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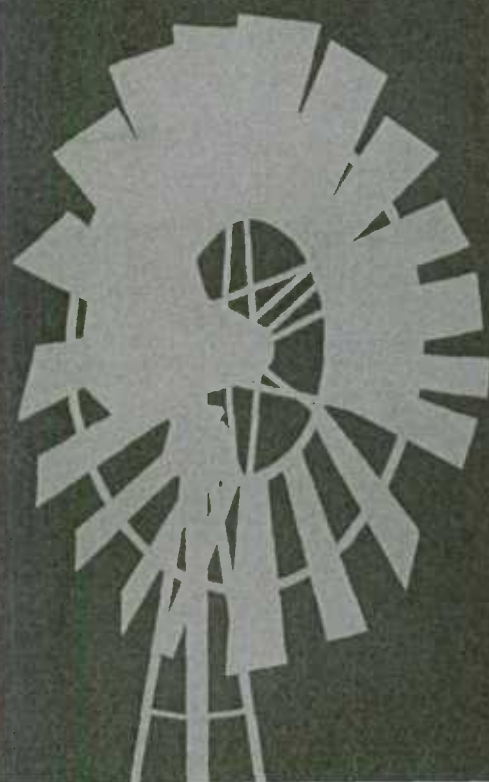
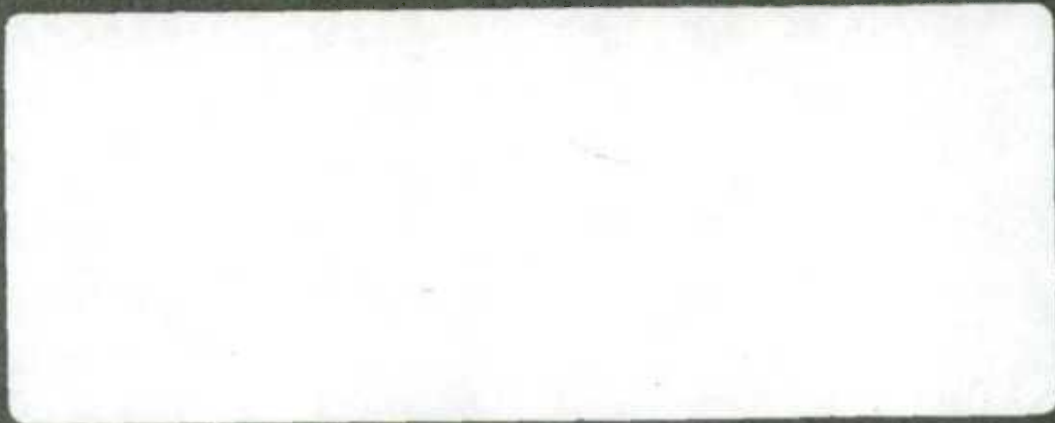
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The Structures of Agricultural Household Earning in North America Positioning for Trade Liberalization

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**The Structures of Agricultural Household Earnings
in North America:
Positioning for Trade Liberalization**

1 Introduction and purpose

Earnings structures reveal the strategic weaknesses and strengths of households in the climate of policy change, competition and predation associated with trade liberalization. We view trade liberalization as a process of harmonizing the rules of entitlement across sovereign trading jurisdictions. Examples of entitlements are entry and exit, information, government income transfers, pollution and structural concentration of market power and property rights.

The distinctiveness of the United States and Canadian agricultural economies influence their competitive advantage in each others' markets. All features of the two economic systems facing trade liberalization are under pressure to harmonize over time. The process includes the form of forward and backward linkages between agricultural and nonagricultural subsystems and stakeholders in the national economies. Trade liberalization is much more than a simple matter of harmonizing border measures.

We argue that earnings reflect the positioning of households to take advantage of, resist, or succumb to this restructuring of entitlements. In general, reduced market segmentation and the harmonization of social, economic and technology policies between the two countries tend to shift economic entitlements away from agriculture. This shift takes place because technological change substitutes industrial inputs for land and on-farm labour, the main property entitlements in agriculture. Information inputs are substituted for decision making ability, the main intellectual property entitlement.

Households earning economic rents, which are directly attributable to entitlements to transfers from government treasuries or legislated market power, are vulnerable to trade liberalization. Households with these attributes may be expected to seek to prevent harmonization, and most certainly may be expected to restructure or punt.

Competitive advantage is the ability to place a good or service into another trading jurisdiction at a net margin per unit of immovable assets higher than that of other competitors (Tweeton, 1992). Competitive advantage takes into account resource endowments, intellectual property and all prevailing market imperfections contrived and otherwise. Competitive advantage is achieved typically through economic efficiency coupled to alliances with government(s).

Intellectual property is the expression of talent, skill and knowledge owned by an individual or an institution such as a household. The term is more comprehensive than that of human capital and qualitatively distinct. Intellectual property is depleted by obsolescence, anxiety, discouragement, paranoia and depression. It is augmented through processes of accretion by learning and the release of human energy through motivated interest in work and risk taking. Its rewards are a flow of returns in proportion to the scarcity and uniqueness of the expression of these intellectual attributes, including an economic rent, social approbation and psychological satisfaction. Intellectual property is differentiated and protected by law, as is real property, in ways unique to each country.

Trade agreements, amplified by the tariffication outcome of the GATT agreement and the NAFTA provisions to reduce tariffs, promise a new tilt to the playing field on which business games with government are played (Freshwater, Apedaile and Ehrensaft, 1992). The outcome of these games is revealed in revised agricultural terms of trade, and in technological, institutional and structural change. These shifts lead to the redistribution of the economic value of productivity gains within agriculture, and among households and regions.

Specifically, the story in our analysis is that structural change is pervasive across all levels of importance of agricultural households to each economy. By and large the earnings structures are changing in concert across North America. We see structural change as the movement of agricultural households towards the extreme ends away from mid points on a scale of their importance to their national economies. Broad based restructuring of economic activities and employment in rural economies appears to be the most powerful force restructuring earnings of agricultural households. During the last three decades, pluriactivity of household labour has been hypothesized to be a transitory stage in a process of increasing concentration of households producing agricultural products. It is now increasingly recognized to be part of a global response to contradictions between feelings of impoverishment and the diminishing marginal utility of greater income needed

to satisfy aspirations to higher standards of living.

Households with high economic rents and low shares of direct agricultural subsidies within their earnings structures are likely to be most resilient to and best positioned to take advantage of rule changes. Generally these households are in the Southwest United States and have the highest volumes of sales of agricultural commodities per household. Households with the highest proportions of wages and of direct agricultural subsidies are most vulnerable to rule changes. Generally these households are found in Western Canada and in mid ranges of importance to their national economies.

The results reported here focus attention on three topics for US/Canadian negotiations on harmonization. The first is the ways that inputs, environmental and social costs of food security, agricultural export earnings and of countryside amenities are shared among consumers, taxpayers, agricultural households and future generations. The second is the cultural and legal understandings of property rights and entitlements such as the right to farm, land tenure, pollution rights, tax concessions, and the exercise of uncompetitive market power. The third issue is the collective vision and purpose for agricultural households in the national economies. The wheat dispute of 1993-4 is part of the early stages of testing, sometimes called "the dance", in the much larger process of negotiating around these topics.

This paper is modest relative to the scope of these structural and trade harmonization issues. The overall purpose is to use earnings structure to identify and define the positioning of agricultural households relative to opportunities and vulnerabilities of increasing cross-border trade in agricultural commodities, agricultural inputs, processed food products and intellectual property.

2 Method and data

2.1 Method of structural analysis

This study is comparative. The North American continent, less Mexico, is divided into east and west. Each side of the continent is then defined as three regions, Canada, north and

south United States. The data resources in both countries are massaged to create a comparable base of evidence. We paid particular attention to north-south patterns of structural change in anticipation of technological and harmonization features of trade-induced adjustment processes.

We present two forms of earnings structure to carry our analysis beyond the usual models of structural change (Boehlje, 1992). The approach is inspired in part by Nicolis and Prigogine (1989) and Stokes (1992), and in part by Coasian and Ricardian ideas on property rights and rents (Coase, 1937 and Ricardo, 1951). The focus is on the household to embrace all social definitions of family and to extend the concept of an operating decision unit beyond that of a farm and explicitly to encompass non-agricultural activities (deLord and Lacombe, 1990).

The source structure represents the earnings by type of profit seeking activity engaged in by a household. The source structure is observed as shares of household earnings from market derived net farm income; direct agricultural subsidies; off-farm income from wages and self employment; other nonfarm income comprised mainly of interest and investment income; and social safety net income from unemployment insurance, social security/assistance and old age security.

The composition structure of earnings represents the outcome of institutional and rent-seeking behaviour for rewards to fixed factors. Composition structure is observed by measured shares of household earnings accruing to labour, capital, and property rights and entitlements.

Source structure of earnings is a more sensitive indication than is the composition structure, of the effects of changes in rules governing transactions and property rights. These rules are viewed here as the outcome of predator prey relationships between agriculture and government much along the lines modelled by Rausser (1991) and de Gorter et al (1992).

The composition structure enables analysis of the resiliency and positioning of households relative to the closing and opening of opportunities in the process of trade. With new

opportunities, households with a large share of earnings in the form of economic rents are best able to finance adjustments needed to position themselves for economic growth. As other opportunities for these same households disappear under freer trade, education and intellectual property replace real property as the basis for being swift-footed in adjustment (Schultz, 1972). We suggest that substantial real property rents, as opposed to intellectual property rents, may become an impediment to adjustment.

Households having relatively low proportions of rent are vulnerable. Loss of entitlements for these households through policy harmonization, such as health care, would cut into standards of basic needs. Reallocation of household capital and mature labour to endeavours in new places would be more difficult, the lower the proportion of economic rents in household earnings. Under these circumstances, household youth would move.

2.2 Comparability of data

This paper reports an experimental technique to extract structural evidence in a comparable way from the Whole Farm Data Base in Canada and the Farm Costs and Returns Survey in the United States. Comparability of the data bases between the two countries is the greatest challenge facing this work. Oliveira, Whitener and Bollman provide an overview of the comparability issues in farm structural data in Working Paper No. 24 in this series. Comparability issues specific to this paper are presented here.

Data for the USA is from the 1988 and 1991 Farm Costs and Returns Survey (FCRS). It is a complex multi-frame sample of farm operators, involving both list and area frames. It is intended for cost of production analysis and assessing the general economic wellbeing of farm households (Ahearn, Perry and El-Osta, 1993). Since the survey was not intended for structural analysis its use here constitutes, in a sense, a test of its versatility.

The Canadian data is from the 1987 and 1990 Whole Farm Data Base (WFDB) (Spooner and Foley, 1992), and the 1986 and 1991 Agriculture Population Linkage data base. The WFDB is a fused data base of 60,000 observations comprising taxfiler data, Farm Credit Survey data and the Farm Financial Survey. The taxfiler component alone is used here. Retabulation of this unpublished enumeration level data (microdata) enabled us to modify

definitions of the variables to improve comparability between the two countries.

Multi-farm operators and multi-operator farms pose the first problem for comparability. They do not conform to the one-farm one-household structure needed to analyze farm businesses and farm households simultaneously, because they involve multiple families and households. The result is discontinuities between counts of farms and households, and between financial analyses of farm businesses and farm households.

The US FCRS tabulations exclude corporate farms and cooperatives, but include partnerships. The Canadian WFDB data also exclude corporate farms and individuals and households with more than one farm. However, since the classification criterion was the volume of gross farm sales, all households that could be "associated" with a single farm such as a partnership farm, are included.

The household data provide the average off-farm income and the household's share of net farm income. Thus households associated with a single unincorporated farm are included. The data for land area, capital and labour are for unincorporated census farms with gross revenue from agricultural sales greater than Can \$10,000. This data from the Canadian Agriculture Population Linkage is classified into vingtiles, defined below, determined from the WFDB.

Households with agricultural sales under Cdn \$10,000, correspond to 25% of all census farms in 1990 (Author j, Table 2B, 1993). Those associated with larger corporate agricultural enterprises account for 32% of agricultural sales in 1990 (Author g, 1991). The truncation of the lower end affects the structural characteristics of the first one or two vingtiles. The second truncation mainly affects the earnings structures of the upper 10 vingtiles, leading to under estimation of their per household market-based earnings and economic rents. This observation is based on the hypothesis of a higher level of profitability of agricultural activities by households operating incorporated farms.

We judge the short period of comparison to be adequate to indicate the direction of structural change. The length of period is irrelevant for purposes of prediction, however,

because history of complex dynamical systems does not constitute a basis for predicting the future. The periods are 1987-1990 (Canada) and 1988-1991 (USA).

The definition of variables and assumptions leading to comparability are recorded in an Appendix to the larger project report on this work (Apedaile et al, 1994).

2.3 Classification of households

Households are classified in increasing order of their agricultural contribution to the national economy. Comparisons between regions and across time are therefore standardized by level of agricultural sales relative to the total contribution of agriculture within each jurisdiction being compared. For example, households accounting for 21-25% of aggregate sales in Eastern Canada are compared to households in the Northeast United States which also account for 21 through 25% of agricultural sales.

The comparison is thus between households of equal rank in their contribution of agricultural products to their respective regional economies. This approach offers a solution to the problem of incomparability in time and across jurisdictions arising in the clash between historically dissimilar and arbitrary static reference bases for farm classifications, and the dynamics of technological change, farm consolidation and economic restructuring.

This classification of agricultural households and the definition of sales class marks a significant departure from most structural work. Agricultural households are grouped here according to their contribution to the national economy measured in terms of gross agricultural sales, not net farm income. Sales are the measure of the size of the farm component of household economic activities. We are looking for changes in the structure of agriculture based on what households do, not changes in number and distribution of households.

Twenty equal sized gross sales classes, called vingtiles, are established. A vingtile is a group of households which account for 5% of aggregate agricultural sales. There are two advantages to the classification. The groups are comparable across years and regions.

The relative contributory status of the group of households within a vingtile does not change over time and space. But the households themselves do. They restructure and/or attain a different contributory status, thus revealing the structural change of each vingtile. Problems with fixed sales classes are avoided. These problems stem from class obsolescence and hanging relevance across time, commodity specializations and regions. Second, the equality of class interval in proportional terms allows exploration of the possible forms of mathematical functions which may exist characterizing structural change (Koutsouyanis, 1981).

Vingtiles work well as long as the sample size for each vingtile is large enough. We do not know the definition of "large enough" and so opt for small cutoffs to obtain as much continuity as possible of data across all twenty vingtiles. Vingtiles for Canadian data were not distinguished when sample size is 15 or less. The corresponding minimum sample size for the United States data is 30 or less. This higher cutoff should offset the lower sampling fraction and higher aggregation weights in the US to reduce some of the apparently erratic behaviour of the data across the United States vingtiles.

This procedure works well for the WFDB but not so well for the FCRS. The variability in the graphs contained in Figures 1 through 4 illustrates the problem. The use of vingtiles may have pushed the FCRS beyond its design capabilities because all variability of the sample observations for each vingtile turns up as design noise in the vingtile estimates. Outliers are not exempted. Compression of the vingtiles into deciles would contribute some smoothing, but at the expense of information. We judge that evidence of patterns is present despite the apparent noise. Predictions are not intended, nor should they be attempted.

2.4 Estimating source and composition structure

The source structure of earnings is reported directly in the FCRS and the income tax component of the WFDB. Net farm income in the WFDB is unincorporated net farm income after depreciation as claimed for tax purposes. Direct agricultural subsidies (DAS) in Canada may be under-reported, often being combined with commodity receipts. Unlike the USA, the Canadian DAS typically includes premiums paid by farmers in current and previous years (Bollman, 1989). Income from pluriactivity is off-farm income from employment and self employment. The Canadian WFDB provides data for the income of

the operator and the spouse and dependent children, if present. " Other income " and " off-farm income " as well as " farm income " may be under reported according to the activity of the household in the underground economy.

The composition structure is derived. The wage share of earnings is income attributed to work effort, excluding the contribution of intellectual property. Thus the wage share could be viewed as the return to the " right to farm ". It is estimated at the level of basic needs defined by the national standards of the day in each country. In the United States, the wage share of earnings is the income required at the poverty line for food, clothing and housing. The Canadian definition is the slightly more generous " Low Income Cutoff " (LICO) defined by Statistics Canada.

Both " wage " definitions reflect family size. The standards for a three person household are US \$10,860 and Cdn \$16,472 respectively. The amounts are neither adjusted for purchasing power nor for the exchange rate differential. No attempt is made either to compare earnings structures using the same wage definitions. The two definitions simply represent minimum standards set by two different societies. These standards affect the relative competitive positions of United States and Canadian agriculture in each others' markets.

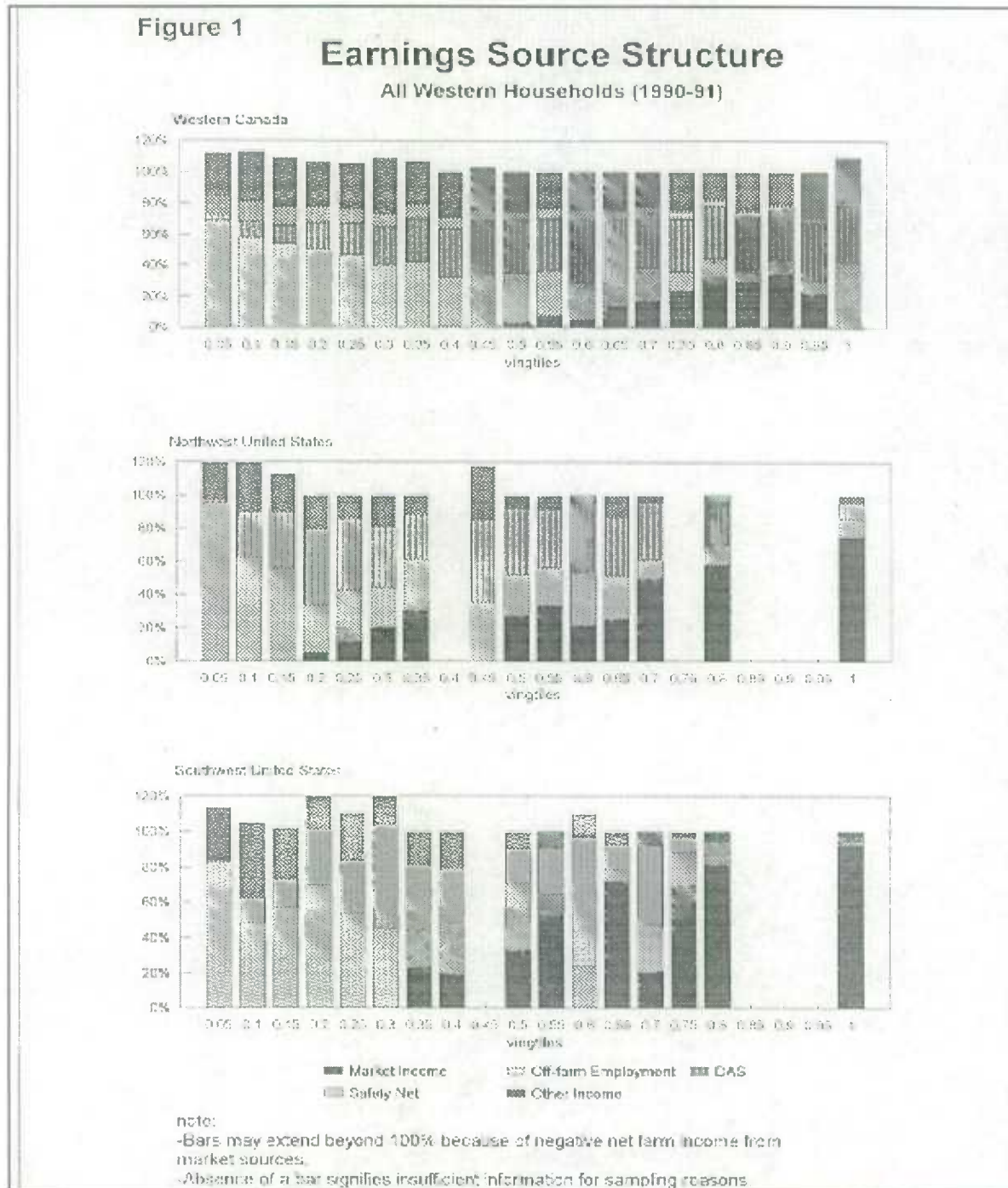
Capital returns are defined as a real rate of return of 3% on reproducible capital excluding buildings. The capital stock used for the calculation is the market value of machinery, equipment and tools, breeding stock, and quota value. This standard is an arbitrary long term opportunity cost to capital, taking into account the relative immobility of these types of capital.

Economic rent is the residual of household income less wages and the return to capital. In this work, profits are lumped with rents. Economic rent is the return to real property, including land, buildings and breeding stock, and to intellectual property including experience, skills, talent and education, after accounting for business expenses, and the long run return assigned to capital and labour. Economic rent includes the return from entitlements to degrade the ecosphere, to preferred tax status, to trade protection and to income transfers from government.

The structural patterns and tendencies reported in this paper must be interpreted carefully. Some change is not structural. Some non-change may mask structural change. Much of the change is a feature of changing terms of trade. The sample size for the United States regions is not large enough to allow the nature of change over the three year period to be understood completely, given the variance of household characteristics, especially for specialized households.

3 Source structure of earnings in 1990-91

3.1 Earnings source structure for all western households (Figure 1)



3.1.1 Relative importance of market-based agricultural earnings

Market based earnings for western Canada in 1990 are positive from the 10th vingtile on (median sales of \$108,000). The proportion is highest for households in the 18th vingtile (median sales of \$441,000) at 35 percent of earnings. This proportion is about half the high of 72 percent in the 13th vingtile in the southwest United States for 1991. About 30% of the value of agricultural output in 1990-91 in the western half of the continent is produced at a loss by about 60% of Canadian and 85-90% of the United States farms.

3.1.2 Role of pluriactivity

Pluriactivity in 1990 accounts for more than 30 percent of earnings for the 81% of western Canadian households which produce the first half, 10 vingtiles, of the output of the agricultural sector. The proportions of off-farm income in the Northwest and Southwest United States are greater than the Canadian proportions in the early vingtiles but decline sooner to nominal values by the 6th or 7th vingtiles. However the 1st through 7th vingtiles in the Northwest and Southwest account for 88 and 94% of all agricultural households compared to only 67% in western Canada. Pluriactivity is a pronounced feature of the source structure of earnings in the western US and appears to be becoming that way in western Canada, especially in the first two thirds of the vingtiles. Eastern Canada is notably less dependent on household pluriactivity than is western Canada.

Fuller and Bollman (1992) using similar data bases to those we used for the late '80s concluded that pluriactivity within agricultural households was more prevalent in Canada than in the United States. By matching their evidence based on the participation rates of spouses and operators in off-farm activity, with ours on earnings structure, we conclude that pluriactivity in the United States seems to be associated with higher quality rural jobs than in Canada. Further work would be needed to determine whether job quality differences could be attributed to education and skill levels, permanency, length of part-time, the mix of government (eg defence) and private sector jobs, performance of labour markets and metro influence.

3.1.3 Incidence of direct agricultural subsidies

The role in 1990 for direct agricultural subsidies in western Canada is particularly important for mid-sized family farms between the 6th and 15th vingtiles grossing between Cdn \$65,000 and 210,000 respectively. The proportion of direct subsidies ranges from 25-41% of earnings. This pattern is similar in 1991, at 27-49%, for the Northwest United States where the same vingtiles correspond to US \$135,000 and 631,000 (14th vingtile) in gross sales respectively. Direct agricultural subsidies in the Southwest, range widely from 8-73% for these same vingtiles, corresponding to aggregate sales volumes of US \$159,000 and 1,457,000 respectively.

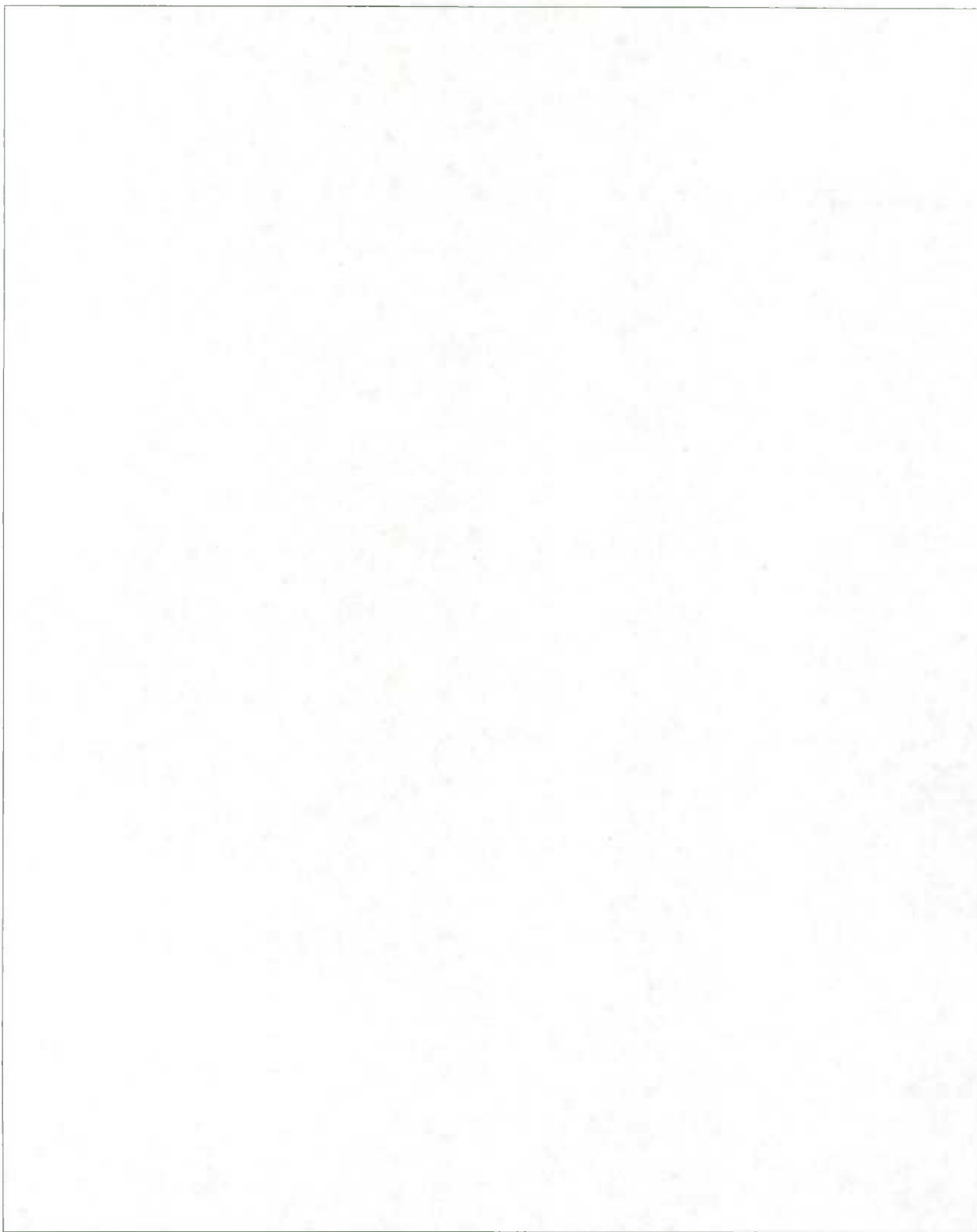
3.1.4 Other earnings and social safety nets

Other sources of earnings with a few vingtile exceptions are structurally more important in western Canada than in the western United States, ranging downward in Canada from 36% in the lower vingtiles to 18% in the upper vingtiles in 1990. Social safety net income in Canada accounted for an additional 13-3% of earnings declining relatively in higher vingtiles. Other earnings are equally important in the two US regions up to the 8th vingtile ranging downward in the Southwest from there to 4% in the 15th vingtile. In the Northwest, other earnings decline steadily across the vingtiles from a high of 31% in the second vingtile to 5% in the 20th. The US proportions include social safety net income.

3.2 Earnings source structure for all eastern households (Figure 2)

3.2.1 Relative importance of market-based agricultural earnings

Eastern Canadian agricultural operations are about 30% larger than they are in western Canadian household economies in most vingtiles, as measured by median sales of agricultural commodities. The reverse is true in the US regions. Agricultural sales are between 40 and 100% larger in the Northwest and 40-240% larger as vingtiles increase in the Southwest. Typical median sales for the 5th and 15/16th vingtiles are contained in tables 1, 2, 3 and 4 for all regions.



Eastern agricultural households rely increasingly on commodity markets and direct agricultural subsidies as they become individually more important to each of the two national economies. Market derived shares of household earnings become important at the 7th vingtile in both eastern Canada and the Northeast United States, and at the 5th vingtile in the Southeast. The proportion from these vingtiles on, runs at 30-58% of earnings in Canada, 46-66% in the Northeast US and 29-55% in the Southeast.

3.2.2 Role of pluriactivity

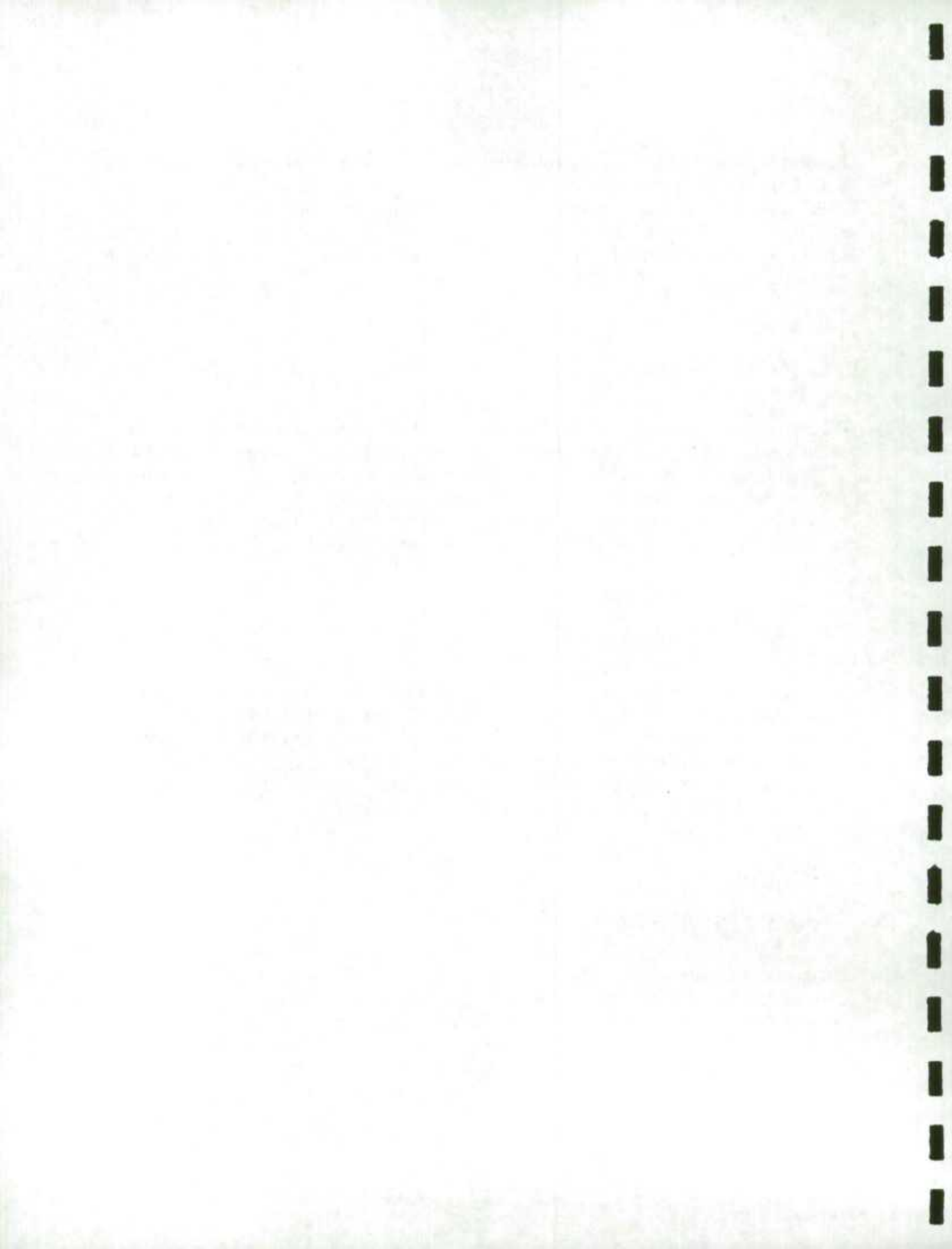
Off farm income is more important to eastern households at most vingtiles as one moves south. In all three regions the households in the first 4 vingtiles accounting for 57, 77 and 87% of the agricultural households from north to south respectively are dependent on off farm income. The proportion of off farm income in household earnings declines in all regions to 8, 8 and 4% respectively by the 19th vingtile (Figure 2). However, the proportion starts out in early vingtiles a full 10% higher in the two US regions than in Canada

3.2.3 Incidence of direct subsidies

Direct agricultural subsidies, excluding the income effects of supply management, assume the significant level of 17% of total household earnings at the fourth vingtile in Eastern Canada. This proportion increases to a constant 28-30 % for each of the subsequent 14 vingtiles which together account for 28% of the farms and 65% of the region's output. The importance of direct agricultural subsidies is also constant across most of the vingtiles in the eastern United States but at about half the Canadian proportions for the Northeast and a third in the Southeast.

3.2.4 Other income and social safety net income

Other household income for the higher vingtiles, including social safety net income, declines proportionally to 19% in the two US regions from about 24% in Northeast and 33% in the Southeast in the first vingtile. A similar pattern holds for eastern Canada, but leveling off at the higher share of 21%, down from 34%, of which social safety net income is 3 and 10% respectively. It was not possible to distinguish social safety net income in the US data.



3.3 North-south issues in source structure

The more important an eastern agricultural household is to its regional economy, the less pluriactive it is. The principal south/north pattern in the source structure of earnings is the growing part time nature of commercial agricultural households as one moves south. This pattern of increasing pluriactivity is in spite of the much higher concentration of output in the south. The eighty percent of output in the Southeast in the top 16 vingtiles is produced by 13% of the households, compared to 23% of Northeast and 43% of eastern Canadian households.

Direct agricultural subsidies account for a greater proportion of earnings south to north. Several hypotheses, untested here, could explain this south north pattern. One is that technological change originates in the south and becomes less and less appropriate as it moves north. Second, regionally defined standards for earnings are higher in the north, particularly as one crosses the border into Canada. Third, northern farmers are better lobbyists or predators on the national treasury. Fourth, agricultural households produce more public goods and services as one moves north, or the production of public amenities, such as healthy communities and preservation of the countryside, receives greater public recognition in the Northeast and in Canada. And, fifth, the ecosphere is less suitable to agriculture and less yielding to the substitution of capital for land in the Northeast US and eastern Canada, as was observed for Alberta by Packer and Apedaile (1965).

4 Composition structure of earnings in 1990

4.1 Western composition structure for all households (Figure 3)

Across all vingtiles the regional wage share of earnings in 1990-91 is highest for western Canada by a wide margin followed by the Northwest and then the Southwest. The Canadian wage share holds constant at a little over 50% of earnings for the 6th through 13th vingtiles. The proportion of earnings accounted for by the return to capital is highest in Canada reflecting higher levels of nonland capital in the inputs structure.

The proportions of rents are higher in the US regions. The proportions of rents in Canadian earnings for 1990 are lowest for households generating between Cdn \$75,000 and \$156,000 in the 7th through 13th vingtiles. The proportions in these vingtiles range between 19 and 36%. The US proportions for the same vingtiles in 1991 with some

irregularities in the data, are much higher at 69 to 87% of earnings for the Southwest and 65 to 73%, except 20% in the 8th vingtile, for the Northwest. The composition structures of earnings in all western regions are essentially unchanged between 1987/88 and 1990/91.

4.2 Composition structure for all eastern households (Figure 4)

The patterns of shares for the three types of earnings are similar across the three eastern regions from the 1st to the 20th vingtile. The share of wages declines.

There is an almost constant share of capital earnings and the share of economic rent increases. As in the West, economic rents are higher in the United States regions for all farms and vingtiles. In the Southeast economic rents are generally in excess of 50% of earnings from the 5th vingtile (households grossing US \$89,000) and over 90% from the 13th vingtile grossing US \$436,000.

In eastern Canada, the rent share is greater than 50% in the first three vingtiles, declines slightly to the 9th vingtile with gross sales of Cdn \$142,000, then increasing to the range of 50-74% for the balance of the vingtiles. The pattern in the Northeast is like in Canada with the lowest proportion of rent in the 3rd through the 11 vingtiles. The 11th represents median aggregate sales of US \$198,000. However, proportions of rents exceed those in eastern Canada in the upper vingtiles by 10-15%.

Figure 3
Earnings Composition Structure
All Western Households (1990-91)

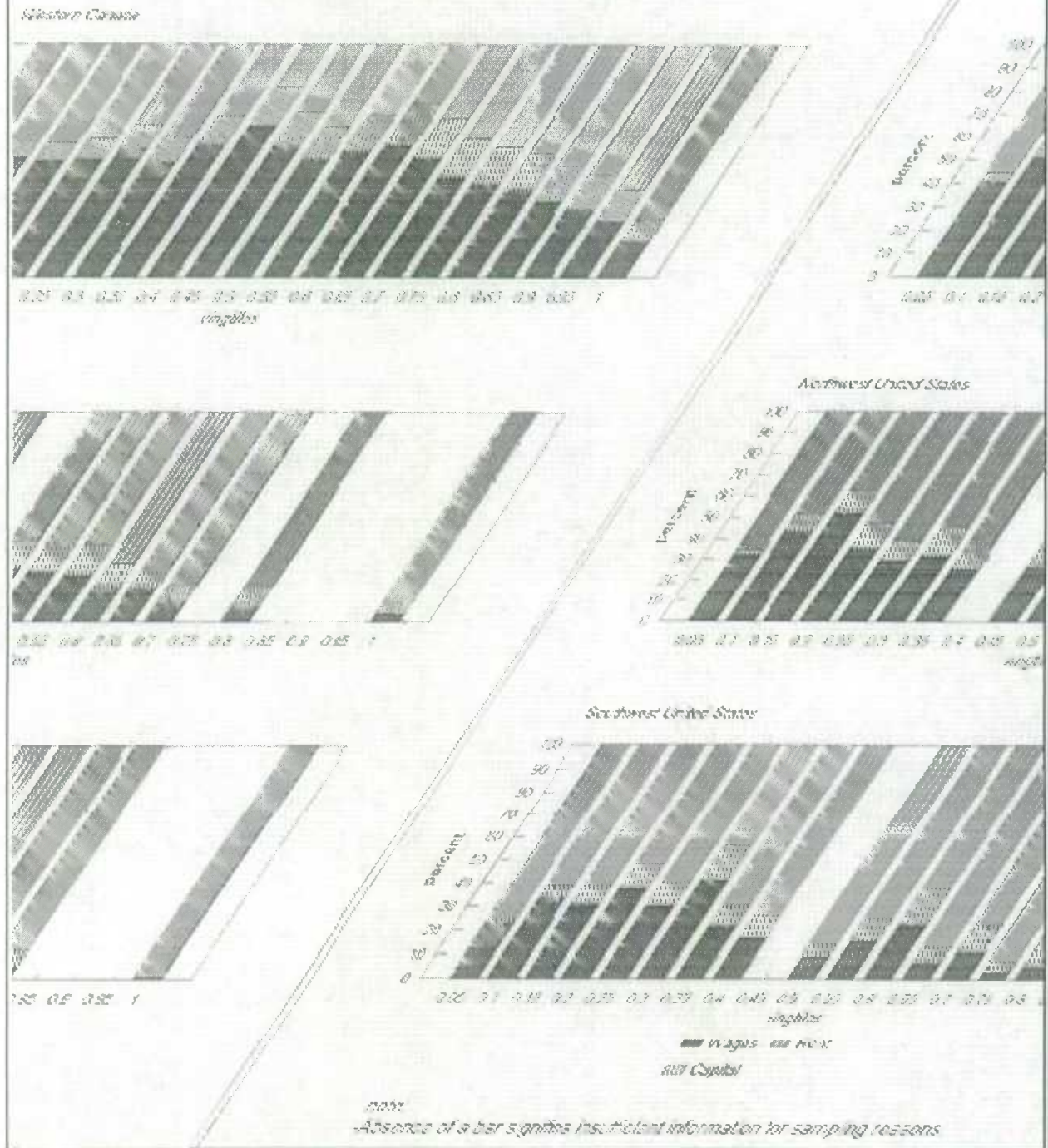
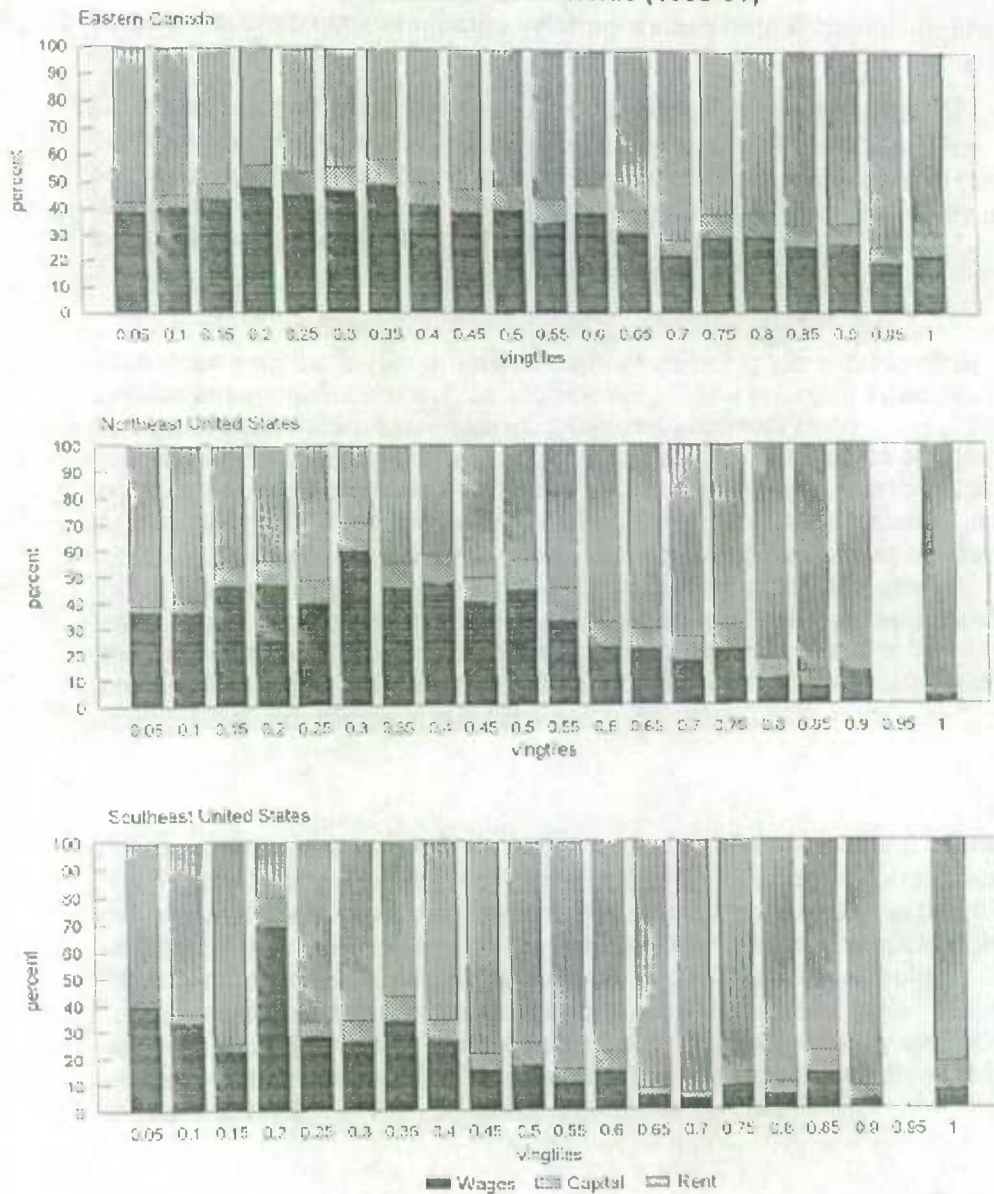


Figure 4

Earnings Composition Structure

All Eastern Households (1990-91)



note:

-Absence of a bar signifies insufficient information for sampling reasons.

5 Directions of structural change on the western half of the continent

Up to this point attention has been focussed upon static inter-regional comparisons of the source and composition structures in 1990/91. This snapshot provides useful evidence for regional differences but not of the direction of change. Now we attempt to compare regional dynamics by comparing evidence for 1987/88 with 1990/91.

This three year period is generally accepted as being too short to draw predictive conclusions about structural change. The changes in values of structural parameters cannot be attributed with confidence to structural change alone for reasons outlined earlier. The source structure is especially vulnerable to non-structural "noise" in the rural economy, to commodity prices and to treasury outlays. The composition structure, in contrast, changes in a relatively measured way, as noted already in several places. In both cases, the direction of change does constitute useful evidence of ongoing harmonization or divergence of earnings structures, as the case may be. We consider comparisons of the magnitude of the change in composition structures to be more indicative of real structural change than are the source structures.

Two vingtiles are selected for a detailed examination of structural change. They mark arbitrary breaks along the scale of importance of households to the national economy. The first is the fifth vingtile. Households in this vingtile have in common across time and regions their contribution of the 20 through 25th percentile of agricultural output. These households together with smaller contributors to agricultural output in vingtiles 1-4 account for 25 percent of the agricultural output of their country and 60-90 percent of the households. The second is the 15th vingtile which marks those households in the 70-75th percentiles of output.

The choice of these two vingtiles for comparisons over time achieves several purposes. They could be considered to represent small and large farms, where the definitions of small and large are determined by the times and regions involved. Second they are internal to the continuum of economic importance, avoiding extreme situations which could exist at each end. Third they represent approximately the median structures of each half of the continuum. The blending of the 15th and 16th vingtiles is necessary in some cases for reasons of data.

5.1 Western structural change at the 5th vingtile

Agricultural households within the first few vingtiles correspond to Perry and Ahearn's definition of limited resource farms (1992). The fifth vingtile could be viewed as beyond the limited resource category, on the boundary between sub-commercial and commercial agriculture.

The evidence here is that structural change is pervasive and simultaneous among agricultural households at all levels of importance to their regional economies (Tables 1 and 2). The result was not anticipated without a much longer period for observation. Quite the contrary. We were looking for signals of future structural change at the lower end of the distribution based upon structural change among the most commercial and industrialized upper end households.

The first five vingtiles account for the large majority of households, 57, 82 and 90 percent in Western Canada, the Northwest and Southwest U.S. respectively. The number of agricultural households in the 5th vingtile is increasing in the US regions (Table 1). Median area per household in this vingtile is only increasing in the Northwest, 31% in the three year period. In 1990-91 median area in the western United States regions for this vingtile is double that in western Canada.

The changes in the source structure for the lower vingtiles for the US regions are much smaller than in Canada. Pluriactivity in the Canadian regions seems to be playing catch-up to this feature of the US source structure for earnings, already prominent in 1988. Pluriactivity beyond the 5th vingtile in all regions declines as the capacity to produce agricultural commodities increases. These agricultural opportunities seem to be less associated with land than with agriculturally specific intellectual property for which there is limited off-farm demand.

The composition structure at the fifth vingtile appears to be stabilizing in the western United States regions with around 60% of earnings in the form of economic rents. In western Canada, economic rents are increasing rapidly from a very low share of 19% to a still low 34%. Thus labour returns continue to be the dominant component of earnings in western Canada, while returns to entitlements dominate in the United States. The slight reductions

in rent shares in the US may signify a turn-around in the composition structure associated with declines in direct agricultural subsidies. In Canada, the increase in rent share is associated with a significant increase in pluriactivity and market based income.

5.2 Western structural change at the 15th and 16th vingtiles

The numbers of households in these two vingtiles are thinning out much more rapidly in the United States than in Canada, as output capacity concentrates in the higher vingtiles. The 15th and 16th vingtiles in 1991 in the Northwest have only an estimated 1839 households remaining, down 45% from 3371 in 1988. In the Southwest, the number of households in the same vingtiles is only 1656 in 1991, down from 2039. The numbers in western Canada are an estimated 4625 down only 11% from 5170 in 1987.

Evidence from the 15th and 16th vingtiles demonstrates that households holding the same relative position within their regional industries can have markedly different structural characteristics. Median household sales in 1990-91 are Cdn \$232,000 in Canada, US \$1,010,000 in the Northwest and US \$1,762,000 in the Southwest. Net farm earnings per household including wages paid to family members are also dramatically lower in Canada at Cdn \$26,000, compared to US \$136,000 and US \$279,000 respectively. Median area per household for each region respectively in 1990-91 is much larger in the US at 4401 and 5131 acres in the Northwest and Southwest respectively compared to 1820 acres in Canada.

The production shares classification seems to have produced evidence of an unusually rapid shift in the farm size distribution in the United States compared to Canada. Individual US households in the 76 through 80 percentiles of sales have much higher sales capacity than just two years previously. For example in the Northwest, US \$1,010,000 in 1991 up from US \$567,000 in 1988. In western Canada this concentration process is stagnant by comparison, with sales capacity up only \$21,000 to Cdn \$232,000 from 211,000 in 1987. These differences in the shifts may be interpreted as evidence of differential rates of concentration. We have not investigated ways in which the sampling structures of the two data bases may also be reflected in this result.

Pluriactivity in all three regions, in these vingtiles accounted for 12% of earnings in

1990-91, up in Western Canada from 10% in 1988, up from 6 in the Northwest and down from 19 in the Southwest. It would seem that pluriactivity in these vingtiles may be at an earlier stage of development in Western Canada than in the United States.

In contrast to the rapid change in source structure, the composition structure at the 15th and 16th vingtiles remains relatively stable in the all western regions. Economic rents account for 90% of earnings in the Southwest up slightly from 86% in 1988. Rents in the Northwest declined slightly to 84%. These high proportions indicate heavy reliance upon property rights and entitlements. When changes in the source structure are considered, the evidence suggests that the mix of entitlements may be shifting to entitlements associated with stronger predatory power in markets, such as would be obtained through contractual alliances. Direct subsidies linked to real property seem relatively more important in Canada.

Table 1. Structural change in the 5th vingtile of gross agricultural sales representing the lower end of the distribution of size of farm operation, western Canada, northwest and southwest United States, 1987-88 through 1990-91.

Structural attribute	West Canada		Northwest U.S.		Southwest U.S.	
	1990 level	change 1990-87 percent	1991 level	change 1991-88 percent	1991 level	change 1991-88 percent
structural change in the 5th vingtile accounting for 5 percent of agricultural sales						
median agricultural sales (\$1000)	55	-5.2	113	+18.9	121	+17.5
total earnings per hshld (\$1000)	30.2	-10.5	36.3	-12.7	35.7	-11.9
net farm income per hshld (\$1000)	4.7	-2.0	19.8	+4.0	6.9	+2.0
number of agr households	8190	-1	8617	+3	11301	+4
percent of all hshlds	7		4		3	
cumulative % hshlds	57		82		90	
cumulative % sales	25		25		25	
cumulative % subsidies	29		44		45	
land per farm (acres)	906	-2.3	1804	+30.8	1899	0
earnings; absolute change						
source structure						
net market income (%)	-5	+21	12	-14	-11	-4
pluriactive income (%)	46	+23	31	-2	54	+2
direct agr subsidy (%)	21	-51	43	-2	30	-8
composition structure						
economic rent (%)	34	+15	61	-1	59	-7

Source: Author, 1987 and 1990. Whole Farm Data Base (WFDB), Statistics Canada. Unpublished taxation data. Excludes corporate farms, cooperatives and households which operate more than one farm, but includes all unincorporated partners associated with a single farm with gross agricultural sales over Cdn \$10,000.

Source: Author, 1986 and 1991. Agriculture and Population Linkage data base, Statistics Canada. Unpublished data for unincorporated single-operator farms classified into vingtiles determined from the WFDB.

Source: Author, 1988 and 1991. Farm cost and Returns Survey. United States Department of Agriculture, Washington. Excludes corporate and cooperative farms but includes partnerships.

Table 2. Structural change in the average of the 15th and 16th vingtiles of gross agricultural sales representing the upper end of the distribution of size of farm operation, western Canada, northwest and southwest United States, 1987-88 through 1990-91.

Structural attribute	West Canada		Northwest U.S.		Southwest U.S.	
	1990 level	change 1990-87 percent	1991 level	change 1991-88 percent	1991 level	change 1991-88 percent
structural change in the average of the 15th and 16th vingtile accounting for 5 percent of agricultural sales						
median agricultural sales (\$1000)	232	10	1010	78	1762	33
total earnings per hshld (\$1000)	43		168		268	
net farm income per hshld (\$1000)	26		136		279	
number of agr households	4625	-11	1839	-45	1656	-19
percent of all hshlds	4	0	1	0.5	<0.5	
cumulative % hshlds	98		99		100	
cumulative % sales	77		81		78	
cumulative % subsidies	88		96		98	
land per farm (acres)	1820	14	4401	-16	5131	-12
earnings; absolute change						
source structure						
net market income (%)	28	57	58	1	76	32
pluriactive income (%)	12	2	12	6	12	-8
direct agr subsidy (%)	35	-68	23	4	8	-15
composition structure						
economic rent (%)	46	4	84	-4	90	4

These vingtiles are used together because of some data gaps for the US regions. The numbers are medians for this decile.

Source: Author, 1987 and 1990. Whole Farm Data Base (WFDB), Statistics Canada. Unpublished taxation data. Excludes corporate farms, cooperatives and households which operate more than one farm, but includes all unincorporated partners associated with a single farm with gross agricultural sales over Cdn \$10,000.

Source: Author, 1986 and 1991. Agriculture and Population Linkage data base, Statistics Canada. Unpublished data for unincorporated single-operator farms classified into vingtiles determined from the WFDB.

Source: Author, 1988 and 1991. Farm cost and Returns Survey, United States Department of Agriculture, Washington. Excludes corporate and cooperative farms but includes partnerships.

6 Directions of structural change for all eastern households

6.1 Eastern structural change at the 5th vingtile

The fifth vingtile of agricultural households in the eastern half of the continent represents the smaller commercial farms. They appear remarkably similar in all three regions. Median sales in 1990-91 are \$85,000 in Canada, \$82,000 in the Northeast and \$89,000 in the Southeast. Median area per household for each region respectively in 1990-91 are also similar at 239, 362 and 338 acres. Total earnings per household are \$36,000, \$27,600 and \$39,000 respectively.

Structural change in the sources of earnings is most active in the Northeast United States. The share of direct agricultural subsidies is down 28 points to 9 percent approaching the 5% level of the Southeast. In Canada the share is down 13 points to 20%. The share of market derived income is up 18 points to 26% in the Northeast, again approaching the level of 31% in the Southeast, unchanged over the 1988-90 period. Income from pluriactivity passed the 50% mark in the Northeast surpassing the 49% share in the Southeast which experienced a reduction of 2 points over the three year period. The share of off-farm income is 34% in Canada, up 12 points.

The composition structure follows the pattern of change in the west and in the higher eastern vingtiles. Economic rents in all regions are increasing even though they are 20-30 points lower as a share of earnings than for the 15th vingtile. The fastest rate of increase was 28 points to 46% in Eastern Canada followed by the Southeast, up 11 points to 67%. The rent share of earnings in the Northeast was relatively unchanged between 1988 and 1991 at 49-52%.

These changes should be put into context. Agricultural activities account for less than a third of household earnings in this vingtile in all eastern regions. Nevertheless, these households account for nearly the same proportion of households, 3-4%, as they do of regional agricultural sales, south to north respectively. The cumulative percentage of households up to and including the fifth vingtile are 90%, 81% and 62% south to north.

6.2 Eastern structural change at the 15th vingtile

The higher vingtiles of the Northeast are also undergoing a period of rapid restructuring of earnings. The change reflects the characteristics of the farms which occupy these vingtiles in the two periods. Farms which retained the same vingtile status have changed their operations during that period. The proportion of net farm income in household earnings is up to 43% from only 1% in 1988. This increase compares to a decrease of 9% in the Southeast and +2% in Eastern Canada. Pluriactivity in the Northeast is up by 19 percentage points compared to 14 in the Southeast and a decrease of 1% in Canada. Direct agricultural subsidies in the Northeast have diminished markedly to 20% of earnings in 1991 from 77% in 1988. These numeric changes signal the presence of active structural change in the Northeast, observed earlier for lower vingtiles. We caution again that the numbers do not enable prediction, because past history of behaviour of complex systems, like these, does not determine the future.

In contrast to the Northeast, Eastern Canada is experiencing nearly no structural change in the source of earnings. We think this means that the composition of the farms in this vingtile is relatively unchanged compared to the Northeast US. However, there is evidence that the restructuring in Canada is taking place in the inputs as opposed to the earnings structure. All three regions experience a similar 30% decline in their debt/equity ratios at the 15th vingtile. This vingtile in Canada, with substantially higher capital labour and capital output ratios in 1987-88, records declines of 53% and nearly 42% in these ratios by 1990 respectively (Apedaile et al, 1994). Eastern Canada also has the lowest proportion of market based income and pluriactive income, and the highest proportion of direct agricultural subsidies in household earnings of all three eastern regions.

The pattern of change in the composition structure in the upper vingtiles appears to be stable in the east half of the continent. The proportions of economic rent in the composition structure are greater than 60% in all regions and continuing to increase, especially in the Northeast. The share of rents is highest in the Southeast at 86% in 1991. The rent share in the Northeast increased the most to 69%, a level comparable to that in Eastern Canada. Rents are highest and still increasing in the south and wage shares are highest and decreasing the least in the North. This change pattern and its stability in the composition structure for the east is similar to the pattern in the west half of the continent.

Table 3. Structural change in the 5th vingtile of gross agricultural sales representing the lower end of the distribution of size of farm operation, eastern Canada, northeast and southeast United States, 1987-88 through 1990-91.

Structural attribute	East Canada		Northeast U.S.		Southeast U.S.	
	1990 level	Change 1990-87 percent	1991 level	change 1991-88 percent	1991 level	change 1991-88 percent
Structural change in the 5th vingtile accounting for 5 percent of agricultural sales						
Median agricultural sales (\$1000)	85		82		89	
Total earnings per hshld (\$1000)	36		28		39	
Net farm income per hshld (\$1000)	13		10		14	
Number of agr households	3860	-20	27130	-4	9911	-13
percent of all hshlds	5		4		3	
cumulative % hshlds	62	-1	81	3	90	
cumulative % sales	23	-2	27	-1	28	
cumulative % subsidies	27	-4	40	9	26	11
Land per farm (acres)	239	-11	362	3	338	-4
Earnings; absolute change						
source structure						
net market income (%)	16	-8	26	18	31	1
pluriactive income (%)	34	12	51	7	49	-2
direct agr subsidy (%)	20	-13	9	-28	5	-2
composition structure						
economic rent (%)	46	28	52	3	67	11

Source: Author. 1987 and 1990. Whole Farm Data Base (WFDB), Statistics Canada. Unpublished taxation data. Excludes corporate farms, cooperatives and households which operate more than one farm, but includes all unincorporated partners associated with a single farm with gross agricultural sales over Cdn \$10,000.

Source: Author, 1986 and 1991. Agriculture and Population Linkage data base, Statistics Canada. Unpublished data for unincorporated single-operator farms classified into vingtiles determined from the WFDB.

Source: Author, 1988 and 1991. Farm cost and Returns Survey, United States Department of Agriculture, Washington. Excludes corporate and cooperative farms but includes partnerships.

Table 4. Structural change in the 15th vingtile of gross agricultural sales representing the upper end of the distribution of size of farm operation, eastern Canada, northeast and southeast United States, 1987-88 through 1990-91.

Structural attribute	East Canada		Northeast U.S.		Southeast U.S.	
	1990 level	change 1990-87 percent	1991 level	change 1991-88 percent	1991 level	change 1991-88 percent
structural change in the 15th vingtile accounting for 5 percent of agricultural sales						
median agricultural sales (\$1000)	267		379		545	
total earnings per hshld (\$1000)	54		66		122	
net farm income per hshld (\$1000)	36		42		85	
number of agr households	1420	-4	5930	-15	1620	-1.4
percent of all hshlds	2		1		<.05	
cumulative % hshlds	94		98		99	
cumulative % sales	71		78		80	
cumulative % subsidies	83		89		80	
land per farm (acres)	370	-6	1014	15	1635	27
earnings; absolute change						
source structure						
net market income (%)	39	2	43	42	50	-9
pluriactive income (%)	12	-1	30	19	24	14
direct agr subsidy (%)	28	-9	20	-57	19	-9
composition structure						
economic rent (%)	61	8	69	13	86	1

Source: Author, 1987 and 1990. Whole Farm Data Base (WFDB), Statistics Canada. Unpublished taxation data. Excludes corporate farms, cooperatives and households which operate more than one farm, but includes all unincorporated partners associated with a single farm with gross agricultural sales over Cdn \$10,000.

Source: Author, 1986 and 1991. Agriculture and Population Linkage data base, Statistics Canada. Unpublished data for unincorporated single-operator farms classified into vingtiles determined from the WFDB.

Source: Author, 1988 and 1991. Farm cost and Returns Survey, United States Department of Agriculture, Washington. Excludes corporate and cooperative farms but includes partnerships.

7 Discussion

This work is exploratory. We propose that two aspects of earnings structure, namely, source structure and composition structure, have something to say about the behaviour of agricultural households under trade liberalization. This work is also experimental. Structural analysis hasn't been done this way before. It involves novel retabulations for major Canadian and United States agricultural household data bases for which structural analysis was not anticipated. The results are evidence of both the versatility and limits of these two sets of sample data.

The method involves tabulations in vingtiles designed to shed light on how complex systems change structurally. It is useful to recall that agricultural households are parts of complex human systems behaving in dynamic and nonlinear fashions. The main feature of the design is that households may move across class boundaries over time as their economic status changes. Classification criteria from one region are not imposed on another. The relative status of households according to individual contribution to their national economies is the constant in comparisons.

We must emphasize again that the inherent nature of dynamical systems is that nonlinear phenomena prevent linear prediction of structural change, because it is associated with bifurcation behaviour (Apedaile et al, 1994). Structural predictions have always been quicksand for agricultural economists. Major exogenous impulses, like new trade rules, can change the proportionality of parameters such as terms of trade and relative productivities to strengthen or weaken the governing influence of strange attractors, upon which implications rest (Solomonovich et al, 1994). Nevertheless, we feel that the evidence reported here does enable anticipation of the nature of structural adjustments which may accompany freer trade and a changing policy environment.

Structural tendencies in both countries suggest that the source structures of earnings are moving in concert. This is not surprising. Changes in the source structure during the 1987/88-1990/91 study period are influenced mainly by market opportunities and treasury disbursements. We observe a tendency in the data over this short period for market based earnings to improve, especially in the United States. As direct subsidies are withdrawn or restructured, both their proportions and identification change in the earnings of farm households.

The consequent restructuring of entitlements to households changes both the composition structure of rents and wages in earnings, and what is observed. For example, today the growing EEP in the United States does not show up as a distinct payment to agricultural households and so does not appear as a direct subsidy. In contrast, GRIP payouts in western Canada, not only are counted as direct subsidies but overstate the subsidy by the amount of the insurance premium paid by the farmer. Changes in entitlement or in method of accounting can change the form as much as the substance of earnings.

High proportions of rents coupled with low proportions of direct subsidies in earnings structures generally signify resiliency to increased international competition, particularly where intellectual property rents are involved. A problem arises when harmonization processes attenuate real property rights and politically gained entitlements, or make intellectual property obsolete. Then the same rents which position households for resiliency to competitive forces are likely to diminish under rule changes. In particular, when rents are associated with significant proportions of direct subsidies in the source structure, the wellbeing of those households is particularly sensitive to changes in definitions of eligibility for subsidies.

Source structures of earnings suggest that the east and west halves of the continent stand to be affected in opposite ways by subsidy roll-backs and redefinition of eligibility criteria for income support, that is to say, entitlements. The difference between eastern and western Canada is that the support programs in the East are both taxpayer and consumer financed, while in the West they are only taxpayer financed. The degree of consumer financing shows up in the much larger share of market-based earnings in the East, attributed to supply management. The differences enable east and west in Canada to be played off against each other as the combined provisions of the GATT and NAFTA are tested by strategic trade moves to improve market shares, as evidenced by the Canada/United States durum wheat dispute in 1994. The differences for the east and west United States lie in the greater dependence of the West on taxpayer support. The Eastern agricultural households are largely self financing at all levels of importance to the National interest.

Households in the fifth through tenth vingtiles appear to be most exposed to changing rules on entitlements in all regions but the Northwest where the vulnerability occurs in even lower vingtiles. Relatively high proportions of wage earnings in the composition structure, much of which come from off-farm sources, limit their economic resiliency. High proportions of

direct subsidies in the western source structures make them doubly vulnerable. These households may be expected to slip into lower vingtiles. They are likely to disengage from their already modest agricultural contribution to the national economy irrespective of agricultural trade liberalization. Rural development in tradeables other than agricultural commodities at the level of community economies is the main alternative to rural outmigration for these households.

Western Canadian agricultural households in the middle ten vingtiles appear to be the most precariously positioned of all agricultural households in the six regions. They have a relatively high wage share in the composition structure, giving a clear signal of the future farm consolidation and decline in farm numbers in store for the Canadian prairies. They are the yet-to-disappear middle. This situation is associated with "right to farm" entitlements. It may also be evidence that the wage necessary to keep people from leaving the farm is less than the LICO.

Households at the high end of the range of shares of production in Canadian regions generally exhibit high rent and high direct subsidies. These households are most dependent of all on politically derived entitlements, benefitting from the political power of the middle. They have and use influence to maintain and enhance these entitlements. If these were to be reduced by trade liberalization their ability to finance adjustment, attributed to healthy rents, may be impaired. Reduction of rents reduces cash flow and the market value of real property.

To this point the discussion focuses on general principles and emphasizes sensitivity to rule changes. This emphasis is in keeping with the protective nature of most agricultural policies. Harmonization means making protective measures in both countries more the same. It is already in progress with improvements in transparency and accessibility to dispute resolution provided by the CUSTA.

The potential structural effects of a continental agricultural policy, with no restrictive trade measures between the two countries, are evident in the comparisons at the fifth and fifteenth vingtiles. The earnings structures at the fifth vingtile in the eastern half of the continent are quite similar across the three regions. Trade liberalization might change the pace but not the differential pattern of structural change: Not so at the fifteenth in the east,

nor for both vingtiles in all western regions. Consider the cases one by one.

If legislated supply management in Canada were to be replaced by contractual supply management by processors, harmonization of agricultural policies would reduce the number of Canadian households in the higher vingtiles. Farm numbers in the 15th, for example, are proportionally only one quarter as prevalent in the eastern United States as in eastern Canada. Some Canadian households would be expected to move to higher vingtiles and most to lower vingtiles. With harmonization extended to the whole economy, the actual shifts across vingtiles would depend on the sequencing of policy change. Some examples of policies relevant to sequencing are licencing of intellectual property, highway running rights, truck, rail and ship policies, fuel taxes, port operations, collective bargaining, and environmental policies.

The major impacts of harmonization for North America revealed by our analysis, where supply management is not explicit, are reserved for the western half of the continent where traded commodities are relatively more important. This interpretation is based on the observation that the greatest differences in earnings and size structure of agricultural operations on the continent are at the higher vingtiles in the west. These differences also show up in smaller scale at the fifth vingtile. Consider the fifteenth/sixteenth vingtile. Median agricultural sales in the Northwest are more than four times those in western Canada. In the Southwest, they are more than eight times. Correspondingly, the proportion of the number of farms in these US regions, in these two vingtiles are a quarter and an eighth respectively of the proportion in western Canada.

Harmonization for western North America is not related to open borders as much as it is to harmonization of direct support from taxpayers. The impact of policy harmonization in the direction of the current United States model on numbers of farms in western Canada would be so great that a rapid change is politically and socially inconceivable. This earnings structure is valued in Canada and the affected households are still numerous enough to mount effective political resistance.

The main focus of policy harmonization in the west would be the relationship of households to commodity buyers at the first transaction. Given that some farms are more effective users of scarce resource entitlements than others, some analysts would argue that the US

model of an oligopoly for private grain trade and direct farm/agribusiness contracts favour efficiency. Growing awareness that not all the social, and especially the environmental costs, are reflected in these farm gate transactions with highly concentrated inputs suppliers and commodity buyers, makes this conclusion less obvious. As these costs become better understood and pricing institutions emerge to capture them, harmonization could test severely the fundamental philosophies of the two countries about the role of the State in the private economic affairs of its rural citizens.

Harmonization at the farm gate involves reconciling two radically different approaches in the two countries to attuning the collective concerns with individual pursuit of market imperfection. The Canadian "countervailing market power" model of the Canadian Wheat Board for export grain and supply management for feathers and milk contrasts sharply with the United States model of a "treasury floor" under agricultural terms of trade for cereals and oilseeds and unrestrained contract farming for the industrializing livestock sector.

The data lead us to believe that the Canadian model appears to slow technological change. Whether or not this rate is more in line with the pace of learning about its long run implications is unclear, despite delayed adoption in Canada of US inspired chemical and biotechnology by means of supplementary government testing and regulation. Neither is it clear that such learning would be put to advantage anyway, either in perfectly competitive markets or by other politically driven allocative and distributive economic processes.

These observations have implications for steering the pace and sequencing of harmonization, and the process of structural change. Harmonization at the pace implied by the tariffication and tariff reduction schedules in the GATT and the NAFTA are likely to have little effect on the regional earnings structures at the fifth and lower vintiles. The proportions of households in these vintiles are likely to continue to grow. Numbers, however, should continue to decline, but at a slower rate as households slip down into lower vintiles. There may be a need for a small farm policy to continue the delivery of countryside amenities, including environmental restoration, in some parts of regions of the two countries.

The policy implications for households at higher vintiles are more complex. In eastern regions, attrition of household numbers in the form of early retirements, out-migration of youth, pluriactivity and professionalization has been in progress for some time. The

comparisons of 1987-88 and 1990-91 indicate that the dynamics of this process, observed through earnings structures, are very active, especially in the Northeast. The time line on tariffication of supply managed commodities and their derivatives is an important element in an orderly adjustment in Canada of private wealth in the form of quota entitlements and real property rights. Timing is perhaps even more important for community wealth and amenities as the spatial distribution of cows and agricultural households per acre concentrates without supply management.

The harmonization challenge is evident in the approach and results of our structural analysis. The shift of humans, households and communities down the vingtiles and out of commercial agriculture for export and food security is the main problem of structural change. Humans and their social institutions are, relative to financial services, industrial inputs and processes, and commodities, less and less mobile across national boundaries as trade liberalization proceeds. Therefore these less mobile factors take the brunt of the economic costs of structural change. In particular, changes in earnings structure and in the engagement of households in agriculture in western Canada, in harmonization to the US model, could be as large, though not necessarily the same, as for the Canadian East Coast fisheries and West Coast logging.

Some of the evidence of relatively high wage shares in Canadian earnings structures leading to these interpretations may be attributed to the higher LICO in Canada. Other differences may be attributed to higher yields and rates of livestock gain in the United States, and to greater involvement in pluriactivity by US household members, especially for farms selling up to US \$140,000 of farm commodities accounting for 30% of US farm output. Stronger commodity prices in the US and lower US input prices, taking into account direct input subsidies, particularly affect net farm income. Lower direct agricultural subsidies across all US vingtiles offset these circumstances, except for households below the sixth vingtile in the West (Table 1). This complexity requires more research to determine exactly why the proportion of rents is so much higher in the US regions.

Most profoundly, the definition of real property rights and rights of privileged access to home markets underlie most rules of transaction, and therefore the political process of harmonization to reduce trade distortions. Effects of the interaction of agricultural technologies with agroclimatic conditions and local ecospheres in each country are also emerging into the policy domain. However, so far these environmental implications appear to be viewed in the context of maintaining competitive advantage rather than of

harmonization of rules leading to freer trade.

This comparative study of earnings structures reveals the main national differences facing harmonization associated with freer trade. First, the vision and purpose in each country for its rural and agricultural systems must be reconciled for successful harmonization. Second the way costs are shared for food, country-side amenities, sustainability and farm adjustment among agricultural households, taxpayers and consumers are viewed differently in each country. Third, regional differences seem to exist on property rights and entitlements. Examples are; the right to farm, land ownership, intellectual property, tax exemption, conditions of employment, entitlements to uncompetitive business practices and market power, and rights to pollute or degrade land, water and scenery.

Global technological change and economic restructuring have a prevailing effect on earnings regardless of these differences. Policy measures internal to each country are increasingly endogenous to the global process of coevolution of these two agricultural economies. Harmonization of tariffs and non-tariff border measures by both countries should enhance the effects of global technology and structural change. However, the evidence is that policy measures retain strong roots in the fundamentally different rural world views between the United States and Canada, even on a regional basis. Therefore the pace, sequencing and form of harmonization of domestic regional agricultural policies in these two North American countries are less than obvious.

References

- Ahearn, M., J. Perry and H. El-Osta. 1993. The economic wellbeing of farm operator households, 1988-90. Economic Research Service, USDA, Washington. January. 173p.
- Apedaile, L.P., C. Barnard, R.D. Bollman and B. Calkins. 1994. Structural Change of Earnings by Agricultural Households in the United States and Canada. Project Report. Department of Rural Economy, University of Alberta, Edmonton.
- Apedaile, L.P., H.I. Freedman, S.G.M. Schilizzi and M. Solomonovich. 1994. Equilibria and Dynamics in an Economic Predator-Prey Model of Agriculture. Mathematical and Computer Modelling. Vol. 19, Issue 11. pp 1-15.
- Arkleton Trust. 1989. Appraisal of the Factors Which Influence the Evolution of Agricultural Structures in the Community and Contribute to the Efficiency of the Common Agricultural Policy at the Regional and Farm Level. Preliminary report of the Arkleton Trust (Research) Ltd, Nethy Bridge, Inverness, Scotland, 17 December. 63 p + appendices.
- Author a. 1988. Farm Cost and Returns Survey. USDA, Washington.
- Author b. 1991. Farm Cost and Returns Survey. USDA, Washington.
- Author c. 1986. Census of Agriculture. Statistics Canada, Ottawa.
- Author d. 1986. Census of Population. Statistics Canada, Ottawa.
- Author e. 1987. Whole Farm Data Base. Statistics Canada, Ottawa
- Author f. 1990, Whole Farm Data Base. Statistics Canada, Ottawa
- Author g. 1991. Census of Agriculture. Statistics Canada, Ottawa.

Author h. 1991. Census of Population. Statistics Canada, Ottawa.

Author j. 1993. Census overview of Canadian agriculture: 1971-1991. Cat. 93-348. Statistics Canada, Ottawa.

Boehlje, M. 1992. Alternative models of structural change in agriculture and related industries. *Agribusiness*, Vol. 8, No. 3. pp 220-231.

Bollman, R.D. 1989. Who receives government payments? *Canadian Journal of Agricultural Economics*, Vol 37. pp 351-378.

Bollman, R.D. and A. Fuller. 1992. Pluriactivity among farm families: Some West European, US and Canadian comparisons. In: Bowler, I.R., C.R. Bryant and M.D. Nellis. (Eds). 1992. *Contemporary Rural Systems in Transition*, Volume 2; Economy and Society. C.A.B. International, Wallingford. pp201-212.

de Gorter, H., D.J. Nielson and G.C. Rausser. 1992. Productive and Predatory Public Policies: Research Expenditures and Producer Subsidies in Agriculture. *American Journal of Agricultural Economics*, Vol. 74, No. 1. pp 27-37.

DeLord, B and P. Lacombe. 1990. Dynamique des structures agricoles: Exploitations ou familles? *Economie Rurale*, No 199. septembre/octobre. pp 19-25.

Foley, E. and P. Spooner. 1993. Whole farm data base reference manual. Agriculture Division, Statistics Canada, Ottawa (unpublished).

Freshwater, D., L.P. Apedaile and P. Ehrensaft. 1992. Rural Areas, Level Playing Fields and Rules of the Game. *Choices*, May. pp 18-19.

Koutsoyiannis, A. 1981. *Theory of Econometrics*. Second Edition. The Macmillan Publishers Ltd. 681 p.

Nicolis, G. and Prigogine, I. 1989. *Exploring Complexity*. W.H. Freeman and Co. New York. 313 p.

Oliveira, V.J., L.A. Whitener and R. Bollman. 1994. Farm Structure Data: A US-Canadian Comparative Review.

Packer K.J. and L.P. Apedaile. 1985. Structural Characteristics of Southern Alberta Grain Production and Higher Freight Rates. Occasional Paper No. 11, Department of Rural Economy. University of Alberta, Edmonton, 1985. 44p

Perry, J.E. and M.C. Ahearn. 1992. Limited opportunity farm households in 1988. Unpublished draft report. ERS, USDA. 17 p.

Rausser, G.C. 1991. Predatory versus productive government: The case of US agricultural policies. Working Paper No. 613. Department of Agricultural and Resource Economics, University of California, Berkley. 35 p.

Ricardo, D. 1951. On the Principles of Political Economy and Taxation. Volume 1 of the works and correspondance of David Ricardo, P. Sraffa, Editor. Cambridge University Press for the Royal Economic Society, Cambridge. 447 p.

Schultz, T.W. 1972. The Increasing Economic Value of Human Time. American Journal of Agricultural Economics, Vol. 54. No. 5. December. pp 843-850.

Solomonovich, M., L.P. Apedaile, H.I. Freedman, S.G.M. Schilizzi and L. Belostowski. 1994. Impacts of recovery rates and terms of trade on strange attractors and predictability in sustainable agriculture. Staff Paper No. 94-06. Department of Rural Economy, University of Alberta, Edmonton. 38 p.

Stokes, K.M. 1992. Man and the Biosphere. M.E. Sharpe, Armonk NY. 323 p. See especially pages 3-31 for the philosophical origins for the understanding of humans' relationship to the biosphere, including principles of the systems approach to co-evolution.

Tweeten, L. 1992. Agricultural trade: Principles and policies. Westview Press, Boulder. 318p.



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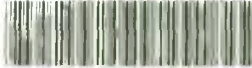
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