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HUMAN CAPITAL AND RURAL DEVELOPMENT: WHAT ARE THE LINKAGES?

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Human Capital and Rural Development: What Are the Linkages?

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Abstract

Rural Canada is experiencing considerable “demographic pressure” as 1.76 rural persons are now looking for a job for each rural person retiring from the workforce. Rural Canada appears disadvantaged. Among OECD countries, Canada has the biggest urban-rural gap in the share of the workforce (aged 25 to 44) with university or college graduation. New jobs in the globalising economy require a high capacity to deal with disequilibria. Improving the human capital of the local workforce is essential to provide opportunities for the individuals in the workforce, regardless of where they will work.

However, local economic development strategies should focus on more than human capital development to stimulate local job growth. We offer 4 measures of local community development. Our equations explain only 21 to 34 percent of the variability in these measures of local community development in the 1980s. Contrary to the research findings in the United States, the findings reported in this paper suggest that the human capital complement in Canada’s communities did provide a positive (albeit weak) boost to job growth in the locality during the 1980s.

Thus, what are the linkages between human capital and rural development? First, the literature suggests human capacity is largely developed by the nutrition and nurturing of children, specifically in the period of minus nine months to plus three years. Secondly, a higher human capacity in a community (as proxied by years of schooling) is weakly associated with a higher growth in community employment but is weakly associated with a lower growth in wages that appears to cause a weak association with lower aggregate community earnings. Investment in nutrition and nurturing of children is a key factor. A higher education level in a community provided only a weak employment boost during the 1980s.

Human Capital and Rural Development: What Are the Linkages?

1. Introduction

Policy analysts, newspaper reporters, best-selling authors and the general public “believe”, in large majority, that the human capacity of the workforce will be the key factor determining improvements in well-being over the medium term. The evidence is scattered and the evidence of interest to rural populations is even more scattered. The objective of this paper is to assemble, to review and to synthesise the evidence concerning the role of human capacity to improve the well-being of rural people and, by inference, the well-being of rural places¹.

2. Why “rural” ?

Rural Canada is experiencing considerable “demographic pressure” as 1.76 rural persons are now looking for a job for each rural person retiring from the workforce (OECD, 1996, p. 43). Overall, rural areas experience lower employment growth, in part because the fastest growing sector, the business services sector, is largely concentrated in metropolitan centres (Government of Canada, 1995). Rural areas of Canada not adjacent to metro areas are experiencing out-migration, higher unemployment and lower incomes. Thus, there is justification for attention to rural employment policy.

¹ We acknowledge the not uncommon observation that a community may be dying but the few remaining individuals may report above average levels of well-being.

3. Why “human capital” ?

Nobel Laureate T. W. Schultz (1975) has emphasised the value of the ability to deal with disequilibria. As “disequilibria” [read: unpredicted change] confronts us from all directions, the ability to “define the problem” and “to solve the problem” takes on a high value. If we merely needed to grow the same crops with the same tools [technology] as our forefathers, then there would be no so-called “disequilibria” and there would be a low payoff to the human capacity to deal with disequilibria.

“Human capacity” and “human capital” are used interchangeably in this paper to encompass the overall capacity of an individual to contribute to his / her own well-being and the well-being of the community / economy. Long treatises have discussed the various components which include physical health, knowledge, ability to solve problems and even the investment of a geographic move that improves one’s earnings. The ability to cope with change and to solve problems is the implicit focus of this paper. The level of formal education is used as a proxy for human capital.

More recently, Reich (1991) has argued that the wealth of a locality is contained in the human capacity of the residents. Wealth in the form of financial assets and technology are easily transferred across borders. The complement of skills of the resident population is the wealth of a locality.

4. Human capital: where does it start?

The story starts with evidence of where cognitive skills start to develop. The importance of nutrition and nurturing of children (starting at age “minus nine months”) has been well documented elsewhere but the explicit link of nutrition and nurturing of children to local economic development is not well documented. Keating and Mustard (1993), Hertzman (1994), Mustard (1994), Nash (1997) and Blakeslee (1997) have reviewed the literature to make a direct linkage between the nutrition and nurturing of children and the ability of a society to

generate economic development. Children with good nutrition and good nurturing have the ability to cope and to succeed in a world that now requires an enhanced ability to deal with disequilibria – whether the disequilibria confronts the child in a Grade One classroom, a high school classroom or finding or making a job. If there is only one policy investment to be made in the development of human capital, investment in nutrition and nurturing of children should be **“the”** investment.

These arguments are not new. In the 1960s, some analysts (for example, see Abramson, 1967) suggested that psychological disorders in farm families – due, in part, to isolation and the dashed expectations for good crops and good incomes – fostered learning disabilities and impeded rural development. In such situations, it was not clear if local economic development would be facilitated by public intervention to train the adult population. Rather, attention to nutrition and nurturing the next generation may have been the appropriate target for public intervention. Others (for example, Popkin, 1972) also documented the relationship between achievement and nutrition.

5. The story for rural places

Most discussions of future trends predict “analytical skills” (i.e. the ability to deal with disequilibria) are expected to provide the big payoff for individuals (and by association, for localities where these individuals live) (e.g. Reich, 1991). Given the apparent “simultaneous globalisation and localisation” of society (Wade and Pulver, 1991, p. 108), problem-identification and problem-solving skills are needed to participate in the globalising economy. *At the same time*, more and more of the responsibility for human capital development is falling to the local level in most jurisdictions.

Some studies indicate that rural areas with a more highly educated workforce show more development. For example, a study by McGranahan and Kassel (1997) for the OECD

has shown that, for a selected group of OECD countries, high-education rural regions showed higher employment growth (or lower employment losses) than low-education rural regions².

Detailed studies in the United States (e.g. McGranahan, 1991; McGranahan and Ghelfi, 1991; Killian and Parker, 1991; and Killian and Beaulieu, 1995) show that a simple association between local education levels and local employment growth provides a positive correlation – areas of higher education levels will have higher employment growth. However, simply taking into account the industrial mix and the type of region lowers the impact of an educated workforce to nil. That is, in certain communities with a certain industrial mix, it appears that the presence or absence of an educated workforce has little impact on employment prospects.

These (admittedly) simple models search for the impact of human capital on rural places. The argument is that if a community has a highly-skilled workforce, the jobs will come. The general conclusion from studies in the United States might be summarised anecdotally as being similar to the case of the local community investing in an industrial park -- if you do **not** have an industrial park, the jobs will not come; if you do have an industrial park, the jobs still will not come unless you do something more. A well-educated workforce provides a similar benefit (and removes a similar constraint) as an industrial park -- it is a necessary but not a sufficient condition.

Thus, localities in the United States that invest in a well-educated workforce should not expect that jobs would come unless they do other things as well. Nevertheless, there remains a high and significant return to individuals to invest in education and training, wherever they shall end up working.

² However, some countries that were not able to provide detailed data did report better employment growth (or less loss) in low-education rural regions.

6. The story for Canada

Rural Canada appears disadvantaged. Among OECD countries, Canada has the biggest urban-rural gap in share of the workforce (aged 25 to 44) with university or college graduation (OECD, 1996, p. 170).

In census metropolitan areas (CMAs)³, the share of the population, 15 years of age and over, with less than Grade 9⁴ was 12 percent in 1991 (Table 1). This proportion increases as one moves away from the zone of metropolitan influence and increases to 28 percent in zones of no metropolitan influence. The share with less than Grade 9 varies considerably among the provinces -- in the zones of no metropolitan influence, the share varies from a high of 34 percent in Québec to a low of 20 percent in Nova Scotia.

A similar and inverse pattern is shown for the proportion of the population, 15 years of age and over, with Grade 12 or higher years of schooling. The highest shares are in the metropolitan centres (65 percent) and the lowest shares are in the zones of no metropolitan influence (40 percent) (Table 2). Again, considerable diversity among the provinces is evident.

Thus, the more “rural” the community, the lower the level of educational attainment in the community.

³ A census metropolitan area (CMA) is a city with an urban-core population of 100,000 or more plus the population in all surrounding municipalities where more than 50 percent of the workforce commutes into the urban core.

⁴ The “grade” level indicates the number of years of formal education. The almost universal progression is one grade level per year and children in Grade 1 are typically 6 years of age. In terms of the ISCED (International Standard Classification of Education), Grade 9 is equivalent to a lower secondary education (ISCED level 2) and Grade 12 is equivalent to an upper secondary education (ISCED level 3).

Table 1. Percent of Population with less than Grade 9 education, Canada and Provinces, 1991

	CMA/CA	Strong metropolitan influence zone	Moderate metropolitan influence zone	Weak metropolitan influence zone	No metropolitan influence zone	Total
Newfoundland	12	25	27	26	33	20
Prince Edward Island	11	19	19	28	33	15
Nova Scotia	10	15	16	19	20	13
New Brunswick	14	27	26	24	24	20
Quebec	18	26	30	28	34	20
Ontario	11	14	16	15	31	12
Manitoba	11	15	23	25	33	15
Saskatchewan	11	17	23	22	24	16
Alberta	7	9	14	14	22	9
British Columbia	8	10	10	11	21	9
Canada	12	17	22	20	28	14

Source: Statistics Canada. Census of Population, 1991.

Note: A census metropolitan area (CMA) is a core of 100,000 population plus all surrounding municipalities where 50 percent or more commute into the urban core. A census agglomeration (CA) is a core of 10,000 to 99,999 plus the surrounding municipalities where 50 percent or more of the workforce commutes into the urban core.

In this table, a "strong" influence zone comprises all municipalities where 20 to 49 percent of the workforce commutes into a CMA or CA. A "moderate" influence zone comprises municipalities where 5 to 19 percent of the workforce commutes into a CMA or CA. A "weak" influence zone comprises municipalities where >0 to 4.9 percent of the workforce live in the municipality and work in a CMA or CA.

Table 2. Percent of Population with Grade 12 or higher education, Canada and Provinces, 1991

	CMA/CA	Strong metropolitan influence zone	Moderate metropolitan influence zone	Weak metropolitan influence zone	No metropolitan influence zone	Total
Newfoundland	62	43	41	45	34	51
Prince Edward Island	65	52	49	39	19	57
Nova Scotia	62	51	52	49	43	57
New Brunswick	62	46	46	49	48	55
Quebec	64	52	47	48	40	61
Ontario	65	57	53	55	38	64
Manitoba	61	51	42	42	32	55
Saskatchewan	62	48	44	45	41	54
Alberta	68	57	52	53	45	64
British Columbia	67	60	59	58	46	66
Canada	65	54	49	50	40	62

Source: Statistics Canada. Census of Population, 1991.

Note: A census metropolitan area (CMA) is a core of 100,000 population plus all surrounding municipalities where 50 percent or more commute into the urban core. A census agglomeration (CA) is a core of 10,000 to 99,999 plus the surrounding municipalities where 50 percent or more of the workforce commutes into the urban core.

In this table, a "strong" influence zone comprises all municipalities where 20 to 49 percent of the workforce commutes into a CMA or CA. A "moderate" influence zone comprises municipalities where 5 to 19 percent of the workforce commutes into a CMA or CA. A "weak" influence zone comprises municipalities where >0 to 4.9 percent of the workforce live in the municipality and work in a CMA or CA.

The federal government, as part of its 1991 "Prosperity Initiative", proposed an objective of having 90 percent of all individuals having Grade 12 (or equivalent) by age 25 (Canada, 1991, p. x).

In 1991, only 11 percent of census consolidated sub-divisions⁵ reported that over 90 percent of residents aged 20 to 24⁶ had achieved Grade 12 or equivalent schooling (Table 3). As indicated above, the incidence with less than Grade 12 is higher in rural regions of Canada.

⁵ A census consolidated sub-division (CCS) is an incorporated municipality, township, town or city. If a small incorporated town is surrounded by a municipality, the two are "consolidated" for statistical purposes as a CCS.

⁶ We report the data for residents aged 20 to 24 to indicate the performance of the educational system for the age group that was the most recent potential group of high school graduates and to assess

Table 3. Number of Census Consolidated Sub-Divisions
by Percent of Youth 20 to 24 who have
Completed High School(*), Canada, 1991

Percent of youth 20 to 24 years who have completed high school	Number of census consolidated sub-divisions	Percent
less than 50 percent	335	14
50 to 60 percent	193	8
60 to 70 percent	449	19
70 to 80 percent	667	28
80 to 90 percent	501	21
90 to 95 percent	89	4
95 percent and over	171	7
Total(**)	2,405	100

Source: Statistics Canada. Census of Population, 1991.

(*) or equivalent (i.e. have taken post-secondary training).

(**) number of CCSs with 40 or more individuals aged 20 to 24 years to facilitate the calculation of the percent who have completed high school

One reason for a lower attainment of higher education in rural regions is a (perceived and perhaps real) lower demand for workers with higher education in rural areas. There is consequently a (perceived and perhaps real) lower pay-off to higher education in rural regions. Looker (1997) found that rural youth aspire to **and** attain a lower level of education. Interestingly, many rural youth do aspire for courses that “train” entrepreneurs. Hajesz and Dawe (1997) found over 2/3 of the rural youth in their sample would take an entrepreneurship class if taught in the school and 1/2 would take an entrepreneurship class if taught outside the school.

the status of CCS educational attainment relative to the government objective of a 90 percent high school graduation rate by age 25.

7. The impact of the level of schooling on local economic development

7.1 A preliminary model

As noted above, the literature for the United States provides little support for the hypothesis that higher levels of schooling will bring forth local job growth. However, this relationship has received little attention in Canada. The purpose of this section is to develop a preliminary model of local economic development to evaluate the contribution of schooling levels to local development.

The research attempting to explain international, national and local economic development is vast and varied. Issues of employment demand including technological change and issues of employment supply including labour mobility must be considered. Research attempting to explain differences in growth among countries generally finds that the level of human capital in the initial period positively influences subsequent national growth but the growth in the level of human capital appears to contribute little to national economic growth (Griliches, 1996).

Research to explain employment growth among USA counties appears to indicate that community education levels have no impact if one simply controls for the mix of employment by industrial sector as an explanatory factor in local employment growth in the USA (e.g. Killian and Parker, 1991, p. 108).

Freshwater *et al.* (1996) developed a simultaneous three-equation model to estimate the impacts of various variables on development outcomes and to test whether areas within the Tennessee Valley Authority showed higher levels of development outcomes. In effect, Freshwater *et al.* (1996) acknowledge that development is not a univariate dimension. They propose three measures of development; they develop an equation to explain each measure of development; and they explicitly recognise the endogeneity among the three measures of development by including each of the other two measures of development in each of their three equations (estimated simultaneously by 3-stage least squares).

We anticipate conducting a similar analysis for Canada but the results reported here start with a single-equation ordinary least squares model in the spirit of Kusmin *et al.* (1996).

Following Freshwater *et al.* (1996), we acknowledge that development is multi-dimensional. Development policy pursues more than one objective. Community welfare is

measured in more than one dimension. We offer four measures of local community “development”⁷ that are admittedly narrowly focussed on the performance of the labour market:

1. the rate of growth⁸ of average real⁹ earnings¹⁰ per worker in the community (for individuals with earned income, 15 years of age and over) (**LNCAVERN**¹¹);
2. the rate of growth of average real hourly wage rates¹² for workers in the community (**LNCWAGE**);
3. the rate of growth of employment in the community (**LNCEMP**); and
4. the rate of growth of community aggregate earnings¹³ (**LNCTEARN**) is offered as comprehensive indicator of community economic development. Kusmin *et al.* (1996) argue that the growth in community aggregate earnings (whether due to employment growth, or growth in earnings per worker, or both) is a useful single indicator of local economic development.

We identify four sets of factors to explain growth within localities:

1. a measure of the level of **human capital** in the community;
2. variables capturing the mix of **employment by industrial sector**, as local economic development will be (dis)advantaged by whether the local industrial sector is concentrated in expanding (declining) sectors;
3. measures of **local factors** influencing the level of local development; and
4. variables to capture the **nature of the region** within which the local economy is situated.

⁷ Freshwater *et al.* (1996) explicitly recognise that the level of human capital in a locality is (may be) a desired developmental outcome in its own right (this was their third measure of development) and at the same time, they want to know the role of this human capital in promoting the levels of the other indicators of development.

⁸ In each case, the rate of growth is calculated as the difference of the logarithm of the levels: $\ln(1990 \text{ level}) - \ln(1980 \text{ level})$.

⁹ We observe the rate of growth of *real* earnings and *real* wage rates by first deflating the 1990 data to 1980 data before calculating the rate of growth.

¹⁰ “Earnings” includes wages and salaries plus net self-employment income from operating a farm or non-farm business. Conceptually, this is equivalent to multiplying the hourly wage rate times the number of hours worked.

¹¹ Each variable is identified in bold by an acronym (in this case, the acronym represents the logarithm of the change in average earnings) that is used in the tables and the subsequent discussion.

¹² The hourly wage rate is estimated as the wages and salaries plus net self-employment income reported for the previous year divided by (the number of hours worked in the week prior to the census multiplied by the number of weeks worked in the previous year).

¹³ Community aggregate earnings is calculated as the sum of “earnings” for each individual who resides in the community.

The level of local human capital

Two alternative ways of measuring the level of local human capital are tested:

YOS1981: the average years of schooling for all individuals 15 years of age and older in the community; and

LTGR981: the percent of individuals, 15 to 64 years of age, with less than Grade 9 in 1981; plus

SOMEU81: the percent of individuals, 15 to 64 years of age, with some post-secondary schooling in 1981.

The idea here is that localities with low levels of education may gain due to increases in lo-tech manufacturing jobs and, at the same time, localities with well educated workforces may gain employment as they were more capable of participating in “new economy” jobs.

Mix of employment by industrial sector

The share of employment in four key sectors with (potentially) exportable goods and services is included:

PRIM81: the percent of employment in 1981 in agriculture, fishing, forestry, mining and oil extraction and hunting and trapping.

TRMFG81: the percent of employment in 1981 in traditional manufacturing activities (manufacturing industries not designated below as “complex”).

COMFG81: the percent of employment in 1981 in complex manufacturing activities (includes printing / publishing, machinery, aircraft, electrical products, petroleum and coal products, chemicals, and scientific / professional equipment industries).

PRSERV81: the percent of employment in 1981 in producer service activities (i.e. finance, insurance, real estate and business services such as accounting, consulting, software design and development, etc.).

Note that only the share of employment in sectors with (potentially) exportable goods and services are identified. These sectors are generally driven by market demand from outside the community. Most other sectors are driven by market demand from within the community and thus are endogenous with local population growth. Recognition of the dependency of the

community on key types of export markets is expected to explain part of local economic development in the 1980s. Specifically, the share of employment in primary sectors and in traditional manufacturing is expected to be negatively associated with both growth in employment and growth in earnings per worker. Specialisation in complex manufacturing and producer services is expected to be positively associated with employment growth and earnings growth.

Local factors influencing local economic development

- SELF81:** the percent of individuals, 15 to 64 years of age, who were self-employed in 1981 (excluding farm self-employed). One hypothesis would suggest that areas with a higher share of self-employed in the labour force (i.e. more “entrepreneurs” !) would generate more employment growth (but growth in average earnings would be expected to lag). An alternate hypothesis would suggest that a high incidence of self-employment in the initial period is an indicator that there is little prospect for new wage jobs and thus unemployed workers have resorted to self-employment endeavours.
- ABORIG81:** the percent of individuals in 1981 with an Aboriginal ethnic background. Localities with a higher share of Aboriginal population show a boom in the Aboriginal working age population due to the high fertility rates in the last two decades. However, an expanding potential work force may not translate into expanding employment. Typically, unemployment is higher, labour force participation rates are lower and outward mobility is not negligible. Growth in average earnings would be expected to be less than average.
- UNEMP81:** the percent of the labour force, 15 to 64 years of age, which is unemployed in 1981. A high unemployment rate indicates an excess supply of labour that would be expected to generate employment growth but growth in earnings per worker would be expected to be lower.
- EDUCIN81:** the percent of individuals in 1981, 15 to 64 years of age, working in the “educational industry” -- i.e. working in an educational institution, whether as an instructor or as support staff. It is expected that the knowledge infrastructure provided by the members of the educational industry would provide a positive contribution to local employment growth. However, the education industry *per se* achieved significant earnings growth in the 1970s even relative to the significant

real growth in all sectors. Thus, it is expected that localities with a higher share of employment in education industries would show less earnings growth in the 1980s.

YOUTHIN81: the percent of youth in 1981, aged 25 to 29, who have moved into the locality in the five years previous to 1981. This might be interpreted as an indicator of “expected” growth over the subsequent period. It is also expected to augment the level of human capital. Both employment growth and average earnings growth are expected to be positively associated with this variable.

PEROLD81: the percent of the population in 1981 that is 55 to 74 years of age. A high share of individuals in this age class usually results from the outward mobility of youth and thus this variable is an indicator of “expected” employment decline and / or earnings decline. Also, a high share of the population in this age category is expected to have lower educational levels and thus this variable is also intended to account for the fact that a measured low average educational attainment level may result from a high share of older persons in the community.

NEW5581: the percent of individuals 55 to 74 year of age in the locality who moved into the locality in the 5 years previous to 1981. This is a proxy for a retirement destination community. The stronger is this factor, the larger is the expected employment growth to provide services for the retirees. The impact on earnings per worker is uncertain as the new jobs may be in lower-paying service sector jobs.

LT21K81: the percent of individuals in the locality living in households with income less than the national median of \$21 thousand (current 1981 dollars). There is a new and expanding literature (see Osberg, 1995) that suggests that places with a more equal distribution of welfare will experience more growth. In other words, there is not a trade-off between equity and growth -- rather a more equal distribution of welfare contributes to economic growth. It is expected that a larger share of low income individuals will reduce local employment growth. However, localities with a high incidence of low incomes in 1981 would be expected to regress towards the mean and thus to show relatively higher earnings growth in the 1981 to 1991 period.

The nature of the region in which the locality is located

To indicate the nature of the region, we adopt the typology developed by Hawkins (1995) (see also Hawkins and Bollman, 1994 and Bollman, 1994). Seven types of regions were identified. Dummy variables are used to indicate the type of region in which the locality is situated. Census divisions with large cities were identified as primary settlements (**DPRSETTL**). Census divisions with smaller cities were identified as urban frontier (**DURBFRON**). The excluded class¹⁴ of census divisions were the rural nirvana census divisions -- these were rural census divisions benefiting from the metropolitan influence of Toronto plus a few census divisions around Vancouver, Winnipeg and Montreal. Census divisions where agriculture was important were agro-rural census divisions (**DAGRRUR**). These were located in the grain belt of Saskatchewan and Manitoba plus the agricultural areas of Québec. Census divisions with poor economic prospects were clustered as rural enclave census divisions (**DRURENCL**). These census divisions include Pontiac County in western Québec plus most census divisions in the Gaspé region of Québec, northern New Brunswick, the ends of Prince Edward Island, the ends of Nova Scotia and outport Newfoundland. Census divisions endowed with natural resources (forestry, mining, oil and gas) (many Alberta census divisions plus northern British Columbia and northern Ontario) plus the census divisions with good human capital resources in the capital cities of Whitehorse, Yukon and Yellowknife, Northwest Territories were labelled resourced areas (**DRESAREA**). Other northern census divisions with a larger Aboriginal population were designated as native north census divisions (**DNATIVNO**).

The excluded class was labelled “rural nirvana” because these regions were experiencing both population growth and earnings growth as they were in the rural shadow of large metropolitan markets. Thus, **DPRSETTL** may be expected to have higher employment growth and higher earnings growth than the excluded regions and all other regions would be expected to have lower employment and lower earnings growth.

We estimate the association between these variables and the four measures of community development for three sets of observations:

¹⁴ Dummy variables (i.e., 0,1 variables) are used to indicate into which group an observation is classified. One group must be excluded from the analysis to prevent the matrix from being singular (which is caused by the sum of the dummy variables for each observation being equal to 1). The coefficient on each dummy variable indicates the impact on the dependent variable by the given dummy variable, relative to the excluded group.

1. all communities in all regions (i.e. all census consolidated sub-divisions in all census divisions in Canada);
2. all communities in only *predominantly rural regions*, as defined by the OECD (1996) (i.e. census divisions with more than 50 percent of their population living in rural communities); and
3. only rural communities, as defined by the OECD (1996), regardless of the type of region in which they are situated (i.e. all census consolidated sub-divisions with less than 150 inhabitants per square kilometre).

The three sets of results are discussed to see if the relationships also apply when the analysis is restricted to communities in rural regions and to rural communities, regardless of the type of region.

7.2 Data

The data are tabulated from the 1981 and the 1991 Censuses of Population.

7.3 Results

We present the results for four regression equations estimated by ordinary least squares. The objective is to determine the empirical association between community human capital and the growth in real average earnings (**LNCAVERN**), the growth in real average hourly wages (**LNCWAGE**), the growth in community employment (**LNCEMP**), and the growth in aggregate community earnings (**LNCTEARN**)¹⁵. The equations where community human capital is measured by **average** years of schooling (**YOS1981**) are presented in Table 4. The equations where the community human capital complement is indicated by the **distribution** of the population by level of education attainment are presented in Table 5. The adjusted R² ranges from 0.21 to 0.35, which is consistent with similar studies investigating local community growth. There is no difference in adjusted R² between equations with the average years of schooling (**YOS1981** in Table 4) and the distribution of educational attainment (**LTGR981** and **SOMEU81** in Table 5).

¹⁵ These equations essentially assume that the local community is in a disequilibrium situation in the initial period. The level of each determining variable in the initial (1981) period is hypothesised to influence the change in each measure of community development toward an equilibrium state in the subsequent period. See Newman and Sullivan (1980) for a detailed discussion of alternative frameworks.

Our results indicate that the association between our measures of human capital and our measures of community economic development are generally weak.¹⁶ There was a weak association between the community average years of schooling (**YOS1981**) and both a higher rate of growth of community employment (**LNCEMP**) and a higher rate of growth of average earnings per worker (**LNCAVERN**) (as summarised in Table 6). On the other hand, there was a weak association between the community average years of schooling (**YOS1981**) and a lower rate of growth of community average hourly wage rates (**LNCWAGE**). Overall, as a result, there was a weak association between the community average years of schooling (**YOS1981**) and a lower rate of growth of aggregate community earnings (**LNCTEARN**). Evidently, community aggregate earnings (**LNCTEARN**) grew less in communities with a higher level of average education (**YOS1981**) because the lower growth in wages (**LNCWAGE**) was not off-set by the growth of employment (**LNEMP**) and / or the growth of the hours worked component of the growth in average worker earnings (**LNCAVERN**).

¹⁶ The nature of the association between education and community development outcomes differs somewhat due to the exact specification of the equations. The results presented here do not overstate the role of human capital in community economic development.

Table 4. Factors associated with local economic development, Canada, 1981 to 1991

Dependent variable:	LNCTEARN (mean=10.63)			LNCAVERN (mean=-3.77)			LNCWAGE (mean=-0.031)			LNCEMP (mean=12.29)		
	Mean	Regression coefficient	"t"-statistic*	Regression coefficient	"t"-statistic*	Regression coefficient	"t"-statistic*	Regression coefficient	"t"-statistic*			
Constant			59 4.5	-5.2 -0.6		0.2 1.8		22 2.2				
Level of local human capital												
YOS1981	10.52	-1.4	-1.3	1.4 1.9		-0.0087 -1.0		0.86 1.1				
Industrial structure of employment by industry												
PRIM81	20.72	-0.68	-13.0	-0.36 -9.4		-0.0033 -7.7		-0.3 -7.0				
TRMFG81	14.24	-0.18	-2.9	-0.01 -0.2		0.0009 1.9		-0.31 -5.4				
COMFG81	2.18	0.24	1.1	-0.014 0.1		0.0018 1.4		0.2 1.1				
PRSERV81	3.93	0.21	1.0	-0.14 -1.1		-0.00048 -0.3		0.28 1.5				
Local factors influencing the dependent variable												
SELF81	5.22	-0.039	-0.2	-0.092 -0.5		0.0029 1.5		0.058 0.3				
ABORIG81	2.24	-0.32	-1.9	0.04 0.8		-0.00046 -0.9		-0.24 -1.7				
UNEMP81	9.34	-0.4	-4.5	-0.052 -0.9		-0.0018 -2.5		0.016 0.2				
EDUCIN81	5.55	-0.58	-3.1	-0.56 -4.8		-0.0063 -4.3		-0.16 -1.0				
YOUTHIN81	36.95	-0.014	-0.4	-0.032 -1.1		-0.00049 -1.4		-0.0035 -0.1				
PEROLD81	15.96	-0.93	-6.8	-0.15 -1.6		-0.004 -3.3		-0.7 -6.5				
NEW5581	10.73	0.41	5.7	-0.018 -0.3		0.0003 0.5		0.44 6.9				
LT21K81	51.67	0.34	7.3	0.24 6.8		0.0024 5.8		0.08 2.1				
Type of region in which the locality is located												
DPRSETTL	0.014	-8.9	-1.8	-6.8 -3.4		-0.049 -2.4		-5.7 -1.4				
DURBFRON	0.28	-19	-11.0	-11 -10.6		-0.1 -8.3		-7.7 -5.7				
DAGRRUR	0.32	-25	-14.0	-14 -13.8		-0.17 -13.6		-6.5 -4.7				
DRURENCL	0.12	-18	-7.6	-9.9 -6.5		-0.039 -2.2		-14 -7.2				
DRESAREA	0.072	-15	-5.5	-7.2 -4.7		-0.041 -2.3		-8.7 -3.8				
DNATIVNO	0.007	-7	-0.8	-12 -2.6		-0.054 -1.4		-1.1 -0.1				
Number of observations		2315		2315		2315		2315				
Adjusted R2		0.34		0.22		0.22		0.21				

Note: All t-statistics have been corrected for heteroscedasticity.

Table 5. Factors associated with local economic development, Canada, 1981 to 1991

Dependent variable:	LNCTEARN (mean=10.63)			LNCAVERN (mean=-3.77)		LNCWAGE (mean=-0.031)		LNCEMP (mean=12.29)		
	Mean	Regression coefficient	"t- statistic"							
Constant			36	5.5	12	2.7	0.098	1.8	25	4.5
Level of local human capital										
LTGR981	24.37	0.31	2.8		-0.046	-0.5	0.0011	1.1	0.13	1.5
SOMEU81	27.02	0.07	0.6		-0.059	-0.7	-0.0005	-0.5	0.17	1.8
Industrial structure of employment by industry										
PRIM81	20.72	-0.68	-12.8		-0.36	-9.4	-0.0034	-7.7	-0.29	-6.7
TRMFG81	14.24	-0.21	-3.4		-0.03	-0.7	0.00074	1.6	-0.32	-5.7
COMFG81	2.18	0.27	1.2		0.054	0.5	0.002	1.6	0.21	1.2
PRSERV81	3.93	0.22	1.1		-0.037	-0.3	-0.00015	-0.1	0.28	1.5
Local factors influencing the dependent variable										
SELF81	5.22	-0.057	-0.2		-0.088	-0.5	0.0029	1.4	0.046	0.2
ABORIG81	2.24	-0.32	-1.9		0.03	0.6	-0.00047	-0.9	-0.25	-1.8
UNEMP81	9.34	-0.43	-5.0		-0.09	-1.5	-0.002	-2.8	-0.0082	-0.1
EDUCIN81	5.55	-0.61	-3.2		-0.51	-4.2	-0.0062	-4.2	-0.18	-1.1
YOUTHIN81	36.95	-0.0075	-0.2		-0.022	-0.7	-0.00044	-1.2	-0.002	-0.1
PEROLD81	15.96	-0.93	-6.8		-0.14	-1.4	-0.004	-3.3	-0.7	-6.5
NEW5581	10.73	0.43	5.9		-0.0082	-0.2	0.00037	0.6	0.45	7.1
LT21K81	51.67	0.32	7.0		0.22	6.3	0.0023	5.7	0.071	1.9
Type of region in which the locality is located										
DPRSETTL	0.014	-9.6	-1.9		-6.1	-3.0	-0.048	-2.4	-6.4	-1.5
DURBFRON	0.28	-19	-11.0		-11	-10.1	-0.1	-8.0	-8.5	-6.0
DAGRRUR	0.32	-26	-14.3		-15	-13.8	-0.17	-13.5	-7.4	-5.3
DRURENCL	0.12	-18	-7.8		-10	-6.4	-0.037	-2.1	-16	-7.7
DRESAREA	0.072	-16	-5.8		-7.6	-4.9	-0.042	-2.4	-9.4	-4.1
DNATIVNO	0.007	-9.4	-1.0		-13	-2.8	-0.058	-1.4	-4	-0.5
Number of observations		2315			2315		2315		2315	
Adjusted R2		0.35			0.22		0.22		0.21	

Note: All t-statistics have been corrected for heteroscedasticity.

Table 6. Comparison of hypothesised and actual results

	Growth in (constant dollar) aggregate community earnings (LNCTEARN)		Growth in (constant dollar) average earnings per worker (LNCAVERN)		Growth in (constant dollar) hourly wage rate (LNCWAGE)		Growth in community employment level (LNCEMP)	
	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual
Level of local human capital								
YOS1981	+	neg.	+	pos.	+	neg.	+	pos.
LTGR981	?	POS.	-	n.s.	-	pos.	+	pos.
SOMEU81	+	n.s.	+	n.s.	+	n.s.	+	pos.
Industrial structure of employment by industry								
PRIM81	-	NEG.	-	NEG.	-	NEG.	-	NEG.
TRMFG81	-	NEG.	-	n.s.	-	pos.	-	NEG.
COMFG81	+	pos.	+	n.s.	+	pos.	+	pos.
PRSERV81	+	pos.	+	n.s.	+	n.s.	+	pos.
Local factors influencing the dependent variable								
SELF81	?	n.s.	-	n.s.	-	pos.	+	n.s.
ABORIG81	?	neg.	-	n.s.	-	n.s.	+	neg.
UNEMP81	?	NEG.	-	n.s.	-	NEG.	+	n.s.
EDUCIN81	?	NEG.	-	NEG.	-	NEG.	+	neg.
YOUTHIN81	+	n.s.	+	n.s.	+	neg.	+	n.s.
PEROLD81	-	NEG.	-	neg.	-	NEG.	-	NEG.
NEW5581	?	POS.	?	n.s.	?	n.s.	+	POS.
LT21K81	?	POS.	+	POS.	+	POS.	-	pos.
Type of region in which the locality is located								
DPRSETTL	?	neg.	?	NEG.	?	NEG.	?	neg.
DURBFRON	?	NEG.	?	NEG.	?	NEG.	?	NEG.
DAGRRUR	-	NEG.	-	NEG.	-	NEG.	-	NEG.
DRURENCL	-	NEG.	-	NEG.	-	NEG.	-	NEG.
DRESAREA	?	NEG.	?	NEG.	?	NEG.	?	NEG.
DNATIVNO	-	n.s.	-	NEG.	-	neg.	-	n.s.

Note: "n.s." indicates "not significant" (with a t-statistic less than 1.0)

Note: pos. or neg. indicates the sign of the association and a t-statistic between 1.0 and 2.0

Note: **POS.** and **NEG.** indicates the sign of the association and a t-statistic of 2.0 or more

Our alternative measures of the community's human capital complement consider the distribution of the population by level of educational attainment. The results indicate that areas with a lower educational attainment (**LTGR981**) and areas with higher education attainment (**SOMEU81**) were both weakly associated with a higher rate of growth of employment (**LNCEMP**) in the 1980s. Interestingly, communities with a higher share of **lower** educated individuals (**LTGR981**) were weakly associated with higher growth of wages (**LNCWAGE**), but when combined with the weak association with a higher rate of employment growth, we find communities with a higher share of their population with a lower education (**LTGR981**) have a significant association with higher growth in aggregate community earnings (**LNCTEARN**). Thus, it appears that communities with low-skilled workers (as indicated by a high share of individuals with a lower level of education) were able to attract jobs during the 1980s and were also able to increase their wage level during this period.

Many of the other variables have the hypothesised association with the dependent variables. As expected, employment specialisation in the primary sectors (**PRIM81**) was associated with lower growth in all measures of community development outcomes. Community specialisation in traditional manufacturing (**TRMFG81**) was significantly associated with lower employment growth (**LNCEMP**) and with lower growth in aggregate community earnings (**LNSTEARN**). Community employment specialisation in the primary and traditional manufacturing sectors constrained the growth in community development outcomes during the 1980s.

The share of the labour force that was self-employed (**SELF81**) had a weak association with a higher growth of hourly wages (**LNCWAGE**), contrary to expectations. However, there was no significant association with job growth. Thus, communities with a higher share of the workforce being self-employed did not indicate an 'entrepreneurial' community and with higher job growth.

A higher share of Aboriginal people in the population (**ABORIG81**) was weakly associated with lower employment growth (**LNCEMP**) and weakly associated with lower growth in community aggregate earnings (**LNCTEARN**). In spite of a high demographic demand for jobs in Aboriginal communities, job growth was less in the 1980s, holding all other factors constant.

A higher rate of unemployment (**UNEMP81**) in the community in the initial period constrained the growth of hourly wage rates (**LNCWAGE**), as expected. The apparent excess

supply of labour in the initial period, as indicated by a higher rate of unemployment, had no significant impact on job growth in the subsequent period.

Communities with a higher share of employment in the education sector (**EDUCIN81**) experienced lower employment growth (**LNCEMP**), lower wage growth (**LNCWAGE**), a lower growth in average earnings (**LNCAVERN**), and consequently, a lower growth in aggregate community earnings (**LNCTEARN**) in the 1980s. The presence of an educational institution did not spur local economic development.

A higher share of in-migration by youth (**YOUTHIN81**) in the previous period was not associated with employment growth nor with earnings growth. A higher share of in-migration by youth was weakly associated with lower wage growth (**LNCWAGE**). It was hypothesised that this variable would signal areas expected to grow in the subsequent period.

A higher share of older individuals in the population (**PEROLD81**) did signal past out-migration of youth and was associated with lower employment growth (**LNCEMP**) and with lower earnings growth (**LNCAVERN** and **LNCTEARN**).

Retirement-destination communities (**NEW5581**) appear to generate significant growth in aggregate community earnings (**LNCTEARN**) by generating significant growth in employment (**LNCEMP**).

Communities with a higher share of poor persons (**LT21K81**) were associated with higher growth in all measures of community economic development. It appears that these communities were catching up (i.e. had relatively higher growth rates) during the 1980s.

The type of region in which the community is located does matter. Communities in each type of region showed less growth than communities in the omitted category—the booming “rural nirvana” regions. Note that employment growth was much lower in communities in the “rural enclave” (**DRURENCL**) regions, relative to the communities in the excluded group—communities in the “rural nirvana” regions. Regarding growth in wages (**LNCWAGE**), growth in average earnings (**LNCAVERN**) and growth in community aggregate earnings (**LNCTEARN**), we see the lowest growth (i.e., the largest negative coefficient) for communities in the “agro-rural” regions (**DAGRUR**).

Recall that the United States studies found no significant association between community employment growth and community education levels, if the industrial structure of employment and the type of region were taken into account. In this study, we have controlled

for the industrial structure of employment and the type of region and we do obtain a positive (albeit weak) association between employment growth and education levels.

The results above refer to all communities in all regions. The equations presented in Table 4 and Table 5 were also estimated for communities in *predominantly rural* regions and for all rural communities, regardless of the type of community. We discuss the results regarding the human capital variables here. In general, the association between our measures of community human capacity (**YOS1981**, **LTGR981**, **SOMEU81**) and community economic development outcomes are consistent with the discussion above (Table 7). This contrasts with the results of Killian and Parker (1991) who found no association between employment growth and education levels for rural areas. However, our association is not strong. The weak association between average levels of schooling (**YOS1981**) and higher employment growth (**LNCEMP**) holds for communities in rural regions and for rural communities, regardless of the type of region. Interestingly, the association between employment growth (**LNCEMP**) and the distribution of the population by educational attainment (**LTGR981** and **SOME81**) also holds when we constrain our analysis to communities in *predominantly rural* regions and to rural communities, regardless of the type of region. Specifically, for both rural communities and communities in rural regions, we find that communities with a higher share of their population with a lower educational attainment **and** communities with a higher share of their population with a higher educational attainment are both associated, weakly, with higher employment growth. Some rural communities with lower skilled workers were able to attract jobs and some rural communities with higher skilled workers were able to attract jobs.

Table 7. Summary of Association between Community Education and Community Development Outcomes, Canada, 1981 to 1991

	Number Of Communities	Growth in (constant dollar) Aggregate Community Earnings (LNCTEARN)	Growth in (constant dollar) Average Earnings per Worker (LNCAVERN)	Growth in (constant dollar) Hourly Wage Rate (LNCWAGE)	Growth in Community Employment Level (LNCEMP)
ALL REGIONS:					
Average years of schooling in the beginning period (YOS1981)	2,315	(negative)	(positive)	(negative)	(positive)
Share with less than Grade 9 education in the beginning period (LTGR981)	2,315	POSITIVE	n.s.	(positive)	(positive)
Share with some university education in the beginning period (SOMEU81)	2,315	n.s.	n.s.	n.s.	(positive)
PREDOMINANTLY RURAL REGIONS:					
Average years of schooling in the beginning period (YOS1981)	1,784	NEGATIVE	n.s.	(negative)	(positive)
Share with less than Grade 9 education in the beginning period (LTGR981)	1,784	POSITIVE	n.s.	(positive)	(positive)
Share with some university education in the beginning period (SOMEU81)	1,784	(positive)	n.s.	n.s.	POSITIVE
RURAL COMMUNITIES:					
Average years of schooling in the beginning period (YOS1981)	2,170	(negative)	(positive)	(negative)	(positive)
Share with less than Grade 9 education in the beginning period (LTGR981)	2,170	POSITIVE	n.s.	(positive)	(positive)
Share with some university education in the beginning period (SOMEU81)	2,170	n.s.	n.s.	n.s.	(positive)

Note: "n.s." indicates "not significant" (with a t-statistic less than 1.0)

Note: (positive) or (negative) indicates the sign of the association and a t-statistic between 1.0 and 2.0

Note: **POSITIVE** or **NEGATIVE** indicates the sign of the association and a t-statistic of 2.0 or more

8. Conclusions

Our equations explained only 21 to 34 percent of the variability in local community development in the 1980s. Contrary to the research findings in the United States, these findings suggest that the human capital complement in Canada's rural communities did provide a positive (albeit weak) boost to job growth in the locality during the 1980s. However, after the lower wage growth is taken into account, aggregate community earnings grew less in communities with a higher level of education.

Thus, what are the linkages between human capital and rural development? First, the literature suggests human capacity is largely developed by the nutrition and nurturing of children, specifically in the period of minus nine months to plus three years. There is mounting physiological evidence of the linkage between the nutrition and nurturing of infants and their subsequent ability to cope and adapt. Arguably, this is the first place that localities should focus their attention on human capacity development. Secondly, a higher human capacity in a community (as proxied by years of schooling) is weakly associated with a higher growth in community employment but is weakly associated with a lower growth in wages that appears to cause a weak association with lower aggregate community earnings. Investment in nutrition and nurturing of children is a key factor. A higher education level in a community provided only a weak employment boost during the 1980s.

Improving the human capacity of the local workforce is essential to provide opportunities for the individuals, regardless of where they will work. Although human capital resources are essential to participate in the new globalising economy, local economic development strategies should recognise they need to focus on more than human capital development to stimulate local economic development. As noted by von Meyer (1997),

The success of the dynamic rural regions is not due to favourable sectoral mixes. ... The positive performance in creating rural employment results from specific territorial dynamics that are not yet properly understood, but probably include aspects such as regional identity and entrepreneurial climate, public and private networks, or the attractiveness of the cultural and natural environment. (von Meyer, 1997, p. 20)

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