

The Role of Capital Formation in Economic Disparities Among Canadian Regions: 1961-1990

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Economic theory has long considered the notion of capital formation and investment as central to the analysis of capitalist economies (Marx, 1967; Kalecki, 1971; Keynes, 1936). But it was only recently that the dramatic regional changes in several countries have shown the importance of the sectoral and spatial distribution of investment in the creation of regional disparities. The conflicting theories of regional growth and development are based on opposing views of the investment process and the regional dynamics underlying its spatial distribution. Most of these paradigms, however, agree that regional capital accumulation constitutes a major component of the creation of jobs and economic growth in those regions (Romer, 1990; McHugh and Widdows, 1984; Kaldor, 1970).

The equilibrium-based neoclassical theory of regional growth asserts that if the initial phase of industrialization is associated with concentration of population and economic activity in 'central' or 'core' regions, mature growth is associated with dispersion into other areas of the economy as entrepreneurs re-deploy their capital to these locations. It argues that decreasing returns to scale might lower the marginal productivity of capital and, therefore, induce the redeployment of capital which lowers the rate of investment in areas already characterized by high capital-labour ratios (Borts and Stein (1964), Casetti (1981)). More recently, Barro and Sala-i-Martin

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(1991, 1992) have considered the issue of convergence using a neoclassical growth model to examine the trends in per capita incomes in U.S. states. Their work seems to provide strong empirical support for the convergence and catch-up hypotheses.

However, the cumulative causation theory views investment as a self-reinforcing process and considers agglomeration economies as improving conditions of profitability, therefore, inducing more capital investment in the same direction. Current and future rates of investment depend on levels achieved in earlier periods. It argues that the return on investment is an increasing function of growth in productive capacity. Higher capital yields attract more investment and deprive 'poor' areas of potential growth (Richardson, 1978; Kaldor, 1970).

This polarized spatial structure of capital stock is also emphasized in other theories such as the growth pole theory or the Marxian theory of capital accumulation. However, the latter allows also for tendencies towards dispersal or deconcentration of production and interprets them as means for enhancing or improving conditions of accumulation. Prospects of high profits (availability of resources, labour, etc.) motivate capitalists to shift their investments to 'less developed' areas (Watts, 1991; Walker, 1978).

In what follows, an examination of the validity of these competing theories of investment is undertaken by analyzing the spatial structure of capital stocks in Canada between 1961 and 1990. The implications of this structure for uneven regional development are also discussed. The remainder of the paper is divided into three sections. The next section deals with the spatial structure of Canadian investment during the period 1961-1990 and outlines the impact of capital formation on the regional growth of output, employment and migration. In the third section, we examine the relationship between the sectoral distribution of capital and the change that occurred in the industrial structure of regions over the same period. The fourth section concludes the paper.

The Importance of Capital Formation

Review of the Literature

Economic analysis attempts to explain growth in aggregate output by the relative contributions of two main factors: capital and labour. Technological change is often implicit and is measured by the skill level of the labour force and/or the state of art of the machinery and equipment. Given that an expansion in the stock of capital is a major stimulus to regional economic growth, capital investment should be a central focus of regional economic analysis.

McHugh and Widdows (1984: 86) found a relationship between the age

of capital and unemployment rates in various regions (states) of the U.S.A. They show that the age of capital is an important factor in determining "the order in which plants are shut down" and workers are laid off. This obviously suggests that investment and, therefore, the rate of accumulation are important considerations for regional analysis.

In a somewhat similar study, Anderson and Rigby (1989: 121) show that there exist significant regional variations in the depreciation patterns which have led to "marked variations in the age structure of regional capital stocks" in Canada. They argue that these differences have an important impact on regional output and employment since the latter depend on the age structure of capital which in turn determines the rate of investment. Others (Gertler, 1986, 1987) and Sitwell and Seifried (1984) have also emphasized the role of capital formation and the implications of spatial distribution of investment in creating regional disparities.

Studies by Greenwood (1981) and Muth (1971) have established strong relationships between labour (employment) and capital. Others (Massey, 1978, 1984; Massey and Meegan, 1982; Bluestone and Harrison, 1982) have shown that regional in- and out-migration are closely related to regional growth and decline. In particular, Bluestone and Harrison (1982) argue that the recent period of restructuring has clearly demonstrated that relocation of economic activity has been followed by a series of waves of labour migration. Capital mobility seems to induce labour migration and, in general, labour is found to be dependent on capital for jobs. Consequently, migration is initiated and structured by the changes in the production process.¹

All of the above theories suggest that the spatial distribution of capital is of key importance in determining regional growth in output, employment and interregional migration. The methods used here for examining the impact of capital formation on each of the three major variables referred to above (employment, output, migration) are conceptually simple and essentially aim at determining the level of significance of correlation between capital accumulation and the other variables (see also, Gertler, 1984; 1986; 1987).

The Role of Capital in Regional Growth

In this section, the discussion on regional performance is at two levels. First, aggregated regions are considered in order to discern the general pattern of growth and concentration of economic activity. These regions are: Atlantic Canada (Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick), Quebec and Ontario, the Prairies (Manitoba and Saskatchewan), Alberta, and British Columbia together with the Yukon and Northwest Ter-

1. For an interesting discussion on migration and capital, see Clark et al. (1986: Chapter 11).

ritories. The reason for grouping these provinces together is twofold: (1) they present similar characteristics in industrial structure and economic performance, and (2) some provinces (e.g. Prince Edward Island and Saskatchewan) have very small shares in the national aggregates of capital stock, employment, etc. which makes it less meaningful to consider them separately.

However, the second level of the discussion uses data to identify and highlight the varying performance of each province.² The discussion at this level may provide insight into the types of policy that a provincial government might adopt to improve economic performance and economic conditions (employment, etc.) within its jurisdiction.

Before examining the implications of the spatial patterns of capital formation, it is useful to examine the historical trends shown in the capital stock series. Table 1 shows the growth rate rankings of total capital stock in the six major regions between 1961 and 1990.³

At the regional level, there seems to be a certain degree of stability in the rates of accumulation throughout the 1970s and the first half of the 1980s. This is shown by the high degree of correlation between the growth rate rankings at the regional level which only decline when the growth rates of the late 1980s are compared to those of the beginning of the decade. Indeed, the correlation between the first and last halves of the 1980s is negative, thus suggesting a relative shift in the direction of new investment. This reversal is reflected in the change of Ontario's position from fourth to first place and that of Quebec from fifth to second place, and paralleled by a decline in Alberta and British Columbia which moved from first and second place to fifth and third place respectively.

In Central Canada, Quebec seems to have lost momentum in the 1980s after having taken the lead in early 1960s and during the 1970s. Capital stock growth rates in this region declined dramatically after 1981 and were surpassed by those in Ontario. Manitoba and Saskatchewan were badly hit by the effects of the 1982 recession and have thus maintained a certain stability in their rankings throughout the period 1961-1990. In Atlantic Canada, New Brunswick emerged as the dominant province (except for the recessionary period of 1982) and largely surpassed the high growth rates of the 1960s in Newfoundland. In the latter province, growth rates have shown a clear decline since the beginning of the 1970s.

For the entire period considered, Alberta and British Columbia clearly dominate since capital stocks grew by 261 percent in Alberta and 209 percent

TABLE 1 Rankings of Growth Rates of Capital Stocks: Total (*) and in Manufacturing

	1961-66	1966-71	1971-76	1976-81	1981-86	1986-90	1961-90							
Atlantic	2*	3	1*	1	3*	2	4*	5	3*	4	4*	4	5*	2
Quebec	1*	4	6*	6	2*	3	3*	4	5*	2	2*	2	5*	3
Ontario	3*	1	3*	5	5*	4	5*	2	4*	3	1*	6	4*	4
Prairies	6*	6	5*	2	6*	5	6*	6	6*	5	6*	3	6*	6
Alberta	4*	5	4*	3	1*	1	1*	1	1*	1	5*	5	1*	1
B.C.	5*	2	2*	4	4*	6	2*	3	2*	6	3*	1	2*	5
r*			-0.03		-0.08		0.83		0.83		-0.03			
r			-0.37		0.20		0.30		0.54		-0.54			

Source: Based on data from Statistics Canada, *Investment and Capital Stock Division*, Unpublished material.

r*. Correlation coefficient between successive growth rate periods for total capital stocks.

r. Correlation coefficient between successive growth rate periods for capital stock in manufacturing.

in British Columbia. Growth rates in Alberta were higher than in any other region suggesting that exploitation of natural resources in this region has necessitated important new investment.

Central Canada, the dominant industrial core of the country, has recorded lower growth rates. This is perhaps due to the fact that the aging industrial capital stock of the region is being replaced at a slower rate. This seems to be supported by the fact that capital stocks in the manufacturing sector grew by 209 percent for the 1961-90 period in Quebec, a less industrialized region, and only by 188 percent in Ontario. However, growth rates of total capital stocks were faster in Ontario which might imply that the latter is developing a new competitive advantage in non-manufacturing industries.

The low growth rates in the Prairies suggest that this region has remained largely dominated by agriculture. However, if we consider the manufacturing sector, Saskatchewan seems to have attracted more capital, particularly in the last half of the 1980s.

In the manufacturing sector, the growing continuity between the experiences of the late 1970s and early 1980s seems to have come to an end after the 1982 recession. Alberta moved from first to fifth place and British Columbia from sixth to first place. In Atlantic Canada, growth rates have constantly declined since the beginning of the 1970s which marked important changes and cutbacks in several publicly funded programmes (for example, those supported by the Department of Regional Economic Expansion (DREE)).

Given that higher growth rates have characterized the economies of Alberta and British Columbia, one might be led to believe that there is a tendency towards a regional shift from central to western Canada, similar to

2. Yukon and Northwest Territories are included with British Columbia.

3. For convenience, in what follows, although the discussion refers to per cent growth rates, shares, etc. these data are not reported here. Readers interested in these data may obtain them directly from the author.

that from the frostbelt to the sunbelt in the United States. However, given that the fast growth in capital stocks in the western provinces is largely due to investment in resource-related industries, this shift is not likely to happen in the near future. Capital accumulation would still be expected to be concentrated in Central Canada as can be seen from the rankings and performance of Ontario and Quebec during the last half of the 1980s.

The issue of trends and patterns in the spatial distribution of capital is a central one in the competing theories of regional growth and development. This disputed theoretical issue leads us to empirically examine the spatial and temporal dimensions of change in regional capital stocks in Canada.

Table 2 shows the regional shares of the total national capital stock for the period 1961-1990. The trends observed earlier in growth rates of regional capital stocks are largely reflected in the change in regional shares. The fast growth rates observed in the West translate into important increases in the percentage share in Alberta and British Columbia. The somewhat lower rates of growth in the rest of the country result in a decline in the relative shares of all other regions except Ontario. The Prairie region suffered the largest decline (-3.2 percentage points), followed by Quebec (-1.3). In the case of Atlantic Canada, government intervention during the 1960s and early 1970s helped to increase the region's share. But when these programmes were cut back, the capital stock share in Atlantic Canada fell back to the levels experienced in the 1960s and all provinces in the region have exhibited a decline throughout the 1970s and 1980s.

This change in the spatial distribution of capital stocks is important for two reasons. First, it tells us something about the direction of investment, therefore, providing empirical grounds for testing the various theories about investment location. Second, to the extent that productivity and incomes (which are important indicators of regional disparities) are affected by the intensity of fixed capital use in production, this change gives us an indication of the performance of the productive capacity in each region.

Concerning the validity of the various theories about investment, we must note that the trend towards the decline in shares of capital stocks was relatively smooth and continuous in the Prairies, and was paralleled by a relatively smooth increase in the shares of Alberta and British Columbia. In the other regions, there was some degree of volatility in investment behaviour. Can it be argued then, as suggested by the cumulative causation theory, that investment tended to flow in the same direction of change established in earlier periods? This does not seem to be the case in most Canadian regions since there have been important fluctuations in investment.

The neoclassical theory would interpret the lower rates of investment in Quebec and the rise in Alberta as a tendency towards convergence, but this theory cannot explain the experiences of Atlantic Canada and the Prairies since it predicts that capital will flow to the regions where the capital-labour ratio is low, that is, areas characterized by low wages and high return on in-

TABLE 2 Regional Shares of National Capital Stock, 1961-1990

	1961	1966	1971	1976	1981	1986	1990
Atlantic	7.29	7.42	8.06	8.11	7.76	7.81	7.58
Nfld.	1.79	1.99	2.35	2.37	2.22	2.25	2.07
P.E.I.	0.40	0.40	0.36	0.34	0.32	0.30	0.29
N.S.	2.68	2.59	2.85	2.84	2.68	2.79	2.75
N.B.	2.42	2.43	2.50	2.57	2.55	2.48	2.46
Quebec	23.29	23.93	22.81	23.04	22.20	21.59	21.96
Ontario	33.74	33.60	33.82	33.63	32.01	32.24	34.44
Prairies	11.18	10.89	10.52	10.06	9.44	8.71	7.99
Manitoba	5.33	5.06	5.02	4.85	4.40	4.04	3.77
Sask.	5.85	5.83	5.50	5.20	5.04	4.66	4.22
Alberta	11.91	11.80	11.86	12.20	15.05	15.95	14.70
B.C.	12.58	12.36	12.93	12.95	13.54	13.70	13.33

Source: Same source as for Table 1.

vestment. The Marxian theory of accumulation which views investment as tending generally towards concentration, but also responding to changes in conditions of profitable accumulation, could apply here. The increase in oil prices experienced in the early 1970s seems to have diverted important funds of investment from other areas and drew them into Alberta where oil resources were abundant.

The relative importance of capital formation in determining regional economic performance can be examined through the change in regional output shares over the same period of study. Analysis at this aggregated level overlooks some important components of the structure of production such as changes in capital-labour ratios, the composition of the workforce, technological changes, etc. Consequently, to draw any conclusions concerning the role of capital accumulation in regional disparities one must necessarily account for these changes. This issue has been dealt with elsewhere (see Bougrine, 1992). Nevertheless, it is useful to establish at least the correlation between the spatial structure of capital stocks and the regional shares of output, as presented in Table 3.

First, note that output shares have moved in the same direction as capital stock shares in all regions except Atlantic Canada. This correspondence is quite strong in the Prairies where the correlation coefficient is 0.93. In the rest of the regions, the correlation coefficient ranged from 0.77 to 0.87. It is important to note the shifting importance of the regional economies as Quebec and the Prairies saw their shares of total output decline by 3 and 2 percentage points respectively between 1961 and 1990. Alberta and British Columbia increased their respective shares from roughly 8 to 10.5 percent

TABLE 3 Correlation Coefficients: The Regional Impact, 1961-1990

	r_{ky}	r_{kp}	r_{ke}
Atlantic	-0.24	-0.58	-0.63
Quebec	0.87	0.92	0.94
Ontario	0.77	0.08	0.03
Prairies	0.93	0.89	0.88
Alberta	0.78	0.97	0.92
B.C.	0.84	0.89	0.84

r_{ky} correlation coefficient between capital stock share and output share.

r_{kp} correlation coefficient between capital stock share and population share.

r_{ke} correlation coefficient between capital stock share and employment share.

and from about 10 to 12.5 percent during the same period.

The pattern of change in regional GDP as a measure of economic performance is useful and, when combined with the change in the regional structure of population, it can be used to reflect the change in per capita GDP. While no province or region lost population between 1961 and 1990, the shift in the proportion of total population was significant.⁴ Alberta and British Columbia increased their respective shares by 2 and 3 percentage points from 1961 to 1990. This increase was at the expense of all other provinces except Ontario where the population share also increased.

The second column of Table 3 shows the similarity between the pattern of population and the spatial distribution of capital. Provincial and regional population shares vary directly with provincial and regional capital stock shares. The only exception would seem to be that of Atlantic Canada whose capital stock marginally increased at the end of the period but was not paralleled by an increase of the population share. The overall correlation coefficient between the change in population shares and capital stock shares is 0.87.

This positive correlation result suggests that people move to areas where economic growth is most promising; that is, areas which also attract capital investment. This is consistent with other findings such as Aydalot (1984) for France and Garnick (1984) and Keinath (1982) for the United States. As suggested by these and other studies (Massey and Meegan, 1982; Massey, 1984; Bluestone and Harrison, 1982) capital formation plays an important role in employment generation.

Column 3 of Table 3 gives the correlation between patterns of employment and capital stocks. Here again the overall correlation is very strong (0.89). The exceptional case of Atlantic Canada may be explained by the fact

that the marginal increase in the share of the capital stock did not succeed in improving the general economic conditions which remained depressed and, therefore, could not influence potential out-migrants to stay.

The Sectoral Distribution of Capital and the Changing Industrial Structure of the Regional Economies

In terms of the sectoral composition of regional and provincial GDP, the goods-producing industries have declined in relative terms in all regions and provinces over the period 1961-1990. The shift towards the service-producing industries supports the commonly held perception of a general decline in the relative importance of manufacturing and other goods-producing industries. This usually refers to the decline of these sectors as a source of employment, but our calculations indicate that their contribution to output has also declined.

The most notable change is the decline in the relative importance of manufacturing output, especially in Quebec, Ontario and British Columbia where its share of GDP dropped to less than half of what it was in 1961. A similar trend was observed in construction industries which declined in every province. Mining output also declined in Central Canada and the Prairies, but the biggest decline was recorded in Newfoundland (from 10.5 percent to 2.9 percent). Interestingly, the importance of mining in the GDP of Alberta has increased during this period. This reflects the rise in the importance of oil resources and the considerable investment in this sector during the 1970s and the first half of the 1980s. The output share of agriculture and the fisheries has also declined in all regions and provinces. The only goods producing industries which increased the relative importance of their output in the provincial GDP were those grouped under "other utilities", which include electric power and gas distribution.

Atlantic Canada provides over half of the total national output of fisheries with British Columbia supplying 28 percent in 1990. British Columbia is the largest Canadian producer in the forestry and wood products and provides 42 percent of the output of this sector. Mining is essentially concentrated in Alberta where 56 percent of the mining output was produced in 1990 whereas manufacturing and services are highly concentrated in Ontario and Quebec.

Advanced manufacturing and financial and commercial services are located in what has traditionally been considered as the economic core of the country whereas production of primary commodities is located in the somewhat "peripheral" economies (see Coffey and Polèse, 1988). This hierarchical structure is an obvious characteristic of Canadian economic space. Note, for example that Ontario's share of services and manufacturing

4. Note, however, that population in the province of Saskatchewan declined between 1987 and 1990.

has increased and that this was paralleled by important decreases in agriculture and mining. An opposite trend occurred in the Prairies although the share of mining has also declined. Atlantic Canada shares similar characteristics with the Prairies in that it increased its share of primary production but suffered a decline in its share of services. Alberta and British Columbia have both increased their share of services with Alberta more than doubling its contribution to the mining output from 1961 to 1990.

The combined relative importance of the goods producing industries in the Canadian economy as a whole decreased from 46.5 percent in 1961 to just over 25 percent in 1990. Service-producing industries⁵ have increased their relative shares of GDP in all regions. Thus there is a certain degree of consistency in these patterns with each region experiencing, to varying levels, the same national trends.

How has this change in the industrial structure of regions affected their relative performance? In other words, to what extent has the relative decline (increase) of a particular industry in a region's economy affected its performance in comparison with other regions and what was the role of the sectoral distribution of capital stocks?

These questions can be answered directly by looking at the correlation between patterns of capital stocks and the change in the contribution of each region's sector in the national output of that same sector. The results are summarized in Table 4. In manufacturing, the correlation is highest in Alberta and, somewhat surprisingly, low in Central Canada. Shares of capital stocks in the primary sector have increased in Atlantic Canada, Alberta and British Columbia but declined in the other regions. Output shares (in this sector) followed the same patterns except in Atlantic Canada where they declined after the 1970s. The service sector, where the correlation is positive and quite high, deserves special attention since it has compensated for the decline in the shares of the goods-producing industries thus proving itself as the "growth area of the future". As indicated above, the relative importance of services in the composition of regional GDP has increased, but these industries are essentially concentrated in Central Canada which provided about 65 per cent of the total output in 1990. The positive correlation coefficients in Atlantic Canada, Quebec, and the Prairies indicate a decline in both shares of output and capital stocks in this sector. Services are therefore becoming more and more important in Ontario, Alberta and British Columbia.

5. In addition to services to businesses, this sector also includes other services such as Finance, Insurance and Real Estate (FIRE), government (all levels) services, educational services, and health and social services. It would be interesting to decompose this sector to examine the relative importance of each of these components, but data at the regional (provincial) level are not always available for all categories and often suffer a great deal of inconsistency, especially for the 1960s.

TABLE 4 Correlation Coefficients: The Sectoral Impact, 1961-1990

	I	II	III	IV
Atlantic	0.25	-0.20	0.14	0.34
Quebec	0.14	0.71	0.91	0.74
Ontario	0.06	0.63	-0.65	0.82
Prairies	0.03	0.85	0.93	0.93
Alberta	0.92	0.77	0.92	0.73
B.C.	-0.32	0.63	-0.21	0.75

Note: These are correlation coefficients between share of capital stock and share of output in manufacturing (I), primary (II), utilities (III), and services (IV).

Conclusion

Economic activity is spatially concentrated and heavily specialized in Canada. However, important changes have occurred in the regional structure of the economy over the past thirty years. Alberta and British Columbia emerged as important players on the Canadian economic scene. Location of economic activity in these regions seems to be competing against other Canadian regions and particularly Quebec. Although the Prairies and Atlantic Canada have experienced a relative industrialization, which was reflected in the expansion of their manufacturing sectors, the tendency towards concentration in some "core" regions still characterizes the industrial landscape of the country.

However, the change described above does not seem to fit with the predictions of any particular theory of investment and production location. This suggests that more detailed studies are needed in order to discern the patterns of the regional distribution of economic activity.

It was found that there is a strong relationship between regional capital stocks and growth in regional employment, output, and population for most regions. The sectoral distribution of capital is also highly correlated with the regional share in the national output of the same sector. The limitations of such analysis are obvious, but the results summarized in this paper do suggest that inquiries into the causes of regional disparities must look at investment decisions since the regional distribution of production is intimately tied with the process of regional capital accumulation.

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