RESOURCE ECONOMICS AND ENVIRONMENTAL SOCIOLOGY

Industrial agriculture and community outcomes: A preliminary study of Goldschmidt's hypothesis in rural Canada

John R Parkins

Staff Paper #15-01

Staff Paper

UNIVERSITY OF ALBERTA
DEPARTMENT OF RESOURCE ECONOMICS AND ENVIRONMENTAL SOCIOLOGY

Industrial agriculture and community outcomes: A preliminary study of Goldschmidt's hypothesis in rural Canada

John R Parkins

John Parkins is Professor of Environmental Sociology, Department of Resource Economics and Environmental Sociology, University of Alberta.

The work of Dr. Prem Bhandari was instrumental in constructing the datasets that were used in this analysis. Also, we acknowledge the financial support of the Killam Research Fund, University of Alberta.

The purpose of the Resource Economics and Environmental Sociology 'Staff Papers' series is to provide a forum to accelerate the presentation of issues, concepts, ideas and research results within the academic and professional community. Staff Papers are published without peer review.

Abstract

In the 1970s, Goldschmidt found that industrialization of swine production in Iowa resulted in declining social and economic returns to neighbouring farming communities. This finding is confirmed by several more recent studies in the United States, indicating that regions dominated by family farms possess better socioeconomic conditions compared to regions with larger farms. This paper explores the Goldschmidt hypothesis in the Canadian context with data from the Census of Canada and the Census of Agriculture (2006) at the level of the Census Consolidated Subdivision. Measures of industrialization include indices of farm capitalization and farm receipts, and a ratio of total pigs and total cows per farm within a region and indicators for socioeconomic status include average income and a poverty rate. Bivariate and multivariate statistics show that the relationship between agricultural structure and socioeconomic outcomes is often weak, or potentially non-linear. The mean number of pigs per farm in a Subdivision, for example, is associated with higher average incomes to a point (approximately 2500 pigs) and then, on average, no further income gains are realized from larger herds. Based on these findings, we reject the Goldschmidt hypothesis and construct a more complex picture of the social effects of agricultural industrialization in rural Canada.

Keywords: community development, social impacts, industrial agriculture, social outcomes, rural development

JEL Classification: Q18, R11, R58, D31

Introduction

Progressive principles of modern market economies are based on a series of assumptions such as lower trade barriers, the increasing mobility of financial capital, flexible production and greater specialization that results in competitive, efficient, and productive industries. These principles are a *sine qua none* of mainstream business thinking and underpin neoliberal strategies in most western nations. Yet, there is evidence that the benefits of a more globally integrated economy are at best, not evenly distributed, and at worst, precipitating regions of severe decline in rural Canada and around the world. As an example, Goldschmidt conducted a series of studies on the impact of industrialized farming on towns in California during the 1940s (1978). Follow-up research in the 1990s with communities in Iowa confirms Goldschmidt's original findings that economic well-being in these communities is improved with the presence of smaller farms rather than larger ones.[1]

Based on the original work of Goldschmidt and subsequent follow-up research in the United States and Canada, the guiding question for this study is as follows: What is the relationship between agricultural intensity and social outcomes in rural communities across Canada? This question is crucial, in part, because we are facing a period of unprecedented industrialization within all sectors of primary production in Canada – and the agriculture sector is at the forefront of this transformation. Equally, the viability of many rural and resource-based communities is in question because of factors associated with cyclical commodity markets, increasing global competition, and industrialization – a process of economic transformation that, among other things, leads to fewer jobs and limits local economic benefits to a small number of individuals.

For these reasons, this research question is taken up in the Canadian context, to determine if the Goldschmidt hypothesis is supported with evidence from the Census of Canada (2006) and the Census of Agriculture (2006).

Social impacts from industrial agriculture

The idea that more intensive agriculture contributes to rural depopulation and community decline is a well-established theme within the sociology of agriculture[2]. The relationship between industrial structure and human well-being is particularly problematic within studies of U.S. rural regions, where researchers have identified a fairly regular pattern of diminished social well-being in regions where industrial agriculture is more predominant[3].

---

[1] Durrenberger, E.P. and K. M. Thu. 1996. The expansion of large scale hog farming in Iowa: The applicability of Goldschmidt's findings fity years later. Human Organization 55.

[2] Ervin, A.M., et al. (eds). 2002. Beyond factor farming: Corporate hog bars and the threat to public health, the environment, and rural communities. Canadian Centre for Policy Alternatives – Saskatchewan; Sumner, J. 2005. Sustainability and the civil commons: Rural communities in the age of globalization. Toronto: University of Toronto Press.

[3] Albrecht, D.E., et al. 2000. Poverty in Non-metropolitan America: Impacts of industrial, employment, and family structure variables. Rural Sociology 65(1).

Using a pool of 51 studies in the Unites States, Lobao and Stofferahn identify a consistent trend in this regard[4]. Where industrial agriculture is more prevalent, their evaluation of published studies shows a fairly clear pattern.

Table 1. Summary of studies showing the effects of industrialized agriculture on community well-being (Lobao & Stofferahn 2008).

	Findings with regard to detrimental effects		
	Detrimental	Mixed	No detrimental
Research design			
Case study	5[a]	2[f]	0
Macro-social accounting	12[b]	7[g]	8[j]
Regional economic impact	3[c]	2[h]	0
Survey	7[d]	2[i]	1[k]
Other design	2[e]	0	0[o]
Total (N = 51)	29 (57%)	13 (25%)	9 (18%)

As indicated in Table 1, 57% of studies showed detrimental effects from industrialized agriculture, with a further 25% of studies showing mixed results. In the cases where no detrimental impacts were observed, the authors indicate that positive impacts were confined to economic benefits such as employment. Social benefits (such as enhanced community groups, local participation in public life, etc.) were largely negative when industrial agriculture was more prominent. These results are used to show ongoing support for corporate farming bans in several U.S. jurisdictions.

Although there is less published research on this topic in the Canadian context, several researchers do address the social impacts of industrial agriculture. As an example, Broadway explores social changes associated with the Lakeside Packers meat processing facility in Brooks Alberta[5]. Consistent with studies in the U.S., Broadway finds a degree of social disruption associated with the large-scale industrial facilities – largely due to the influx of foreign workers, adjustment of recent immigrants into a smaller farming community, and job-related stresses that result in high rates of turnover.

These negative outcomes must be tempered, however, with consideration for economic activity that has been created in many rural communities due to the possibilities afforded by more recent modes of industrial agriculture in Canada. In particular, the food and beverage industry has become a major economic player, with the meat and meat products industry producing $14.6

[4] Lobao, L. and C W. Stofferahn. 2008. The community effect of industrial farming: Social science research and challenges to corporate farming laws. Agriculture and Human Values 25, 219-240.

[5] Broadway, M. 2001. "The social costs of beef pacing's move to rural Alberta." In (R. Epp and D. Whitson (eds). Wriging off the rural west: Globalization, governments, and the transformation of rural communities. Edmonton, University of Alberta Press; Ervin et al (2002).

Billion in shipments in 2002. A theory of core and periphery firm behavior in economics[6] and a theory of core and periphery regions in the sociology of underdevelopment[7] would suggest that certain rural communities may enjoy more favorable economic and social relationships with local industrial actors, resulting in economic gains for some communities and declines for others.[8] In short, the impact of industrial agriculture on rural communities may be quite variable.

Research is needed in order to gain greater insight into this variability in community impacts from industrial agriculture. Furthermore, many U.S. studies identify consistently high levels of poverty in rural and resource-based communities, yet the Canadian situation appears to be much different. For instance, a quick analysis of family poverty in the Province of Alberta, reveals rates of poverty among families in rural areas to be only slightly higher than among families in urban areas (statistically insignificant). Poverty rates are also relatively low within communities that host secondary manufacturing facilities (based on the Census of Canada, 2001). The section to follow outlines an approach to understanding social outcomes from industrial agriculture – with a focus on available data from the Census of Canada and the Census of Agriculture (2006).

Methods

This study offers a macro-level accounting approach to the question of industrial agriculture and community outcomes. This approach is consistent with other studies that address similar research questions[9]. It is important to note that other methods, such as regional accounting stances, and survey research are also used regularly to study this question, and authors have observed that the macro-accounting approach tends to show fewer negative impacts from industrial agriculture than other methods. Since the available data for such analysis are normally oriented toward economic outcomes, income, employment, and other community indicators of socio-economic well-being, our approach to the question of community well-being is also biased toward economic indicators.

The unit of analysis in this study is the Census Consolidated Subdivision, which is a mid-level geography in the Census of Canada and the Census of Agriculture, combining the municipal-level geography (Census subdivision) in such a way that includes the town and the surrounding municipal regions. In most cases, the CCS is comprised of 3 or 4 census subdivisions and this particular unit of analysis has advantages for this study in that our basic question involves

---

[6] Averitt, R.T. 1968. The dual economy: The dynamics of American industry structure. New York: Norton and Co.

[7] Allahar, A. L. 1994. Sociology and the periphery: Theories and issues. Broadview Press.

[8] Stedman, R.C., J.R. Parkins, and T.M. Beckley. 2004. Resource dependence and community well being in rural Canada. Rural Sociology, 69(2). 213-234.

[9] Crowley, M. L. and V. J. Roscigno 2004. Farm concentration, political economic process and stratification: The case of the North Central U.S. Journal of Political and Military Sociology 31: 133–155; Lobao, L. M. 1990. Locality and inequality: Farm and industry structure and socioeconomic Conditions. Albany, NY: State University of New York Press.

agricultural activities within a given region and the social conditions with that region's major human settlements.

Data was filtered for this analysis to include only non-Census Metropolitan Areas (CMAs) and CCS jurisdictions where average individual income was greater than zero. Therefore, where income data are suppressed in regions with smaller populations, these regions are not included in the analysis. The dependent variable in this study is *average individual income*.

Other indicators such as population and education attainment are also utilized, but the focus of our statistical analysis involves the relationship between agricultural intensity and average individual income within surrounding communities.

Three specific indicators of agricultural intensity are utilized:

Index of farm receipts. In the Census of Agriculture, total gross farm receipts are reported in nine categories; from the first category (under $10,000) to the ninth category ($2,000,000 and over).

Index of non-family corporations. According to the Census of Agriculture, a non-family corporation is one where the majority of shares are owned by unrelated individuals. In this instance, we assume such corporations to represent a farming enterprise that extends beyond the scope and intensity of family farming.

Index of farm capitalization. Similar to the index of farm receipts, this index is comprised of 9 categories; from the first category (Under $100,000) to the ninth category ($3.5 million and over).

Control variables are utilized because several factors are known to have an impact on average income. These include the following: *Low education attainment*, which is measured by the proportion of residents with high school education or less. Also, *population* is included because average incomes tend to be higher in larger centres due to cost of living and different job opportunities and skill sets in these centres. Lastly, *total number of farms* is included as a control because this variable may have an influence on income but it is not a particularly reliable measure of agricultural intensity. In other words, a larger number of farmers do not necessarily mean a larger number of "smaller" farms, and there are considerable differences in the total number of farms across provinces in this analysis (Table 2).

The following approach to analysis includes the presentation of descriptive statistics, a series of scatterplots to illustrate the bivariate relationships between key variables, and then a series of OLS Multiple Regressions are conducted using SPSS statistical software to determine the strength, direction, and significance of standardized co-efficients. These statistics are reported in a single table for all predictor and control variables.

Descriptive statistics

A total of 1873 non-metropolitan Census Consolidated Subdivisions (CCS) were included in the analysis, with a high of 809 in Quebec and 35 in Nova Scotia. The average population across Canada within each of these subdivisions is 1504 and the average individual income is $26,706 (Table 2). The mean number of farms in subdivisions across Canada is 122 with considerable variation between provinces. In Newfoundland the mean number of farms is 27 and in Alberta the mean is 666. Also, the total number of farms in each province is also quite varied, with provinces in Atlantic Canada reporting less than 2500 farms per province and Prairie Provinces reporting well in excess of 15,000 farms per province.

Bivariate relationships

The zero-order relationships between our indicators of agricultural intensity and average individual income are represented in a series of scatterplots (Figures 1,2 and 3). Figure 1 demonstrates a weak negative association between the index of gross farm receipts and average individual income ($R^2 = 0.014$); an indicator of weak support for the Goldschmidt hypothesis that larger-scale industrial forms of agriculture are associated with poor social outcomes at the community level. The middle line is an estimate of curve fit between the two variables and the upper and lower lines represent a 95% confidence interval around the estimate mean.

There is also weak evidence that the relationship may not be appropriately analyzed with linear assumptions. A quadratic fit line (estimating the non-linear relationship) provides a slightly better result ($R^2 = 0.016$), but this approach was not taken further in this analysis. Instead, the analysis is focused on the development on multiple regression models to gain greater insight into the multiple (farm-related) determinants of average family income in rural jurisdictions. The index of non-family corporations is also negatively correlated with average individual income, also providing weak support for the Goldschmidt hypothesis (Figure 2).

Table 2. Descriptive statistics of census consolidated subdivisions (CCS) for data and jurisdictions included in study

Variable	Canada	NF	PEI	NS	NB	PQ	ON	MB	SK	AB	BC
Mean population (#)	1,504	401	583	2,504	1,030	1,452	4,958	911	248	857	1,085
Mean individual income ($)	26,706	22,837	25,499	26,098	24,650	25,669	30,993	24,691	26,488	34,087	29,804
Mean proportion of population with low education	0.37	0.46	0.32	0.37	0.36	0.37	0.31	0.43	0.38	0.35	0.38
Mean number of farms	122	27	31	92	34	44	192	161	145	666	117
Total number of farms	170,471	433	1,317	2,850	2,108	24,009	33,729	16,719	40,558	39,273	9,475
Mean proportion of non-farm corporations	0.03	0.05	0.01	0.03	0.03	0.05	0.01	0.02	0.01	0.01	0.01
Mean number of cow farms	57	5	14	34	15	19	80	86	66	367	43
Total number of cow farms	79,831	82	588	1,069	908	10,476	14,043	8,925	18,593	21,648	3,499
Mean number of cows	2,126	115	536	539	560	939	2,816	5,889	4,799	13,391	2,325
Total number of cows	1,864,546	577	12,862	5,388	19,050	442,040	399,804	317,998	503,893	107,128	55,806
Mean number of pig farms	7	1	3	4	2	4	18	10	3	22	6
Total number of pig farms	9,289	15	106	124	97	2,170	3,082	1,073	855	1,298	469
Mean number of pigs	13,456	9	3,036	3,427	574	10,074	30,002	28,477	1,295	6,713	123
Total number of pigs	6,768,465	43	33,398	17,133	8,607	2,971,958	2,730,187	939,726	38,835	26,852	1,726
Mean capitalization index	4.41	0.55	4.62	3.46	3.75	4.43	4.38	4.43	4.48	5.24	4.63
Mean receipts index	3.58	0.49	3.69	2.59	3.03	3.97	2.84	3.77	3.88	3.53	2.16
Number of CCS	1,873	85	59	35	115	803	209	108	283	65	105

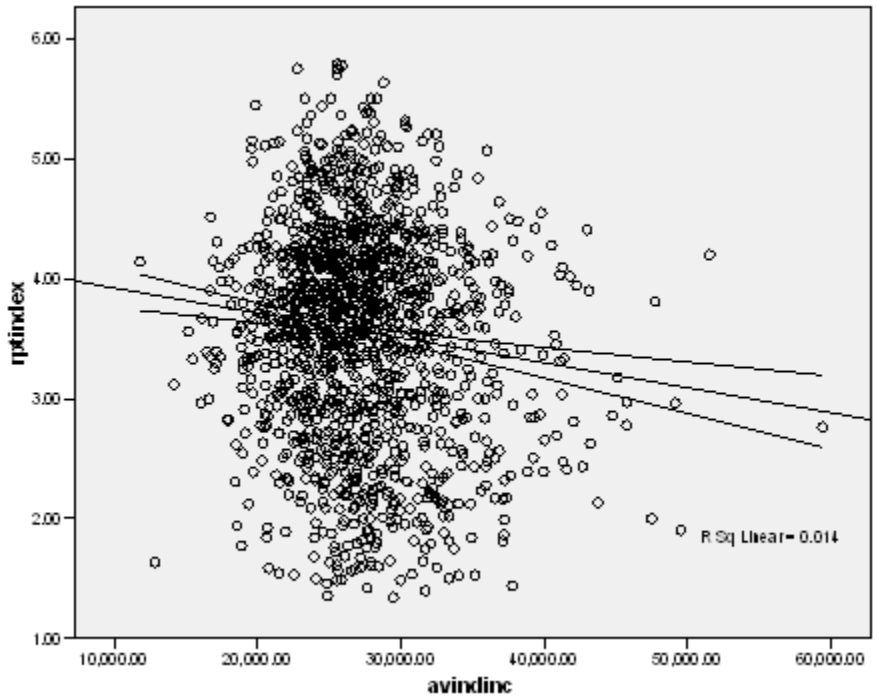

Figure 1. Scatterplot of receipts intensity index and average individual income.

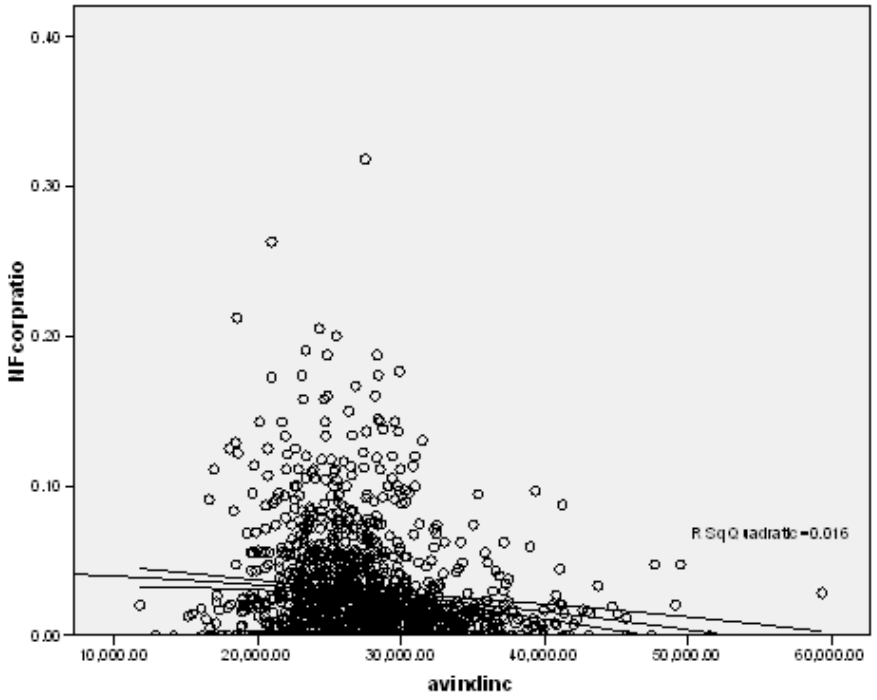

Figure 2. Scatterplot of proportion of non-family corporations and average family income.

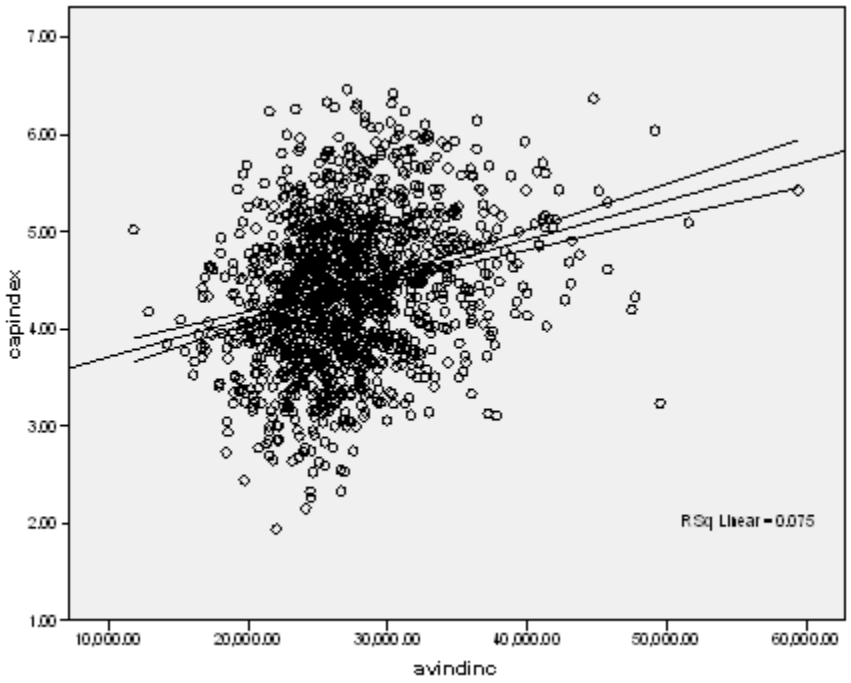

Figure 3. Scatterplot of capitalization intensity index and average individual income.

In contrast to Figures 1 and 2, the relationship reported in Figure 3 is positive between the index of total farm capital and average family income. This relationship is stronger ($R^2 = 0.075$) than the other two indicators of agricultural intensity and is not consistent with the Goldschmidt hypothesis. In other words, where farms are more capitalized there appears to be a corresponding increase in the level of individual income within the surrounding region.

Although this analysis offers some insight regarding our basic research question, the analysis is limited in several ways. First, there is a lack of uniform evidence to retain or reject the Goldschmidt hypothesis in part because of the conflicting evidence within the bivariate analysis (negative and positive co-efficients) and also because the relationships are statistically weak. Second, determinants of individual income are clearly linked to other social factors such as levels of education attainment, size and structure of the community, and so on. In order take account of these contributing factors, the next section explores a series of multivariate relationships to determine if the relationship between agricultural intensity and individual income is affected by other factors.

Multivariate relationships

In the multivariate analysis, OLS regressions were conducted with all three of the key indicators of agricultural intensity. These three models are reported in the first three columns of Table 3. When several contributing factors to individual income are controlled, results indicate that the strength and direction of the original zero-order relationships are maintained. Farm receipts and non-farm corporations are negatively correlated with average individual income (-.105 and -.064 respectively), and the strength of these relationships are also maintained, with non-family corporations maintaining a weakly significant relationship (p>.05). Farm capitalization is positively correlated with average income and this "capitalization" model has the strongest explanatory power of the three individual models (Adjusted R^2 = .241).

Table 3. Standardized co-efficients for farm intensity and average individual income within Census Consolidated Subdivisions, Census of Agriculture and Census of Population (2006)

Predictors	Receipts	Corporate farms	Capitalization	Combined model
Farm receipt index	-.105*			-.395*
Non-family corporation		-.064**		.006
Farm capitalization index			.146*	.436*
Low education attainment	-.219*	-.213*	-.196*	-.178*
Census Population	.188*	-.204*	.200*	.155*
Total farms	.319*	.303*	.271*	.192*
Adjusted R^2	.233	.226	.241	.319

* Significance at p>.000, ** Significance at p>.05.

We also considered a combined model in Table 3, where all three intensity variables were included in the regression equation. This model results in more polarized outcomes between farm receipts and farm capitalization (-.395 and .436 respectively). The non-family corporation variable also becomes insignificant in this model. In other words, the results of this model provide mixed evidence for the research question at hand. On one hand, agricultural intensity as measured by farm receipts is negatively associated with individual income and on the other hand agricultural intensity as measured by farm capitalization is positively associated with individual income.

Intensity of pig and cow operations

Given these mixed results, we explored other possible indicators of agricultural intensity that are available within the Census of Agriculture. Two indicators have some resonance here in that more intensive livestock operations are a significant, yet often controversial, component of many farming regions. Environmental issues such as waste management are often cited as a concern in these situations, yet the arguments in favour of larger-scale industrial forms of livestock management often relate to economic benefits within the

region and local employment benefits in particular. For these reasons we developed two indicators of livestock intensity. The intensity of pig farming was measured as the number of pigs in a CCS divided by the number of pig farms in the same CCS; the higher the ratio of pigs per farm, the higher the intensity of pig farming. The dataset was further filtered to include Census Consolidated Subdivisions where the pig ratio was greater than zero. In other words, analysis included pig producing regions only.

Similar to the pig ratio, the cow intensity ratio was measured as the number of cows in a CCS divided by the number of cow farms in the CCS. The dataset was filtered to include only those jurisdictions where the cow ratio was greater than zero.

Table 4. Standardized co-efficients for pig intensity, cow intensity and average individual income within Census Consolidated Subdivisions, Census of Agriculture and Census of Population (2006)

Predictors	Pig model	Cow model
Pig intensity ratio	-.006	
Cow intensity ratio		-.035
Low education attainment	-.398*	-.395*
Census Population	.249*	-.184*
Total farms	.275*	.229*
Adjusted R^2	.453	.337

* Significance at p>.000.

As reported in Table 4, although the ratio of pigs and cows within a CCS is negatively correlated with individual income in that CCS, this relationship turns out to be statistically insignificant in the multivariate equation. In regions where more intensive forms of livestock management are present, this activity is not associated with any change in average individual income.

The analysis of pig and cow intensity in rural Canada offers no further support for the Goldschmidt hypothesis that industrial agriculture is associated with lower social outcomes in rural areas. Rather, the evidence from this analysis tends to show that the level of agricultural intensity as measured by these indicators has, if anything, a weak negative or insignificant relationship to average individual income. The only exception to this statement is farm capitalization indicators, which appear to be positively correlated with average income.

Discussion and conclusions

One theme in this study involves differential outcomes based on our indicator of agricultural intensity. This outcome is consistent with other research on the relationship between industrial activity and socio-economic outcomes in Canada[10]. Depending on the type of industrial activity, and how this activity is measured, we observe quite distinct community outcomes. One of the major points of contrast in this study has to do with differential outcomes between farm receipts and farm capitalization. The reasons for this outcome are not entirely clear, but it may have to do with the suitability of these indicators as true measures of intensity. For instance, a family farm on the prairies may be highly capitalized in order to cultivate larger farm areas, but this is not necessarily an indicator of industrial agriculture. Families continue to be at the centre of these highly capitalized operations. Similarly, gross farm receipts could indicate agricultural intensity but this indicator is highly subject to the value of commodities that are being produced. Higher revenues from smaller-scale farms in Ontario, for instance, are not necessarily indicative of agricultural intensity. For these reasons there is likely some error between our latent concept of industrial agriculture and our specific measures of this concept. Researchers who are interested in this question will need to continue developing more robust indicators of industrial agriculture that can be applied in this type of study.

Another interesting result of this study involves the control variable, "total number of farms." Although we utilized this variable to deal with variation in the number of farms from one province to the next, and to address some of the diversity of farm size and farm type within Canada, it is interesting to note that "total number of farms" was positively and significantly associated with higher individual incomes across all regression equations (Tables 3 and 4). Given the conceptual limitations of using this variable as an indicator of agricultural intensity, we are reluctant to draw strong conclusions from this outcome, but more consideration of this outcome is warranted in future studies. Is it the case that more farms within a region are good for job creation, and more importantly, result in higher quality jobs with higher incomes? There is evidence here to suggest this might be the case.

Finally, as noted by Lobao and Stofferahn[11] the macro-social accounting approach that is used in this study is more often associated with positive social outcomes than is the case with other research approaches such as mail surveys or regional economic impact assessments (Table 1). The results of this study are consistent with these general findings. Based on the results from this study, there is little to no evidence that industrial agriculture is detrimental to average wage-based income in rural communities throughout Canada. One reason for this outcome might have to do with the differences in social welfare systems between Canada and the United States. The U.S. context may represent

[10] Stedman, R.C., J.R. Parkins, and T.M. Beckley. 2004. Resource dependence and community well being in rural Canada. Rural Sociology, 69(2), 213-234.
[11] Lobao, L. and C W. Stofferahn. 2008. The community effect of industrial farming: Social science research and challenges to corporate farming laws. Agriculture and Human Values 25, 219-240.

greater extremes in regional economic disparity than is the case in Canada. Also, the direct contribution of agriculture to real Canadian wages is relatively small, even in rural areas. Therefore, it is entirely possible that other factors such as the presence or absence of service industries or opportunities for off-farm income (such as employment in the oil and gas sector in Alberta, or the manufacturing industry in southern Ontario) are likely to have a significant effect on average individual incomes within rural regions of Canada. These "buffering" factors are likely to be important in the ongoing transition of industrialized agriculture in Canada.

It is also the case, however, that industrial agriculture is not a windfall for rural communities. Results from this study indicate, for the most part, more intensive forms of agriculture are not associated with higher incomes within host communities.

Further analysis will require work to determine the suitability of indicators for agricultural intensity. This is an important public policy question because of the ongoing industrialization of agriculture that is taking place and the sustainability challenges that are faced by many rural communities. Additional factors such as metropolitan influence are also linked to social outcomes at the community level, and require attention in subsequent analysis. Finally, our assessment of community well-being is limited to a single variable. Subsequent analysis can explore other dependent variables such as levels of transience (migration), education attainment, property values, and other indicators of community well-being.