hierarchy. The "two-sample assuming unequal variances t-test" was used (Microsoft Corporation, 1994). This form of the test assumes that the variances of the two data sets are unequal and is referred to as a heteroscedastic t-test. The formula is,

$$t' = \frac{\bar{x} - \bar{y} - \Delta_0}{\sqrt{\frac{S_1^2}{m} + \frac{S_2^2}{n}}}$$

and the formula below is used to approximate the degrees of freedom:

$$df = \frac{\left(\frac{S_1^2}{m} + \frac{S_2^2}{n}\right)^2}{\frac{(S_1^2/m)^2}{m-1} + \frac{(S_2^2/n)^2}{n-1}}$$

For each of the t-tests, the weighted mean commuting distances and the corresponding standard deviations for each focal point are computed. The weight associated with each distance reflects the proportion of all commuters to a focal

<sup>7</sup> Experienced labour force is defined by Statistics Canada as those either employed, or unemployed but with an employment history.

<sup>8</sup> With some qualifications as noted in Stabler, Olfert, and Greuel (1996), Core municipalities were characterised by commuters associated with that RM (both *to* and *from*) equal to or greater than 30 percent of the Rm.s experienced labour force. For Adjacent RMs, the corresponding commuting "rate" was between 15 and 30 percent; for Peripheral RMs, between 5 and 15 percent.

point,  $j$ , from that location,  $i$ , (rural area or urban centre). That is, the weight ( $p_{ij}$ ) is calculated as:

$$p_{ij} = \frac{c_{ij}}{C_j}$$

where:  $c_{ij}$  = the number of commuters between location  $i$  and focal point  $j$ , and  
 $C_j$  = the total number of commuters associated with focal point  $j$ .

The mean commuting distance associated with focal point  $j$  was calculated as,

$$\bar{x}_j = \sum_{i=1}^n [p_{ij} \cdot x_{ij}] / C_j$$

where  $x_{ij}$  = miles between location  $i$  and focal point  $j$ .

The variance is

$$S_j^2 = \sum_{i=1}^n [p_{ij} (x_{ij} - \bar{x}_j)^2]$$

Significance was determined at the 99, 95, and 90 percent confidence levels.

## 6. COMMUTING BEHAVIOUR BY LMAs, BY GENDER AND BY FARM/NONFARM

The most direct evidence of rural dwellers' participation in urban labour markets is based upon the structure of commuting patterns, disaggregated by gender, as well as by farm/nonfarm status. As noted in the hypotheses above, it is expected that females will commute shorter distances than males, that farm commuters will commute greater distances than nonfarm commuters, and that commuting distances will vary directly with the hierarchical level of the focal point. The LMA framework also permits a more detailed examination of other aspects of commuting patterns, especially differences among the hierarchical level of focal points, variations within LMAs, and intertemporal comparisons.

### 6.1 Commuting Distances in 1991

Weighted average travel distances associated with LMA focal points, by gender and farm/nonfarm status, are presented in Table 1. The 38 LMAs delineated for 1991 are identified according to the ranking of their highest level focal point(s) in the top four tiers of the central place hierarchy.

A disaggregation of commuters by the LMA component (Core, Adjacent, and Peripheral) that is either the origin or destination of the commute provides further detail. For both genders and for farm and nonfarm commuters, the greatest distances travelled, from all LMA components, were those associated with the two (largest) LMAs, those with the province's Primary Wholesale-Retail (PWR) centres as focal points. For LMAs with lower level focal points, the pattern varies somewhat. Commuting distances for total commuters in LMAs with Complete Shopping Centres (CSCs) are marginally greater than the corresponding distances for LMAs with Secondary Wholesale-Retail (SWR) centres for farm males and for

**Table 1.** Weighted Average Commuting Distances in Miles by Hierarchical Status of Highest Level Centre, Disaggregated by LMA Component, Gender, and Farm/Nonfarm Status, 1991

Hierarchical Level of Focal Point Centre - LMA Component	Farm			Non-Farm		
	Males	Females	Total	Males	Females	Total
	Miles					
LMAs with PWR* focal points						
- Core	13.4	12.7	13.0	15.1	15.0	15.1
- Adjacent	31.6	32.2	31.9	32.0	32.3	32.1
- Peripheral	44.6	30.2	38.8	38.2	35.2	37.3
- Total	16.8	15.5	16.1	16.4	16.0	16.3
LMAs with SWR* focal points						
- Core	11.6	11.9	11.8	10.9	9.4	10.3
- Adjacent	21.5	21.2	21.3	18.1	18.6	18.3
- Peripheral	28.0	23.0	24.9	23.5	25.8	24.8
- Total	14.4	15.0	14.7	12.2	11.4	11.9
LMAs with CSC* focal points						
- Core	11.8	11.5	11.6	11.9	11.2	11.6
- Adjacent	14.3	16.0	15.6	12.5	12.9	12.7
- Peripheral	29.3	25.7	26.8	21.7	23.1	21.9
- Total	14.9	14.8	14.8	12.9	13.0	12.9
LMAs with PSC* focal points						
- Core	11.2	9.6	10.2	10.8	9.8	10.3
- Adjacent	17.7	17.6	17.7	17.6	13.9	16.4
- Peripheral	24.6	18.3	19.9	9.3	23.4	19.9
- Total	14.2	13.1	13.5	12.7	10.9	11.9
All LMAs						
- Core	12.1	11.4	12.4	13.0	12.2	12.7
- Adjacent	21.3	20.2	20.6	20.5	19.8	20.2
- Peripheral	29.7	22.0	24.5	26.5	25.7	26.1
- Total	15.0	14.5	14.7	14.2	13.4	13.9

- \* PWR are Primary Wholesale-Retail Centres  
 SWR are Secondary Wholesale-Retail Centres  
 CSC are Complete Shopping Centres  
 PSC are Partial Shopping Centres

both male and female nonfarm commuters. The comparison between LMAs with Partial Shopping Centres (PSCs) and those with CSCs, however, shows the expected relationship, that is, shorter commutes for the LMAs with PSCs. The

**Table 2.** Differences in Weighted Average Commuting Distances Between Peripheral Components of Hierarchical Level Focal Points, Saskatchewan LMAs, 1991<sup>1</sup>

Hierarchical Level of Focal Point				
Hierarchical Level of Focal Point	PWR	SWR	CSC	PSC
PWR	n/a	***	***	***
SWR		n/a	***	***
CSC			n/a	**
PSC				n/a
Weighted Average Commute in Mi.	39.0	29.6	24.5	23.4

<sup>1</sup> These comparisons are based on data pertaining to total commuters rather than on the disaggregation into farm and nonfarm, and male and female commuters. In the data, the number of commuters associated with each CSD and the focal point CSD are recorded. The more remote the CSD, the lower the number of commuters. As the commuters are differentiated by gender and according to farm/nonfarm status, commutes from the more remote CSDs fall below the minimum required for confidentiality even though they may be reported in the aggregated data. Weighted average distances are the product of the weight (relative importance of the location in terms of the proportion of all commuters it represents) and the distance of the CSD from the focal point. Thus, the average distances in Peripheral portions of LMAs based on aggregate data are greater than the disaggregated distances reported in Table 1 above.

All differences were positive as hypothesised, that is, the average weighted commuting distance associated with the peripheral components of the higher level centre is *greater* than that associated with the lower level centre with which it is compared.

\*\* Significantly different at the 5 percent level (two-sample assuming unequal variances t-test).

\*\*\* Significantly different at the 1 percent level (two-sample assuming unequal variances t-test).

weighted average commuting distance for the LMAs will be a reflection of both the geographic distribution of commuters within the LMA area and the distance from the perimeter to the focal point of the LMA.

Within each type of LMA, the weighted average commuting distance, for both males and females as well as for farm and nonfarm commuters, increased through Core, Adjacent, and Peripheral components of the LMA in all cases, with the sole exception of nonfarm males in Peripheral areas of LMAs with PSC focal points.

### *Commuting by Hierarchical Level of Focal Point*

In Table 2 tests of the importance of hierarchical levels of focal points in determining the geographic size of commuting sheds are reported. For the tests, the comparisons were between the weighted average commuting distance in the

peripheral areas of all LMAs. Only commutes associated with the highest-level community in each LMA were included.<sup>9</sup> The results very strongly support the hypothesis that longer commutes are associated with higher-level centres. This observation refines the conclusions found in previous analyses of commuting patterns. Of all the studies reviewed, this present study was the only one to identify the hierarchical level of the focal point as an independent variable.

The results presented here suggest that the functional position of an urban centre is an important part of the explanation of commuting patterns. Higher level centres apparently not only provide the surrounding population with higher order goods and services but also provide the quantity and variety of employment that attracts commuters.

**Commuting Distances by Gender**

Apparent differences between males and females in both the farm and nonfarm population were tested, with the findings presented in Table 3. As shown in the last line of the table, greater commuting distances, significant at the 99 percent level, were found for males in the aggregation of all LMAs for both farm and nonfarm commuters.

**Table 3.** Differences in Weighted Average Commuting Distances Between Males and Females, by Farm and Nonfarm Status, by LMA Type, Saskatchewan LMAs 1991

	Males Compared with Females		
	Farm	Non-Farm	Total
LMAs with PWR focal points	+***	+	+***
LMAs with SWR focal points	-**	+***	+
LMAs with CSC focal points	-	-	-
LMAs with PSC focal points	+***	+***	+***
All LMAs	+***	+***	+***

A "+" indicates that the commuting distance associated with male commuters is *greater* than that associated with female commuters; a "-" indicates that females commute greater distances.

- \* Significantly different at the 10 percent level (two-sample assuming unequal variances t-test).
- \*\* Significantly different at the 5 percent level (two-sample assuming unequal variances t-test).
- \*\*\* Significantly different at the 1 percent level (two-sample assuming unequal variances t-test).

<sup>9</sup> Some LMAs contained more than one hierarchical level of focal point. For example, LMAs with PWR centres also contained three PSCs within their boundaries. The distances shown in Table 1 include all commutes. For the test of significance of differences in commuting distances among hierarchical levels of centres reported in Table 2, only the highest-level centres within each LMA were used.

When type of LMA is distinguished, however, some departures from this trend are apparent. Based on all commutes, farm female commuters in LMAs with SWR centres travel significantly greater (five percent level) distances than do farm males. When this finding is combined with the significantly greater commuting distances for males among nonfarm commuters, no significant differences are apparent between males and females for the total (farm and nonfarm) population at this level. At the next level, that is, LMAs with CSC focal points, no significant differences in commuting distances are revealed for either farm or nonfarm males and females.

In LMAs with PSCs, male commuters again travel significantly greater distances than females (at the 1 percent level). The more detailed disaggregation of types of LMAs leads to the conclusion that males do not consistently commute greater distances than females in all types of LMAs.

This result with respect to comparative commuting distances between males and females is contrary to most previous research on this subject, but, again, previous studies have failed to distinguish among functional levels of LMA focal points. A possible explanation is that the highest paying jobs, justifying the longest commutes, dominated by males, are concentrated at the top of the trade centre hierarchy. At some lower level of the hierarchy, the mix of employment opportunities that warrant longer commutes may be those dominated by females, for example, education and health services.

**Table 4.** Differences in Weighted Average Commuting Distances Between Farm and Nonfarm Population, by Gender and LMA Type, Saskatchewan LMAs, 1991

	Farm Compared with Nonfarm		
	Females	Males	Total
LMAs with PWR focal points	-*	+	-
LMAs with SWR focal points	+***	+***	+***
LMAs with CSC focal points	+***	+***	+***
LMAs with PSC focal points	+***	+***	+***
All LMAs	+***	+***	+***

A "+" indicates that the commuting distance associated with farm commutes is *greater* than that associated with nonfarm commutes; a "-" indicates that nonfarm commutes are greater than farm commutes.

\* Significantly different at the 10 percent level (two-sample assuming unequal variances t-test).

\*\* Significantly different at the 5 percent level (two-sample assuming unequal variances t-test).

\*\*\* Significantly different at the 1 percent level (two-sample assuming unequal variances t-test).

### ***Commuting Distances by Farm versus Nonfarm***

Comparisons of farm and nonfarm commuters, shown in Table 4, reveal both male and female farm commuters travelling greater distances than nonfarm commuters across all LMA types, except for those with PWR centre focal points. As a proportion of the total, farm commuters are relatively less prominent in the LMAs surrounding PWR centre focal points, since there are several bedroom communities surrounding these centres, a phenomenon not found at other levels in Saskatchewan's hierarchy. Since lower-level focal points do not have bedroom communities, commuters are more likely to be individuals with some immobility because of other economic ties to the rural economy, such as farming. While the literature does not appear to deal directly with the farm vs. nonfarm comparison of commuting distances, this finding is consistent with the notion that immobility resulting from participation in a farming operation would result in greater average commuting distances.

### **6.2 Spatial Patterns of Increased Labour Force Participation of Females**

Another way to examine commuting patterns is to focus on how commuters, by gender, are distributed over the LMA components and how the pattern has changed over time. Table 5 shows the number of commuters in 1991 by gender, as well as the change in numbers of commuters between 1981 and 1991 by LMA type. These data are disaggregated into commuters "to" and "from" LMA focal points, and the LMAs are grouped according to the number of commuters associated with the individual LMAs rather than by the hierarchical level of focal points. The two metro LMAs are the largest, both geographically and in number of commuters per centre. Increased in- and out-commuting for both males and females were experienced over the 1981-91 period. The next 13 LMAs are individually smaller in size (containing all the SWR centres, plus five CSC focal points), but combined, account for a larger total number of commuters than the combined metro LMAs. Although the focal points of these LMAs attracted significant numbers of additional in-commuters over the decade there was a substantial reduction in the number of out-commuters. The smallest 23 LMAs (containing one CSC, with the remainder being PSC focal points) gained only in terms of female in-commuters, while experiencing decline in all other categories.

As Table 5 shows, the focal points of the LMAs are more often the destination rather than the origin of commutes--overall, approximately 83 percent of commutes associated with these focal points are "to" commutes. The largest proportion of "from" commutes is at the metro level. The prominence of "to" commutes is slightly more pronounced for females than males--about 88 percent of female commutes in 1991 were "to" focal points. For females as for males, the dominance of "to" commutes increases as the size of the LMA decreases, reaching 99 percent for the smallest 23 LMAs.

**Table 5.** Commuters To and From LMA Focal Points, by 1991 LMA Type, by Gender, 1991 and Changes Between 1981 and 1991

LMA Type	Males		Females		Total	
	1991	1981 to 1991 Change	1991	1981 to 1991 Change	1991	1981 to 1991 Change
Metro LMAs						
To Focal Points	7,555	+1,215	5,995	+2,260	13,550	+3,475
From Focal Points	2,910	+105	1,315	+445	4,225	+550
Total	10,465	+1,320	7,310	+2,705	17,775	+4,025
Mid-Sized 13 LMAs						
To Focal Points	9,465	+935	9,425	+2,825	18,890	+3,760
From Focal Points	1,955	-1,200	1,065	-210	3,020	-1,410
Total	11,420	-265	10,490	+2,615	21,910	+2,350
Smallest 23 LMAs						
To Focal Points	1,865	-340	3,005	+810	4,870	+470
From Focal Points	245	-480	35	-115	280	-595
Total	2,110	-810	3,040	+695	5,150	-125
Total						
To Focal Points	18,885	+1,810	18,425	+5,895	37,310	+7,705
From Focal Points	5,110	-1,575	2,415	+120	7,525	-1,455
Total	23,995	+235	20,840	+6,015	44,805	+6,250

As a proportion of total commuters, the number of females increases the smaller the LMA focal point. For the two metro LMAs, 44 percent of all commuters are females. For the mid-sized 13 LMAs, females make up 50 percent of commuters, and for the smallest 23 LMAs, 62 percent are females. The rural population within the LMAs is still highly dependent on agriculture. In the farm population women are more likely than men to have off-farm employment and this off-farm employment is highly concentrated in health and education services. As the functional level decreases to PSC, these services are among the few still provided by the trade centres.

Table 5 also permits an intertemporal comparison, and it clearly shows that the *increase* in commuters between 1981 and 1991 is largely accounted for by females. In metro LMAs, females made up 65 percent of the increase in commuters *to* focal points and 67 percent of the bi-directional (*to* and *from*) increase was females. In mid-sized LMAs, the corresponding proportions were 75 percent and 111 percent, respectively. The proportion in excess of 100 percent is due to the fact that the total (*to* and *from*) number of male commuters associated with the mid-sized LMAs declined in absolute terms between 1981 and 1991, primarily because of a large decrease in male commuters *from* focal points to the surrounding areas. Finally, for the smallest LMAs, there was an overall decrease in the number of commuters because of a substantial decrease in the number of male commuters that was not offset by the increase in female commuters. Clearly, the changes in commuting patterns across all LMAs between 1981 and 1991 were



dominated by females. This dominance is consistent with an increasing labour force participation rate of females coinciding with a decreasing need for farm labour due to mechanisation.

## 7. INCOME LEVELS BY GENDER OVER LMA TYPE AND COMPONENT

Income levels of rural labour force members are expected to be influenced by their ability to access urban employment opportunities. The consequences of access to employment centres on employment income levels, by gender and by LMA type and component, are shown in Table 6. The previous grouping of LMAs is retained in this table but residual areas are also represented. These data indicate the average employment incomes of those who live in these geographies, regardless of where they work. Unfortunately, the Census data do not permit a separate calculation of incomes of commuters vs. noncommuters. Also, since the distribution of employment income within each geographic area was unavailable, no statistical test of (the substantial) differences in the averages could be performed. Average employment income levels decrease monotonically for both males and females through the metro, the mid-sized, and the smallest LMAs and the Residual areas.

**Table 6.** Average Employment Income Levels (full- and part-time), Indices Relative to Provincial Levels, by Gender, and Female/Male Income Ratios, by LMA Type and Component, 1991

LMA Type - LMA Component	Males		Females		Female Income/ Male Income
	Income \$	Income/ Prov. Avg	Income \$	Income/ Prov.Avg	
<b>Metro LMAs</b>					
- Core	28,522	1.15	16,860	1.12	0.59
- Adjacent	20,453	0.82	11,300	0.75	0.55
- Peripheral	19,185	0.77	11,472	0.76	0.60
- TOTAL	28,159	1.13	16,681	1.11	0.59
<b>Mid-Sized LMAs</b>					
- Core	24,530	0.99	14,402	0.96	0.59
- Adjacent	19,103	0.77	11,620	0.77	0.61
- Peripheral	17,553	0.71	10,717	0.71	0.61
- TOTAL	23,148	0.93	13,788	0.92	0.60
<b>Smallest LMAs</b>					
- Core	22,188	0.89	13,179	0.88	0.59
- Adjacent	18,293	0.74	11,594	0.77	0.63
- Peripheral	17,843	0.72	11,020	0.73	0.62
- TOTAL	20,842	0.84	12,609	0.84	0.60
Residual Areas	18,021	0.72	11,403	0.76	0.63
Provincial Averages	24,879	1.00	15,009	1.00	0.60

Furthermore, a similar pattern is apparent within LMAs, as average income levels decrease through Core, Adjacent, and Peripheral components. Thus, the greater the access to higher level, urban-based employment opportunities, the higher the average employment income levels. Nevertheless, commuting by the rural labour force to centres of employment does not *eliminate* income differentials. This is a result of the following circumstances: among LMAs, income earning opportunities are greatest in the highest level centres and decline as the status of the focal point is lower in the hierarchy; within any LMA, a decreasing proportion of the labour force participates in commuting as distance from the employment centre increases; and, within all LMAs, distance erodes income benefits as commuting time and expenditures rise.

The impact of distance from employment centres on average income levels is very similar for males and females, as indicated in Table 6 by the ratios of income levels to provincial totals, although modest gender differences may be noted. Male income levels in metro LMAs are 13 percent above the provincial average for males; for females, the comparable advantage is somewhat less, at 11 percent. The (gender) pattern reverses as remoteness of the location of employment increases. In Residual areas, female income is 76 percent of the provincial average for females, while male income is 72 percent of the respective provincial figure.

Finally, the last column in Table 6 records the ratio of female to male income for each LMA type and component. The provincial ratio of female to male income levels, at 60 percent, is relatively constant over LMA types. However, the differences that are apparent suggest that females are relatively better off the more rural the area. In Residual areas and in Adjacent and Peripheral components of LMAs, females have income levels ranging up to 63 percent of those of their male counterparts.

The finding that average employment income levels in rural areas fall as commuting interaction with LMA focal points decreases is consistent with the literature and with the expectation that access to high-growth, high-wage employment has positive income effects. While commuters' incomes are not directly compared, the average employment income levels of the geographic areas from which the rural labour force commutes portray the expected pattern of income effects as being positively related to commuter interaction and to the hierarchical level of the labour market focal point.

Persistent income differentials between males and females are also in keeping with the literature. The differences in the industrial and occupational composition of the labour force offer a partial explanation for this. There is some indirect support in the literature for the finding that the income disadvantage of females diminishes somewhat as remoteness increases. For many small urban centres, relatively well-paid jobs in the health and education sectors, dominated by females, is a major source of employment. The same rural areas may offer relatively few professional, managerial jobs in industries dominated by males, who are more likely to be employed in primary, routine manufacturing, or transportation sectors.

## 8. SUMMARY AND CONCLUSIONS

Employment alternatives facing the rural labour force vary substantially over geographic space. While some economic activity is, by definition, rural, most of the rapid service-sector growth that has characterised western economies over the past 15 years has been concentrated in metro areas. The purpose of this paper was twofold: first, to refine the specification of distance by casting the commuting decision in the context of trade centre hierarchy combined with empirically estimated LMAs, and, second, to use the refined specifications to test hypotheses regarding commuting distances and income impacts. These results define, more precisely than in the received literature, the subset(s) of the rural labour force for which urban employment is an important income-earning alternative.

In support of our first hypothesis, commuting distances were found to vary directly with the hierarchical level of LMA focal points for males and females, both farm and nonfarm. Commutes were longer to larger centres and the intensity of commuter interaction with employment focal points systematically diminished as distance increased.

Contrary to the expectation stated in our second hypothesis, females do not consistently commute shorter distances than males when LMA type and component, as well as farm and nonfarm status, are controlled for. Females do, however, have different commuting patterns than males. The intertemporal comparison, between 1981 and 1991, shows a growing predominance of female commuters. Approximately 96 percent of the total increase in commuters between 1981 and 1991 was accounted for by females. This dominance of females was greatest in the mid-sized and smallest LMAs, where there was an absolute decline in the number of male commuters. For both males and females, commutes *to* LMA focal points greatly outnumbered commutes *from* focal points and this pattern was accentuated over time.

Regarding farm vs. nonfarm rural dwellers, the findings lend support to the hypothesised greater commuting distances by farm commuters, based on the expectation that the farm labour force will be less mobile in terms of geographic relocation. Farmers, both males and females, were found to commute greater distances than nonfarmers, with the exception of the LMAs containing PWR centre focal points. While about one-third of all "to" commuters were farmers, the proportion of commuters comprised of farmers increased with remoteness; in the smallest LMAs and in the Residual areas, farm commuters outnumbered nonfarm commuters.

The benefits of rural labour force participation in urban-based economic activity are inferred from the average employment income levels compared across LMA types, and among LMA components. Average employment income levels by geographic area decrease monotonically with the hierarchical level of LMA focal points, as well as with intensity of attachment of LMA components. Both relationships are as hypothesised. In contrast, the ratio of female to male income varies little with LMA type or component, although females are relatively

somewhat better off in more remote areas.

Access to growing urban employment is especially important to females as the female participation rate continues to rise and as females participate to a greater extent in commuting. For rural women, reliance on occupations in education, health, and administration means that the urban centres where these activities are concentrated are an essential source of employment. The positive income effects of proximity to urban-based employment may help to close the male-female earnings gap for rural women.

Few would consider commuting to urban centres for employment an adequate strategy for the maintenance and support of a rural population, because a large portion of this population lives too far from an employment centre to commute on a daily basis. However, commuting does represent a viable alternative for a portion of the rural labour force, and has a positive impact on rural area incomes. The geographic area over which the commuting influence of urban centres is distributed, as this paper has shown, is dependent upon gender and farm/nonfarm status of the rural population as well as the hierarchical level of the urban centre. Consideration of the set of alternatives facing the rural labour force must weigh carefully these dimensions of commuting patterns.

## REFERENCES

- Agriculture Canada. (1989) *Growing Together*. Ottawa: Minister of Supply and Services, Cat. No. A15-5269.
- Bender, L. *et al.* (1985) *The Diverse Social and Economic Structure of Nonmetro America*. Washington, D.C.: USDA, Economic Research Service.
- Bernat, A. and Frederick, M. (1992) Goods-producing Industries added more rural than urban jobs. In 1989. *Rural Conditions and Trends*, 3(1), Rockville, MD: USDA, Economic Research Service.
- Bokemeier, J.L., Sachs, C. and Keith, V. (1983) Labour force participation of metropolitan, nonmetropolitan, and farm women: a comparative study. *Rural Sociology* 48: pp. 515-39.
- Bollman, R. D. (1991) An overview of rural and small town Canada. *Canadian Journal of Agricultural Economics* 39: pp. 805-817.
- Buttel, F.H. and Gillespie, G.W. Jr (1984) The sexual division of farm household labour: an explanatory study of the structure of on-farm and off-farm labour allocation among farm men and women. *Rural Sociology* 49: pp. 183-209.
- Deseran, F.A. (1989) Part-time farming and commuting: determinants of distance to off-farm work for Louisiana farm couples. *Rural Sociology and Development* 4: pp. 171-188.
- Furtan, W. H., Van Kooten, G. C. and Thompson, S. J. (1985) The estimation of off-farm labour supply functions in Saskatchewan. *Journal of Agricultural Economics* 36: pp. 211-219.
- Fuller, T., Ehrensaft, P. and Gertler, M. (1989) *Sustainable Rural Communities in Canada*. Saskatoon, Saskatchewan: Canadian Agricultural and Rural Restructuring Group.

- Godwin, D.D. and Marlowe, J. (1990) Farm wives' labour force participation and earnings, *Rural Sociology* 55: pp. 25-43.
- Gordon, P., Kumar, A. and Richardson, H.W. (1989) Gender differences in metropolitan travel behaviour. *Regional Studies* 23: pp. 499-510.
- Gunter, L. and McNamara, K.T. (1990) The impact of local labour market conditions on the off-farm earnings of farm operators. *Southern Journal of Agricultural Economics* 22: pp. 155-165.
- Hady, T.F., and Ross, P.J. (1990) *An Update: The Diverse Social and Economic Structure of Nonmetropolitan America*. Washington, D.C.: USDA, Economic Research Service.
- Hamrick, K.S. (1994) Service Industries Expected to Dominate 1992-2005. *Rural Conditions and Trends*, 4(4) Washington, DC: USDA, Economic Research Service.
- Hanson, S. and Johnston, I. (1985) Gender differences in work-trip length: explanations and implications. *Urban Geography* 6: pp. 193-219.
- Lillydahl, J.H. and Singell, L.D. (1985) The spatial variation in unemployment and labour force participation rates of male and female workers. *Regional Studies* 19: pp. 459-469.
- Madden, J.F. (1981) Why women work closer to home. *Urban Studies* 18: pp. 181-194.
- Microsoft Corporation (1994) *Microsoft Excel 5.0: User's Guide*. Cambridge MA: Microsoft Corporation.
- Mitchelson, R.L. and Fisher, J. (1987a) Long distance commuting and income change in the towns of upstate New York. *Economic Geography* 63: pp. 48-65.
- Mitchelson, R.L. and Fisher, J. (1987b) Long distance commuting and population change in Georgia, 1960-80. *Growth and Change* 18: pp. 44-65.
- Olfert, M.R. (1992) Nonfarm employment as a response to underemployment in agriculture. *Canadian Journal of Agricultural Economics*, 40: pp. 443-458.
- Olfert, M.R. and Stabler, J.C. (1994a). Industrial restructuring of the prairie labour force: spatial and gender impacts. *Canadian Journal of Regional Science* 17: pp. 133-152.
- Olfert, M.R. and Stabler, J.C. (1994b) *Occupational Restructuring of the Prairie Labour Force, 1971-1986*. Saskatoon: University of Saskatchewan, Department of Agricultural Economics.
- Olfert, M. Rose and Stabler, Jack C. (1994c) Community level multipliers for rural development Initiatives. *Growth and Change* 25: pp. 467-486.
- Olfert, M.R., Taylor J. and Stabler, J.C. (1993). Nonfarm labour market participation of farm women. *Canadian Journal of Agricultural Economics* 41: pp. 81-95.
- Parker, T.S. (1993) Nonmetro Areas Trail in Growth of High-Income Occupations. *Rural Conditions and Trends*, Vol. 4. Washington, DC: USDA, Economic Research Service.
- Parr, J. B. (1987) Interaction in an urban system: aspects of trade and commuting. *Economic Geography* 63(3): pp. 223-240.

- Preston, V. and McLafferty, S. (1993). Gender differences in commuting at suburban and central locations. *Canadian Journal of Regional Science* 16: pp. 237-259.
- Salant, P. (1991). Europeans Strive to Untangle Rural from Agricultural Policy. *Rural Development Policy*, Vol. 7. Rockville, MD: USDA, Economic Research Service.
- Saskatchewan Agriculture and Food (1994) *Agriculture 2000*. Regina: Saskatchewan Agriculture and Food.
- Stabler, J.C. (1987) Trade centre evolution in the great plains. *Journal of Regional Science* 27: pp. 225-244.
- Stabler, J.C. and Olfert, M.R. (1992) *Restructuring Rural Saskatchewan: The Challenge of the 1990s*. Regina: Canadian Plains Research Centre.
- Stabler, J.C. and Olfert, M.R. (1996) *The Changing Role of Rural Communities in an Urbanizing World: An Update to 1995*. Regina: Canadian Plains Research Centre.
- Stabler, J.C., Olfert, M.R. and Fulton, M. (1992) *The Changing Role of Rural Communities in an Urbanizing World: Saskatchewan 1961-1990*. Regina: Canadian Plains Research Centre.
- Stabler, J.C., Olfert, M.R. and Greuel, J. (1996) Evolution of spatial labour markets in the northern great plains: implications for the rural labour force. *Growth and Change*, 27: pp. 206-230.
- Statistics Canada (1995) *Women in Canada: A Statistical Report*. Ottawa: Minister of Industry.
- Statistics Canada (1990) *Focus on Canada: Women in the Labour Force*. Cat. No. 98-125. Ottawa: Minister of Supply and Services.
- Statistics Canada (1989) *Focus on Canada: Trends in Occupation and Industry*. Cat. No. 98-135. Ottawa: Minister of Supply and Services.
- Statistics Canada (1988) *Industry Trends, 1951-86*. Cat. No. 93-152. Ottawa: Minister of Supply and Services.
- Sumner, D.A. (1982) The off farm labour supply of farmers. *American Journal of Agricultural Economics* 64: pp. 499-509.
- Tokle, J.G., and Huffman, W.E. (1991) Local economic conditions and wage labour decisions of farm and rural nonfarm couples. *American Journal of Agricultural Economics* 73: pp. 652-670.
- Whitener, L.A. (1989) Labour market disadvantages of farmers seeking off-farm employment. In *Issues of the Nineties: Perspectives from the Social Sciences*. Proceedings of the 46th Professional Agriculture Workers Conference. Washington, DC: USDA, Economic Research Service.