Governments and Construction Instability

N. M. Swan

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Governments and Construction Instability

1 Introduction

In January 1972 the Economic Council of Canada was asked to inquire into the cyclical instability of the construction industry. For this purpose, a "Construction Reference Group" was formed within the Council. Fifteen studies were undertaken by this group. This study, entitled "Governments and Construction Instability", has two main purposes. The first is to appraise the impact on construction of programs and government action at all three levels; and the second is to set the stage for the relative parts of the chapter on policy recommendations in the Council's report on the Reference.[1]

The first of these purposes is the concern of Chapter 2, which examines the extent of government responsibility for past instability in construction, both directly as a major client of the industry at all three levels and indirectly through the administration of monetary and fiscal policy, regional development policy, and other programs. The first part of the chapter is concerned with the direct influence of government as a construction spender; the second develops a theory of the expenditures of provincial governments with a view to testing, as rigorously as possible, certain common ideas concerning their responsibility for instability; the third tries to assess the nature and seriousness of the indirect influence of government on cyclical variations in construction activity.

The remaining chapters provide a basis for policy recommendations. Chapter 3 considers seven possible policies designed to stabilize construction. These suggestions include adjusting the timing of major projects; smoothing the time paths of particular categories of government expenditure; scheduling government expenditures, either alone or jointly with private spending; imposing market incentives and disincentives to counter the construction cycle; making use of general monetary or fiscal policy; introducing measures specific to residential construction; and making appropriate variations in the rates of federal matching grants for provincial/municipal expenditure.

Chapter 4 offers a consideration of whether such stabilization would be worthwhile. The first section deals with the benefits to be derived from greater stability, including reductions in unemployment, a higher rate of capacity

1 Economic Council of Canada, *Toward More Stable Growth in Construction* (Ottawa: Information Canada, 1974).

utilization in the industry, and possible effects on productivity, bankruptcy, and rates of price increases. The second section looks at costs imposed through the operation of the policies required to achieve greater stability. Six types of costs are considered, the most important of which is the extra costs that would be imposed on households, firms, and governments if they were required to adjust the timing of their expenditures. The third section offers some comments on the uncertainty surrounding estimates of both benefits and costs in this area.

In Chapter 5 an attempt is made to clarify the important respects in which policies can differ, and to devise an acceptable method of choosing among them. In the first section it is argued that stabilization policies should be specific to regions or even to provinces, a proposition which rests on a connection between the seriousness of instability and the degree of mobility of factors of production. The second section develops a method whereby the benefit/cost ratios of the seven policies suggested in Chapter 3 can be ranked, given the impossibility of direct calculations of these ratios, and a partial ranking is obtained. The third section examines the sensitivity of the various policies to lags involved in the stabilization process, while the fourth makes a layman's assessment of their political acceptability. The fifth section considers the extent to which policies require sophistication in the staff administering them. Given that several different policies could in principle be adopted, and that they all differ from each other in several important ways, it is difficult to determine which of the policies should be recommended. The sixth section adapts to this purpose the technique developed in the second section and attempts to obtain a "merit ranking" of most of the policies described in Chapter 3.

2 The Extent of Government Responsibility for Past Instability

1 The Direct Influence of Government Construction Spending

The construction industry sells its output to three major groups – households, firms, and governments. Enterprises such as Hydro-Quebec and Air Canada are included with government as they are subject in principle to government control.

As well as directly controlling how much they themselves spend on construction, governments can affect the behaviour of other spending groups and influence construction activity through economic policies, by legal regulations, etc. on construction. The relative amount of government spending will therefore be less than the impact of government on the sum total of spending decisions.

In 1970, the value of all construction expenditure was $13,780 million. Of this, $3,968 million went to private residential construction, $4,913 million was for private enterprises or private institutions,[1] and the remaining $4,899 million was spent by governments. These figures included both new construction and repairs, and imply that of every $100 spent in 1970 on construction governments spent about $36, firms spent about $36, and approximately $29 went on housing. There has been no discernible trend in this division, although there have been year-to-year fluctuations.

Annual construction output from 1951 to 1970 shows a moderate amount of cyclical instability. One measure of this instability is the average absolute *percentage* deviation from trend, or "mean deviation". The mean deviation for any regularly recurring cycle is equal to half the mean percentage amplitude.

For total construction in constant 1961 dollars, 1951 to 1970, the mean deviation was 5.3 per cent, measured from a linear trend fitted to the logarithms of output. The mean deviation for real Gross National Product over this same period was only 2.1 per cent. The largest positive deviation

1 Where the context is such as to preclude ambiguity we shall shorten "private residential construction" to "housing", and "private enterprises and private institutions" to "firms".

occurred in 1957, when construction was 14 per cent above trend, the largest negative deviation in 1951 when it was 16 per cent below trend. The complete pattern of deviations is shown in Chart 2-1, as the solid line.

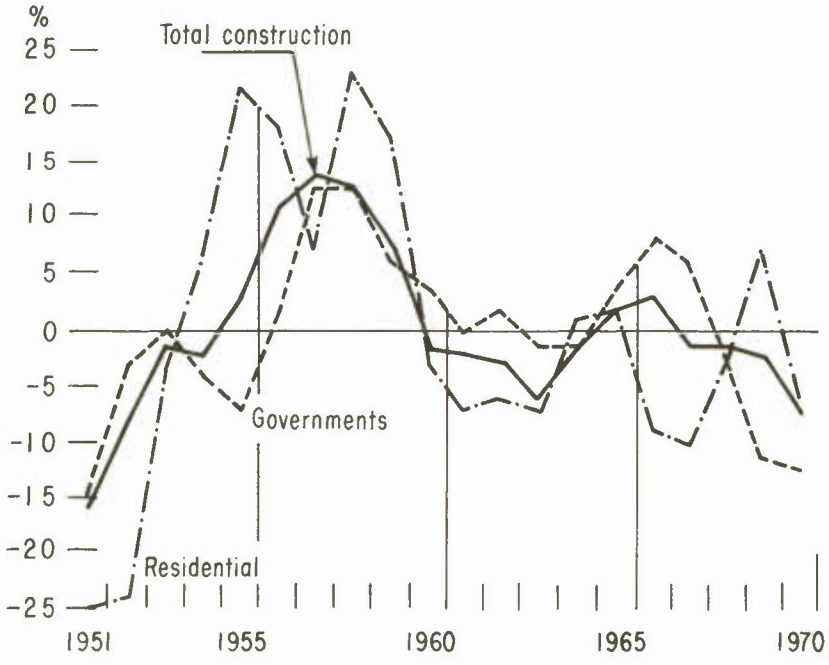
The diagram shows that the industry had a strong boom from 1956 to 1959 and quite sharp recessions in 1951-52, 1962-63, and 1970. In all other years the industry was close to trend.

The broken line in Chart 2-1 shows the path of deviations of government construction from trend. They follow the deviations for total construction, apparently showing that government spending on construction has conformed quite closely to total spending on construction. The correlation is actually 0.78. The appearance is a little deceiving, however, because government construction is itself about one-third of total construction. If this spurious source of agreement is excluded by calculating the correlation between the government deviations and deviations of all non-government construction spending, the value of r drops to 0.55. Such a value indicates only a moderately strong association, even though it is statistically significant.

Chart 2-1 also shows the deviations of residential construction from trend: the mean deviation is 10.1 per cent. Swings in housing construction are well

Chart 2-1

Deviations of Construction From Log Linear Trends (Constant 1961 dollars)

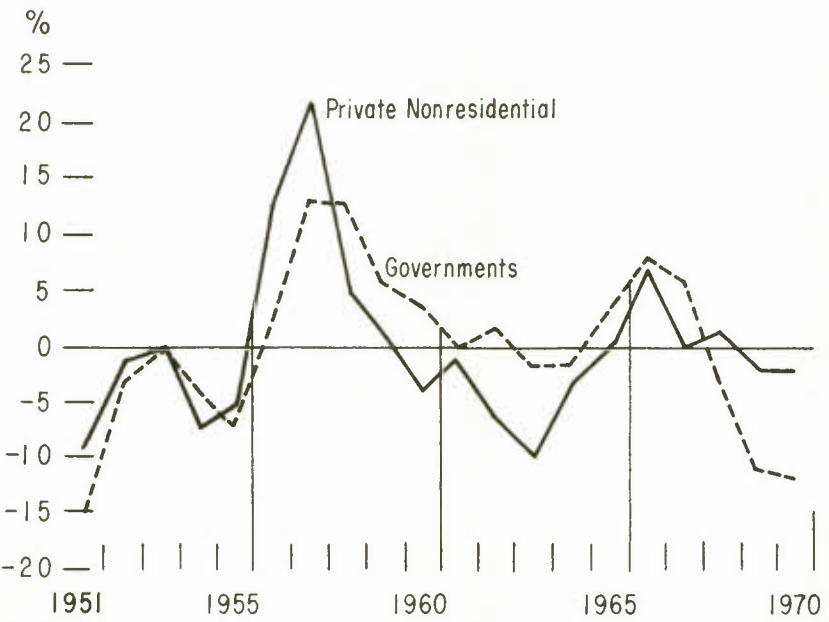


correlated with the swings in total construction, the value of *r* being 0.80. Much of this is also spurious correlation in light of the importance of housing in the total itself. The correlation between residential and nonresidential construction is 0.42 – a much less impressive value which indicates that the cycle in housing is only loosely linked to the cycle in other construction activity.

The stronger relationship between spending by private firms and spending by governments is shown in Chart 2-2. The correlation is 0.52. For new construction (excluding repairs) this rises to 0.66.

Chart 2-2

Deviations of Construction From Log Linear Trends
(Constant 1961 dollars)



A comparison of Chart 2-2 with Chart 2-1 shows that government spending and private nonresidential spending both show about the same degree of instability as construction spending as a whole. In fact, their mean deviations were both 5.7 per cent, compared to 5.3 per cent for the total. Housing construction is much more unstable, with a mean deviation of 10.1 per cent.

There appears to be a general but not overly strong tendency for spending by each of the three groups to move together, so that it is clear that each group bears some responsibility for the overall cycle. The degree of responsibility can be measured by a simple mathematical operation which permits the mean deviation measure of instability for any series to be broken

down fairly accurately into the parts of that mean deviation contributed by sub-components of the series. The mean deviation for total construction in constant dollars over the 1951-70 period was 5.3 percentage points. Table 2-1 shows how this measure was built up from the contributions to instability of spending by government, firms, and households.

Table 2-1

Contributions to Cyclical Instability in Construction, 1951-70

Sector	Contribution to mean deviation	Contribution to mean deviation
	(Percentage points)[1]	(Percentage of total)
Government	1.4	26.4
Private nonresidential	1.6	30.2
Residential	2.3	43.4
Total	5.3	100.0

1 The unit of measure for the mean deviation is percentage points.

Of the total mean deviation of 5.3 percentage points, 26 per cent is contributed by government. In a sense, this is a good record, in that the government share of total spending was higher – 36 per cent on average over the period. It is also a poor record, in that government sector spending could conceivably move counter-cyclically rather than pro-cyclically, resulting in a *negative* contribution to instability. However, it appears that *direct* governmental responsibility for Canada-wide instability has been relatively small.

Private nonresidential spending contributed 30 per cent of the total instability – a somewhat smaller percentage than its share of total construction, which has averaged 35 per cent.

Residential spending appears to be the leading source of instability: although it has averaged only 29 per cent of all construction spending, its contribution to the degree of instability in that spending was 43 per cent.

Charts 2-1 and 2-2 show that the degree of instability was less during the period under consideration. As this is most apparent for residential construction, and less apparent for government and private non-residential construction, the relative responsibility for construction instability may have been changing. Table 2-2 confirms this view.

The Table shows the percentage contributions of government, private nonresidential, and residential construction for periods each of which is two years shorter than the previous one. A comparison of the first two columns reveals that the contribution of residential construction to instability diminishes sharply when 1951 and 1952 are excluded. Chart 2-1 shows that these were very serious recession years for residential construction, so this result is not surprising. The contributions of private nonresidential and

Table 2-2

Contributions to Cyclical Instability in Construction (Various Periods)

Sector	Percentage contribution to the mean deviation of all construction			
	1951-70	1953-70	1955-70	1957-70
Government	26	29	29	28
Private nonresidential	30	41	43	38
Residential	43	30	28	34

government are correspondingly increased, with the bulk of the increase being in the former. The two later periods, 1955-70 and 1957-70, show little change compared to 1953-70.

If the periods 1953-70, 1955-70, or 1957-70 are viewed as more representative of the long-run situation than 1951-70, and the 1951-52 dip in housing construction is considered an aberration, it might be concluded that the role of each sector in instability does not differ greatly from its weight in total construction. Government's contribution to instability is a little less than its contribution to total construction, and that of private nonresidential is a little greater. The residential contribution is roughly proportional to its relative weight.

L. Auer, in another study in this series,[2] uses an alternative method of measuring instability which weights percentage deviations from trend occurring in years of high dollar volume of construction more heavily than those occurring in years of low dollar volume. Given a general growth trend, this is tantamount to weighting recent years more heavily than early years. This method not unexpectedly gives the result that the government share of responsibility for instability in the 1951-70 period is closer to its share of total construction than Table 2-2 shows (a 34-per-cent contribution to instability, with a 36-per-cent share in the total), and that the residential share of instability is also closer to its share in the total (a 33-per-cent contribution to instability, with a 29-per-cent share in the total).

Some conclusions can be drawn from Dr. Auer's results and those of Table 2-2. First, the government's direct contribution to construction instability has been slightly less than its proportion of the total volume of government construction, but just how much less is a matter of which measurement technique is used. It is safe to say that instability due to government during the last two decades was between one-quarter and one-third of total instability. Second, there is evidence that the government share of instability has been rising a little, not because government spending has become less

2 L. Auer, *Construction Instability in Canada*, Economic Council of Canada, (Ottawa: Information Canada, 1975).

stable but because private spending, especially residential, has become more stable.

Details of Government Construction Expenditure

Government construction expenditures accounted for just over one-third of the industry's output between 1951 and 1970. They are almost exclusively for nonresidential construction, and governments account for half of the total amount of this subdivision of the industry.

Government expenditures can be classified by level of government and by type of agency, the latter comprising departments, enterprises, and institutions.[3] Cross-classifications for all of Canada are also available.

Provincial governments are easily the major spenders. In 1970, total government expenditures were $4,899 million, and provincial governments accounted for $2,357 million of this, almost one-half. Municipal governments accounted for another third of the total, some $1,646 million. The federal government is becoming a relatively small buyer. Although in 1951 it accounted for a third of all government spending, by 1970 its expenditures of $896 million were only one-sixth of the total. Therefore any explanation of government spending must be largely an explanation of provincial and municipal government spending.

The relative importance of the various elements of government spending is summarized for 1970 in Table 2-3.

Table 2-3

Distribution of Government Spending on Construction, 1970

	(For each $1,000 of government spending)
Provincial departments	$237
Provincial enterprises	203
Municipal departments	187
Municipal institutions	124
Federal enterprises	88
Federal departments	87
Other[1]	74

1 Provincial institutions ($41), federal housing ($8), and municipal enterprises ($25). The latter was more important in previous years, particularly the mid-1960s, reaching a peak of $72 in 1964.

The first three or four expenditure categories, which accounted respectively for 63 per cent and 75 per cent of the total, invite closer inspection. Departmental spending by provincial governments is mostly for highway construction; a fair amount of municipal spending is also for road

3 Public housing expenditures should be included as a fourth category, but were very small over our period of study.

construction. Among provincial enterprises the various hydros account for a large proportion of all spending. Highways and electricity generation and distribution are together responsible for about a half of all recent government activity in the construction field. An analysis of the determinants of these two areas would clearly cast a good deal of light on the role of government in influencing construction through its direct spending. The fourth largest category, municipal institutions, is mostly for school and hospital building, while much of the rest of municipal departments' spending is for sewers and waterworks. About two-thirds of all government spending consists of provincial/municipal expenditure on six items: highways, electricity systems, schools, hospitals, sewers, and waterworks.

Cyclical Behaviour of Government Spending

The mean deviation for all government spending was 5.7 per cent. Provincial construction was more variable than the *total*, with a mean deviation of 8.7 per cent; municipal construction was only slightly *less* stable than the total, with a mean deviation of *6.6* per cent. Federal construction was easily the most volatile, with a mean deviation of no less than 10.9 per cent. As variability in government spending is partly responsible for the total construction cycle, it is useful to examine how much each level of government contributed to that variability. Table 2-4 gives this information.

Table 2-4

Contributions to Cyclical Variability in Government Spending, 1951-70 (By Level of Government)

Sector	Contribution to mean deviation	Relative contribution
	(Percentage points)	(Per cent)
Provincial spending	3.4	53
Municipal spending	0.8	12
Federal spending	2.2	34
Estimated total mean deviation[1]	6.4	99
Actual total mean deviation	5.7	

1 Differs from actual because the method of calculating contributions of components uses approximation techniques.

Table 2-4 indicates that provincial spending accounts for 3.4 out of an estimated total mean deviation of 6.4; more than half the variability in government spending is due to provincial governments. Municipal governments, although responsible for over one-third of the volume of public construction, contribute only one-eighth of its variability. The federal government, although responsible for less than one-sixth of the volume of public construction, accounts for about one-third of its variability.

The data permit a further examination of variability by categories within each level of government. Table 2-5 gives this more detailed breakdown–the largest contributor to variability in government construction spending. The value of 1.8 is over a quarter of all variability, despite the fact that, on average, federal enterprises have accounted for only one one-tenth of all government construction. More detailed study shows that a single project–Northern Ontario Pipeline–is largely responsible for this phenomenon.

Table 2-5

Contributions to Government Cyclical Variability (By Categories Within Levels of Government)

Sector	Contribution to mean deviation	Relative contribution
	(Percentage points)	(Per cent)
Provincial		
Departments	1.3	19.7
Enterprises	1.7	25.8
Institutions	0.5	7.6
Municipal		
Departments	0.2	3.0
Enterprises	0.7	10.6
Institutions	0.0	0.0
Federal		
Departments	0.5	7.6
Enterprises	1.8	27.3
Public housing	-0.1	-1.5
Estimated total mean deviation	6.6	100.1
Actual total mean deviation[1]	5.7	

1 Differs from estimated because the method of calculating contributions of components uses approximation techniques.

Provincial enterprises are the second largest source of variability; their contribution of 1.7 is just over a quarter of total variability, although they have accounted for only a little more than one-sixth of total public construction. Variability in hydro construction is easily the major element in this category.

The third source of variability is provincial departments' expenditure, largely for highways. This category accounts for one-fifth of all variability, roughly commensurate with its relative importance in the total of government spending.

The three categories so far covered account for almost three-quarters of all variability (72 per cent). Although not all the variability in these three categories can be explained by their largest components, it seems safe to conclude that at least half of all measured cyclical variation in government

construction spending is traceable to just three types of public spending: pipeline, hydro, and highway construction.

The contribution of municipal institutions to variability is zero despite their importance in total public construction (about 11 per cent). The reason is that this category of construction has moved counter-cyclically to total public construction about as often as it has moved pro-cyclically. Public housing–all federal over the 1951-70 period–actually moved counter-cyclically more than pro-cyclically, leading to a slight negative contribution to instability; that is, it helped stabilize government construction somewhat.

The "Structures" Breakdown of Construction Expenditures

So far, construction expenditures have been examined by spending "sectors" -- households, private firms, and the various governmental spending entities. Another approach is a "structures" breakdown, the division of construction spending into expenditures on groups of end-products of the industry. The broadest groupings of end-products studied here are residential building, nonresidential building, and engineering construction. Non-residential building can be further subdivided into industrial, commercial, institutional, and "other" building, while engineering structures can be subdivided into marine, highways, waterworks and sewers, dams and irrigation, electric power transmission and distribution, railways and communication, gas and oil, and "other" engineering.

The structures breakdown is not directly relevant to an analysis of the contribution of the government sector to instability. However, conclusions reached from sector data can be roughly cross-checked with structures data because it is known roughly what structures correspond to expenditures by particular sectors.[4] For example, highways–a structures category–are largely expenditures of provincial and municipal departments, so conclusions about instability in such departmental spending should cross-check with conclusions about instability in highway construction. More significantly, the structures data, but not the sector data, are available regionally. They therefore permit an approximate analysis of *regional differences* in total instability and in the relative role of governments in generating instability in each separate region.

Residential construction accounts for approximately 30 per cent of total construction. Building construction other than residential takes another 30 per cent, while the remaining 40 per cent is engineering construction. There has been no detectable trend in the share of any group.

These categories have contributed somewhat differently to instability. Engineering's contribution has been virtually proportional to its relative weight in total construction, while that of nonresidential building has been much less than proportional, and residential much more than proportional.

4 A very major inconsistency in the data from Statistics Canada was uncovered in this way; this necessitated comprehensive revisions to our data and earlier analysis.

The three series do not move very closely together: with trends extracted, the correlation of residential construction with nonresidential building is only 0.1, not significantly different from zero. Engineering has a correlation of 0.5 with both residential and nonresidential building, significant at 5 per cent but not at 1 per cent.

An exceptional role is played in instability by gas and oil construction. Although it accounts for only 6.7 per cent of all construction (on average from 1951-70), this category is responsible for 17.8 per cent of the variability—more than half of the amount of variability due to all engineering construction. If the resource boom of the 1950s is regarded as a never-to-recur phenomenon, the implication is that construction instability may be much reduced in the future.

Furthermore, the structures data indicate a relatively small role in instability of engineering construction exclusive of gas and oil. With about a third of the weight, these categories of engineering account for less than one-sixth of the variability.

An attempt was made to check whether the share of instability accounted for by government in the sector data (about 26 per cent over the 1951-1970 period) is consistent with the share of instability of those structures which might reasonably be taken as government spending. The check is somewhat sensitive to varying assumptions about how much gas/oil construction is government and how much private, and also to assumptions about the government share of the "railway/communication" and other engineering categories. Bearing these problems in mind, the agreement is very good as Table 2-6 shows.

Table 2-6

Share of Total Construction Variability, 1951-70

	Sector data	Estimated from structures data
	(Per cent)	
Residential	44	46
Private nonresidential	30	29
Government	26	25

Detailed examination of structures data highlights the fact that almost half of the 25 per cent that government contributed to total variability was due to swings in gas/oil and marine construction by governments. If it is assumed that nothing like the Northern Ontario Pipeline and the St. Lawrence Seaway projects will be built in the future it might be concluded that government will automatically be responsible for a much smaller portion of construction instability in the future than in the past. Such an assumption is clearly unrealistic, however, in view of impending projects like James Bay, but it

does point to the very great effect of large special projects on instability. This obviously has significant policy implications.

In considering the structures data by region, an important question is whether total construction is above, on, or below trend at roughly the same time in each region. Is there, in other words, a common Canadian cycle in construction spending? To this end the correlations between pairs of regions are examined, where the variables correlated are the annual deviations from trend. Ten such distinct correlations (Ontario with Atlantic, Quebec with the Prairies, etc.) are arranged in Table 2-7. A strong common cycle would give correlation coefficients near unity; no common cycle would mean near zero correlations.

Table 2-7

Correlations Among Regions of Deviations From Trend

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Atlantic	1.0	0.0	0.3	0.5	0.3
Quebec	0.0	1.0	0.5	0.6	0.4
Ontario	0.3	0.5	1.0	0.7	0.7
Prairies	0.5	0.6	0.7	1.0	0.3
British Columbia	0.3	0.4	0.7	0.3	1.0

The ten correlations are inside the sketched triangle. Clearly there is not much evidence of a common construction cycle. The Atlantic Region in particular shows little common movement with other provinces; the only statistically significant correlation is that with the Prairies and even there chance may be involved in that the value of 0.5 is significant at 5 per cent but not at 1 per cent. British Columbia's cycle is also very weakly related to the rest; only its correlation with Ontario is significant at 5 per cent. Only among Quebec, Ontario, and the Prairies do the links seem moderately strong; even there, the correlation between the two biggest regions, Ontario and Quebec, is rather low (0.5), statistically significant at the 5-per-cent level but so small that a regression of, say, Quebec's cycle on Ontario's would suffice to "explain" only 25 per cent of Quebec's cycle.

If inter-regional correlations are calculated for each of the three major structural categories—residential, engineering, and nonresidential building construction—the picture of regional diversity persists for the last two, but housing expenditures are very much better correlated among regions. (See Table 2-8.) The average of the ten housing correlation coefficients is 0.61. Only in the Atlantic Region does housing construction move somewhat independently of the rest of Canada, with a mean correlation with the other four regions of only 0.39. The inter-regional correlations are very weak for both engineering and nonresidential building construction, averaging 0.30 and 0.26 respectively, implying that there is no such thing as a common national cycle in these types of construction.

Table 2-8

Correlations Among Regions of Deviations From Trend
(By Structure)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
	Residential Construction				
Atlantic	1.0	0.2	0.4	0.5	0.4
Quebec	0.2	1.0	0.7	0.7	0.8
Ontario	0.4	0.7	1.0	0.8	0.9
Prairies	0.5	0.7	0.8	1.0	0.7
British Columbia	0.4	0.8	0.9	0.7	1.0
	Engineering Construction				
Atlantic	1.0	−0.2	0.1	0.4	0.1
Quebec	0.2	1.0	0.5	0.4	0.3
Ontario	0.1	0.5	1.0	0.5	0.5
Prairies	0.4	0.4	0.5	1.0	0.3
British Columbia	0.1	0.3	0.5	0.3	1.0
	Nonresidential Building				
Atlantic	1.0	0.5	0.0	0.3	0.1
Quebec	0.5	1.0	0.0	0.6	0.0
Ontario	0.0	0.0	1.0	0.3	0.8
Prairies	0.3	0.6	0.3	1.0	0.2
British Columbia	0.1	0.0	0.8	0.2	1.0

An implication of these findings is that only for residential construction does it make sense to speak of a Canada-wide policy for influencing or for choosing not to influence instability in construction. For both engineering construction and nonresidential building construction, a policy that differed by region, at least in its timing if not in its methods, would be required to generate meaningful stability. Of course, Canada-wide stability could occur through ups and downs cancelling out across regions by design or otherwise. But this would not be very useful to the industry itself because most firms and their equipment are not sufficiently mobile to take much advantage of opportunities in another region. Some large multi-province firms are obvious exceptions. If stability in either engineering or nonresidential building construction is to be of substantial benefit to the industry, it should be region-specific as far as possible.

Regional specificity is less critical for workers in the construction industry. While geographic mobility, especially for short-term jobs, cannot be easy for labour, it is nevertheless not uncommon.[5] Some workers can move into other industries when construction is low in a province, if there is employment

5 See the forthcoming study in this series, by R.A. Jenness, "Manpower in Construction". Mr. Jenness finds a surprising amount of geographical mobility for many construction workers.

available in those industries. However, because construction usually moves in line with general economic conditions, this is seldom possible. On balance, a policy aiming at stability of construction by region or province would indeed be better for labour than a single Canada-wide policy, but the difference is not likely to be as crucial for labour as it is for the employers.

Canada-wide stability which did not include stability in each region could be indirectly beneficial to the country and the regions; the secondary multiplier effects of swings in construction spending and the cyclical impact on the construction materials supply industries would be appreciably lessened.

Even within each region the correlations among the various types of construction are weak (speaking always of deviations from trend). In Ontario, for example, the correlation between gas/oil construction and highway construction is -0.1, between industrial building and commercial building +0.2, between rail/communication construction and marine construction 0.5, and between all nonresidential building and all engineering 0.1. The correlations for other provinces are similar. The evidence for a single construction cycle common to all or many types of construction is clearly weak. Although stability in a region could theoretically occur for construction as a whole through ups and downs cancelling across different types of structures, such stability might not benefit the industry. Its factors of production might be too specialized to particular structures for the industry to take advantage of overall stability by moving from depressed types of construction to those in boom. With the admittedly very important exception of unskilled labour, a high proportion of the factors do appear to be quite specialized. For the industry to achieve maximum benefit, stability—even within a region—might need to be quite "structure specific". Even so, stability for the total, or possibly for broad groupings of structures such as "residential" and "nonresidential", would improve matters considerably.

The differences in cycles by both structure and region suggest that governmental responsibility for past instability could differ by region. However, it is difficult to examine the governmental role in instability in each region, because data on construction spending by government by region is not directly available. The instability from each *type of structure* can be allocated roughly to private spending and government spending, as explained in detail in the footnote to Table 2-9. The Table also shows the absolute and percentage contributions to instability when such an approximate allocation is made.

Table 2-9 shows that the government share in instability varied somewhat among the regions, ranging from a high of 23 per cent in Ontario to a low of 11 per cent in the Atlantic Region. Except for the Atlantic and the Prairies, the differences are very small, especially considering the approximate nature of the available measurement techniques. Moreover, the Prairie figure of 17 per cent may not be sufficiently less than the percentages for Ontario,

Table 2-9

Contributions of Governments to Instability, 1951-70[1], (By Region)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
			(Per cent)		
Government spending[2]	11	22	23	17	22
	(46)	(33)	(34)	(30)	(34)
Private spending	89	78	77	83	78
	(54)	(67)	(66)	(70)	(66)
Total	100	100	100	100	100
	(100)	(100)	(100)	(100)	(100)

1 The percentage shares in the volume of construction within each region are shown in brackets.

2 Government spending in all provinces includes institutional building, and marine, highway, waterworks, and sewer construction. In Ontario and the Atlantic Region, all of electrical power and dam or irrigation construction was also included. In Quebec, British Columbia, and the Prairies, part of these categories was assigned to government construction, part to private, based on information for Quebec and British Columbia about the changing degree of public ownership over the 1951-70 period, and in the Prairies on the fact that Alberta power production is privately controlled. The ratios of government to private construction used in Quebec, British Columbia, and the Prairies were 33:66, 40:60, and 60:40, respectively. In Ontario, gas and oil construction was partly governmental over the period, due to the activity of the Northern Ontario Pipeline Corporation; the government share over the whole period in gas/oil construction was only 20 per cent (estimated), but its contribution to instability of gas/oil construction was estimated at 50 per cent. In all provinces, half of each of the two construction categories, railways and communications and "other engineering" was assigned to government. Finally, the whole of certain other construction categories was taken as private – the building of residential, industrial, and commercial structures, as well as all gas and oil construction except for Ontario.

Quebec, and British Columbia to conclude that government construction really was more stable there, but it is almost certainly true that it was more stable in the Atlantic Region. The Table shows that government expenditure nowhere ran counter to the construction cycle over the 1951-70 period. Just as in Canada as a whole, government sector expenditures added to instability in construction.

The figures in brackets in Table 2-9 show the percentage shares of the private and government sectors in the volume of construction in each region. These indicate that, although governments did contribute positively to instability in every region, their contribution to instability was always less than their contribution to the volume of construction. However, this conclusion varies with the measurement technique employed. At least one alternative method[6] gives the result that the contribution of government to instability in most regions was only slightly less than proportional to its contribution to the volume of construction.

6 Frequently used in Dr. Auer's study, *Construction Instability in Canada, ibid.*

The results in Table 2-9 imply that a weighted average of the government contributions to instability by province is 21 per cent. This is somewhat less than the figure of 26 per cent shown in Table 2-2, which is obtained when the method used in Table 2-9 is applied to aggregate data for Canada. This difference could be due to the approximate nature of the measurement technique, but more likely reflects a greater degree of cancelling of private instability across regions than of government instability. In any case, comparisons from one region to another almost certainly remain valid. The tendency for each regional governmental contribution to instability to be less than the Canada aggregate governmental contribution does not appear to vary with the measurement technique employed.

Limitations of time and resources precluded an analysis of how much these results on the role of government in instability by region might change if the early years are excluded, along the lines of the analysis for Canada as a whole. However, it seems likely that the conclusions would not change greatly: the role of government in instability might appear a little greater than the above analysis implies, but would remain only a little less than proportional to the volume of government construction. Governmental responsibility may be rather greater than this in view of the many indirect ways (fiscal, monetary, and legal changes) whereby the government sector can influence private sector construction spending. This is a question for later analysis.

2 Testing Common Ideas About Government Responsibility

Provincial government officials interviewed for this study often expressed the view that much of the variability in highway construction was due to federal government policy on grants for highways. Policy for the Trans-Canada Highway was given as the leading example but was not the only one.

Another frequent comment was that highway construction—and sometimes other types of construction for which provincial governments are directly or indirectly responsible—tended to increase with the approach of elections.

These are two quite definite hypotheses about sources of instability in highway construction. Their validity can be tested by examining whether changes in time-series data on highway spending coincide with obvious changes in grants or with elections. However, precise conclusions are not possible with this method, because too many other variables also affect highway spending. It would be useful to know if there are such effects and how much they affect the total amount of instability observed.

The following theory was developed mainly with an eye to estimating the quantitative importance for highway instability of both federal grants policy and provincial elections. The theory also gives, as by-products, valuable insights into important determinants of variability in two other areas of provincial/municipal responsibility, hospital and educational construction.

A formal theory, or model, of expenditures by a typical Canadian provincial government is first developed. The results of empirical work based upon it, in which equations were fitted to annual expenditures by each of the ten provinces, are presented. Simulations were run in order to test the hypotheses.

A Theoretical Model of Provincial Government Spending

The model is kept simple but useful by restricting the endogenous variables to four important budgetary categories: highway spending, hospital-care expenditure, spending on schools and universities, and all "other" spending.[7] The structure of the budget is assumed to affect the utility of policy makers both directly—because they have certain policies they consider intrinsically worthwhile, and indirectly—because the budget affects the utility of citizens and so the outcome of the next election. The marginal utility of any services provided is taken as positive.

Each service provided might be measured in the utility function as a total amount, or in relation to an appropriate population; educational services, for example, could be measured in total, or per child of school age, etc. The "population" requiring a service in this context need not be human; for highways expenditure it could be automobiles or vehicles in general. All services are measured on a per-capita basis[8] and denoted by x's, x_1, x_2, . . , x_n.

The policy maker's utility will also be affected by the need to acquire resources from the public through taxing, borrowing, and other means. The symbol T represents the amount of money raised by methods that would not directly affect a government's asset balance sheet: the components of T include taxes of all kinds, income from privileges, licenses, and permits, liquor profits where applicable, and some miscellaneous items. The total is called "quasi-taxes", and the total expressed as a fraction of province-wide income (Y) is the "quasi-tax rate", using the symbol t ($=T/Y$) for the latter. The symbol B is used for funds raised by bond issues, changes in cash balances and a few minor methods. This is called "quasi-borrowing", and the ratio $B/Y = b$ will be called the "quasi-borrowing rate".

The private sector will have $Y - T - B = Y(1-t-b)$ after the government's requirements are met. If N is the population and P is an index of the general

7 The first three are the categories in which government investment expenditures, largely on construction, are mostly concentrated.

8 This form of measurement was determined after a study of the government sector equations in several models, namely RDX2, CANDIDE, Brookings SSRC, and one by Gramlich (Gramlich, Edward M., "State and Local Governments and their Budget Constraint", *International Economic Review* 10, June 1969, pp. 163-182). A crucial difference, between those models and this one is that each provincial government is treated separately in the later empirical work. In Canada, provincial governments are sufficiently autonomous that such disaggregation is likely to improve the explanatory power of the theory.

price level, $y = Y/PN$ may be defined as real income per capita. It is reasonable to suppose that governments consider their utility to be positively affected by the level of the variable $y(1-t-b)$, which is the real per-capita amount remaining to the private sector after the government has financed its activities, because their utility is linked with private utility through voting and other mechanisms.

It is possible that the method of financing is important to governments; allowance is made by supposing that the ratio of the quasi-bond rate to the quasi-tax rate, b/t, affects their utility.

The theory to this point may be summarized, as U:

$$U = U(x_1, x_2, \ldots, x_n; y(1-t-b); b/t; E)$$

where U represents the government's utility.

To cover the possible influence of elections, an election variable E is included, the form of which will be specified later. Thus:

$$(2\text{-}1)\quad U = U(x_1, x_2, \ldots, x_n; y(1-t-b); b/t; E)$$

The government cannot maximize U as it stands, for the services that can be provided ($x_1, x_2, \ldots, x_n$) and the quasi-tax and quasi-bond rates are not independent. They are connected through the requirement that revenues, inclusive of quasi-borrowing, must match expenditures. Expenditures include the amounts necessary to finance the four services x_1, x_2, x_3, and x_4. These amounts can be represented by X_1 X_2, X_3, and X_4. There are also debt charges excluding retirements (denoted D) and occasional miscellaneous items. Revenues consist of quasi-taxes, quasi-borrowing, unconditional grants from the federal government (G), interest and investment income (I), and matching grants from the federal government. Since X_i is current dollar spending in the ith category, if the rate of matching in that ith category is denoted by m_i, matching grants will be m_1X_1, m_2X_2, m_3X_3, and m_4X_4. Some of the m_i's may be zero. A budgetary equation can then be deduced:

$$(2\text{-}2)\quad \sum_{i=1}^{4} X_i + D = T + B + G + I + \sum_{i=1}^{4} m_iX_i$$

The x_i in (2-1) are obviously related to the X_i in (2-2). The nature of the relationship can be elucidated through an examination of how provincial governments behave with respect to capital expenditures.

Most services provided by government require some capital equipment. Provision of travel facilities needs a capital stock of highways, education requires a stock of schools, even welfare requires office buildings. In any particular year a stock of such capital is already available, and may be used to provide services at a cost involving only the payment for upkeep and needed ancillary inputs – repair and administration for highways, teachers for schools, etc.

If a level of service is required beyond what is possible using the existing capital stock, the cost of providing that service rises sharply, because of the need to provide extra capital. This increase in cost occurs because provincial governments usually charge the full cost of new capital against the current year's budget. If provincial governments always borrowed to finance capital expansions, no such sharp increase would appear. Principal and interest payments on all past borrowing would be added to the cost of services provided today by means of old capital, and for services provided by new capital only the interest and first instalment of principal on that new capital would be included in this year's cost.

The provision of services by a provincial government contrasts sharply with the situation of a private company producing services (or goods) for sale. The private company would see no sharp rise in cost of production for any additional units needing extra capacity (provided the demand for them is not expected to be temporary), because the cost of the capital associated with producing them is expected to be spread over many years. A provincial government sometimes views matters similarly, but more often it will behave differently from a private firm. New highway construction expenditure in Canada and much of the new construction expenditure related to medical care and education are rarely financed from borrowing or accumulated liquid assets. They represent instead a full charge against the current year's budget.

However, even though much of the capital expenditure is not spread over future years in an accounting sense, it would seem that some allowance should be made by the government for the reduced cost of providing the associated service in future years. This almost certainly happens, but only to a limited extent. Unlike a private firm, a government's expected life is much shorter than the life of the capital it provides, so that much of the cost saving will accrue to future governments which have a fair chance of being different from this one. If the utility of government officials were the same as the utility of the public, rather than just positively correlated with it, then a future change of government would not affect a current government's view of the costs of capital investment now, but this is not so. Thus, even though current capital spending permits more services and/or reduced taxes in the future, and even though *some* allowance is likely to be made for this, it remains true that *decisions on services requiring additional capital are likely to be made in a way that implies they cost more per unit than services that do not require it.*[9]

Let the cost of providing the ith service, *exclusive of all capital costs except upkeep*, be denoted c_i per unit (however many units are provided). The value of c_i will depend on wages of various kinds of workers, such as hospital orderlies, painters, etc.; and on raw materials costs, such as asphalt

9 An interesting consequence is that there will be a tendency to underinvest in social capital.

for highway repairs, etc. Let the current cost per unit of that amount of *new capital* required to provide one unit of the *i*th service be denoted P_i. Then the unit cost of the service is c_i as long as it can be provided using existing capital, and $(c_i + P_i)$ per unit for the units provided beyond this point.

Units have now been defined in such a way that one unit of capital provides one unit of service. Let the existing capital stock be denoted K_i. If less than K_i units of service are provided, say K_i^{**}, the total cost is $K_i^{**}c_i$. Since $K_i^{**} = N_i x_i$ (recall that x_i is service per capita and N_i is the "population", so that total services provided is $N_i x_i$) total cost can be expressed when less than K_i units are used as $N_i x_i c_i$, i.e.,

$$(2\text{-}3)\quad X_i = N_i x_i c_i \qquad \text{if } N_i x_i \leq K_i$$

If more than K_i units are used, new capital has to be purchased in amount $N_i x_i - K_i$, which is the number of extra units of capital required above the existing stock. The cost of purchasing these is P_i per unit, for a total purchase cost of $P_i(N_i x_i - K_i)$. In addition, each unit of capital stock, new and old, requires a further cost of c_i per unit for upkeep and the ancillary inputs, so that total cost is

$$P_i(N_i x_i - K_i) + N_i x_i c_i \qquad \text{when } N_i x_i \text{ exceeds } K_i,$$

i.e.,

$$(2\text{-}4)\quad X_i = P_i(N_i x_i - K_i) + N_i x_i c_i\,, \qquad \text{if } N_i x_i > K_i\,.$$

Equations (2-3) and (2-4) are the required links between the x_i in (2-1) and the X_i in (2-2).

Let us now define some convenient terminology. Let $x_i^* = X_i/P_i N_i$, $k_i = K_i/N_i$, $b_i = c_i/P_i$ and one may deduce from (2-3) and (2-4) that

$$(2\text{-}5)\quad x_i = \frac{1}{b_i}\, x_i^*\,, \qquad \text{if } x_i^* \leq b_i k_i\,, \text{ and}$$

$$(2\text{-}6)\quad x_i = \frac{k_i}{1+b_i} + \frac{1}{1+b_i}\, x_i^*\,, \qquad \text{if } x_i^* > b_i k_i\,.$$

It will be convenient to re-express the budget equation in terms of variables in the utility function and to introduce some minor additional notation. First re-arrange (2-2), divide it by Y, and introduce $N_i P_i$ into the summation term, to obtain

$$\Sigma\, \frac{X_i}{N_i P_i}\,(1-m_i)\,\frac{P_i N_i}{Y} = \frac{T+B}{Y} + \frac{G+I-D}{Y}$$

Now put $a_i = (1-m_i)\,P_i N_i/Y$, $s = (G+I-D)/Y$, and recalling the definitions of $t = T/Y$, $b = B/Y$, $x^* = X_i/N_i P_i$, we get

$$(2\text{-}7)\quad \Sigma\, a_i x_i^* = b + t + s$$

The number a_i and the number s are worth a brief comment.

$$a_i = \underbrace{P_i N_i}_{\substack{\text{cost of providing one unit of capital to all the "population" using the service}}} \bullet \underbrace{(1-m_i)}_{\substack{\text{matching grant factor which effectively reduces the prices to the province}}} \div \underbrace{Y}_{\substack{\text{income available in the province}}}$$

$$= \underbrace{\text{net provincial cost of providing a unit of capital to the "population"}}_{\text{net price}} \div \underbrace{\text{income available}}_{\text{income}}$$

= "net price/income relative" associated with capital for the ith good.

Henceforth, a_i's will be referred to as "price/income relatives".

The variable s is the sum of unconditional grants (G) and interest income net of interest charges ($I-D$), expressed as a fraction of provincial income. Both grants and interest are largely beyond control of provincial governments at the time of making the current year's budget, so that s constitutes "net exogenous revenue" relative to provincial income; s is the "exogenous income relative".

Substituting from (2-5) and (2-6) into the utility function (2-1), we have

$$(2\text{-}8)\quad U = U\left[\left\{\begin{array}{l}\dfrac{x_i^*}{b_i} \\ \dfrac{k_i+x_i^*}{1+b_i}\end{array}\right\} \begin{array}{l} i = 1 \ldots 4, \\ \text{choice of term} \\ \text{depending on sign of} \\ x_i^* - b_i k_i \end{array} ; \; y(1-t-b);\; b/t;\; E\right]$$

This utility function has an n dimensional kink at the point ($x_i^* = b_i k_i$, $i = 1 \ldots 4$).

The utility in (2-8) is maximized by choice of the x_i^*, t, and b subject to the budget constraint (2-7). Such maximization is very difficult to carry out. Standard calculus techniques cannot be used because of the kink. What is known is that a reduced form will exist, in which each endogenous variable (x_i^*'s, t and b) will, in general, be a function of all exogenous variables in the system (a_i's, s, b_i's, k_i's, y and E). It follows that:

$$(2\text{-}9a)\quad x_i^* = \phi^i\ (\bar{a}, \bar{k}, s, \bar{b}, y, E) \qquad i = 1 \ldots 4$$

where $\bar{a} = (a_1, \ldots, a_4)$

$\bar{k} = (k_1, \ldots, k_4)$

$\bar{b} = (b_1, \ldots, b_4)$ and

$$(2\text{-}9b)\quad t = \phi^t\ (\bar{a}, \bar{k}, s, \bar{b}, y, E)$$

$$b = \phi^b\ (\bar{a}, \bar{k}, s, \bar{b}, y, E)$$

The equations mean that the four x_i^* variables, as well as the rates of quasi-taxing t and quasi-borrowing b, depend in general on the price/income

relatives of all capital goods, on the existing per capita stocks of all goods, on the exogenous income relative s, on the relative costs of ancillary inputs to capital and the capital itself (the b_i's), on real per-capita income in the province, and on "elections" in a way to be specified. All these variables cannot be expected to influence all categories of spending; only significant variables will be retained in the empirical work.

The Empirical Work

In the empirical work *linear* versions of (2-9a)[10] were estimated for the four categories of provincial budgetary expenditure mentioned earlier. Necessary data were obtained from *Provincial Government Finance* (various issues), from *CANSIM* (for provincial income data, approximated by wage and salary income, and some population data), from *Construction in Canada* (for stocks of structures,[11] estimated as a cumulated weighted sum, with slowly declining geometric weights, of past real construction expenditures), and from published data on vehicle registrations (for the "population" relevant to highway expenditure). No data were obtained for the vector $\bar{b}$.

Equations were estimated for all ten provinces, covering the period from 1952-70 in most cases, though for some provinces, data were available only from 1954.

Two election variables were tried. One was the number of months to go before an election, called $EV1$; the other was the "distance" of an election defined as

$$\text{Min} \left\{ \begin{matrix} M_1 \\ M_2 \end{matrix} \right.$$

where M_1 is the months to go *to* the *next* election, and M_2 the months elapsed *since* the *last* election. This variable was called $EV2$. Either election variable might represent the effect of elections on government spending. Since their values are smallest near elections, a positive effect of elections on spending will appear as a negative coefficient on one or both of the two variables, and conversely for a negative effect of elections on spending.

Table 2-11 gives the regression results for highway expenditures.[12] The results are generally satisfactory, with good Durbin-Watson (D. W.) values and

10 C. Miller of Guelph, in discussion at the Canadian Economic Association meetings, has correctly pointed out that the assumption of linearity is stronger than is usual when one approximates a non-linear function with a linear one, because the non-linearity consists, in part, of a kink.

11 Only two empirical k's were used, stocks of highways and stocks of institutional buildings. Data on types of capital other than structures, i.e. machinery and equipment, was unavailable and probably of minor importance anyway, and while a more detailed breakdown of structures is possible, e.g. into highways, hospitals, and educational buildings, time and resource constraints limited the work to just two.

12 The meaning of the variable names in Tables 2-11 to 2-14 may be found in Table 2-10 on page 26.

Table 2-10

Key to Variables in Tables 2-11 to 2-14

Computer name	Theoretical symbol	Verbal definition
SSS	s	Exogenous income relative
STR	k_1	Per-capita stock of roads
STI	k_2	Per-capita stock of institutional buildings
ARD	a_1	Price/income relative for roads expenditure
AHC	a_2	Price/income relative for hospital expenditure
AED	a_3	Price/income relative for education expenditure
AOT	a_4	Price/income relative for "other" expenditure
*EV*1	*EV*1	Months to go to an election
*EV*2	*EV*2	Months since an election
YPN	Y	Real per-capita income
DNBE	none	Dummy variable
DNBH	none	Dummy variable
DNFH	none	Dummy variable
DNFH	none	Dummy variable
NRY-1	none	Lagged revenue from selling natural resource rights

reasonable $\bar{R}^2$'s, considering the volatile and generally trend-free nature of the independent variable, expressed in a "per vehicle" form. Values of the D.W. for Ontario (3.08) and Saskatchewan (0.76) are a little disturbing.

Income in the province, approximated by wages plus salaries, can influence the dependent variable through its presence in the denominators of the four price/income relatives (*ARD, AHC, AED* and *AOT*) and the denominator of *SSS*. It was also entered as an independent variable in its own right, but it was never significant for roads. The income elasticity of expenditure on roads with respect to provincial income can be calculated from the coefficients on these five variables together with their means and the mean of the independent variable; this is shown in the first column of Table 2-11.

In five of the ten provinces, including the three largest, the income elasticity is positive, being particularly high in Ontario. In five provinces, however, it is negative or zero. While such results are theoretically possible, they are extremely unlikely; these five regressions should not be used for prediction outside the sample period, although they may remain useful for simulations within the sample period.

The price/income relative variable (*ARD*) is negative as expected in eight of the ten provinces, zero in two. It follows that highway expenditures per vehicle are reduced if matching grants are cut–an unsurprising but reassuring result–or if the cost of highway construction goes up in most of the provinces.

There is evidence that the approach of elections (*EV*1), or the nearness of elections (*EV*2), influenced highway spending in six of the ten provinces. Expenditures rose near elections in most of the provinces, but fell in Ontario.

Table 2-11

Regression Results for Highway Expenditures,[1] 1952-69

Province	Income elasticity	*SSS*	*STR*	*STI*	*ARD*	*AHC*	*AED*	*AOT*	*EV*1	*EV*2	*NRY*-1	$\bar{R}^2$	D.W.
Newfoundland	1.3		-.275 (-2.03)	2.41 (2.24)*	-3,718,430 (-4.11)**				-2.78 (-2.14)			.7905	1.59
Prince Edward Island			0.207 (4.42)**	-0.863 (-2.90)*						-2.86 (-3.17)**		.8036	1.94
Nova Scotia	-2.4	1094.1 (2.13)	0.173 (4.55)**	0.416 (2.05)	-666,160 (-3.98)**	1,347,609 (3.66)**						.7901	2.89
New Brunswick	-1.6		0.271 (4.46)**		-1,222,343 (-4.33)**		2,165,690 (3.76)**	-207,429 (-2.10)				.8172	2.62
Quebec	1.3		.054 (2.15)*		-1,194,399 (-4.45)**					-1.14 (-1.84)		.5208	1.07
Ontario	4.2	1812.6 (6.69)**	.100 (6.54)**	-.658 (-11.46)**	-151,366 (-4.19)**	-1,408,361 (-10.42)**		-84,547 (-4.78)**		.353 (3.50)**		.9495	3.08
Manitoba	2.6	584.4 (1.64)	.278 (5.94)**	-1.07 (-6.15)**	-142,195 (-1.91)	-396,589 (-2.65)*		-178,367 (-3.74)**		-.848 (-2.87)*		.8655	1.89
Saskatchewan			.066 (5.42)**									.6192	0.76
Alberta	-1.1	532.5 (2.74)*		.119 (2.34)*	-487,091 (-3.62)**	755,284 (5.10)**				-.395 (1.89)	327.9 (1.72)	.8750	1.29
British Columbia	2.0				-726,330 (-3.14)**	-308,253 (-2.09)				-1.48 (-1.53)		.3000	1.14

1 See Table 2-10 for key.

*Significant at 5-per-cent level.
**Significant at 1-per-cent level.

The existing stock of roads at the beginning of the year had a strong positive effect on highway spending in seven provinces, a negative effect in Newfoundland, and no apparent effect in Alberta and British Columbia. The strong positive influence of this variable is surprising, as the corresponding stock variable used for education and hospital-care regression (*STI*) appears there with highly significant positive coefficients. It is surprising because in a simple two-variable version of the model–one public good and one private good–the expected influence is negative unless the private good is inferior, an unlikely possibility. The fact that a large existing stock requires a greater expenditure on ancillary inputs–more road repairs, greater administrative costs in the Department of Highways, etc.–might suggest that a positive sign is plausible but, at least in the simple case, this plausibility is deceiving. With more than one public good, positive signs might be possible, but this seems unlikely. There are two alternative and more appealing interpretations of the positive signs. First unit costs of ancillary inputs–the c_i's in the theory above–are positively correlated with the capital stock; for example, the more roads were built last year, the higher the wage rates of the Department of Highways personnel are likely to be this year and consequently, the coefficients on the stock variables would be upward biased. Second, *STR* is an excellent measure of the size of the Highways Department at budget time, and *STI* an almost equally good measure of the sizes of the departments concerned with education and hospital-care expenditures, so that *STR* and *STI* may also serve as empirical measures of the operation of incrementalism–the process whereby a department's budget is said to be largely determined by increasing it over the previous year's budget.

The price/income relatives for hospital care, education and "other" goods are occasionally significant, with varying signs. Care should be taken in interpreting the meaning of the signs because, with only four "goods" in the budget, the income effects of price changes are of comparable magnitude to substitution or complementarity effects: for example, the negative sign on *AHC* in Ontario may imply that a greater cost of building hospitals restricts the amount of money available for roads, an income effect, rather than that roads and hospitals are complements. In four provinces the exogenous income variable has the expected positive effect. The variable *NRY*-1 in Alberta is akin to exogenous revenue; it is lagged revenue from selling natural resource rights. This was included on the advice of an Alberta official familiar with their budgetary process. It is close to significance and of the expected positive sign. The stock of institutional buildings is important for explaining road spending in six provinces, and is of varying sign. There is no obvious theoretical reason for this variable to have one sign or the other in any particular province, especially as provincial preference functions almost certainly differ.

Other Categories of Expenditure

The results for education, hospital-care, and "other" expenditures are shown in Tables 2-12, 2-13 and 2-14. They are not as important as the highway regressions in explaining instability in construction.

Generally speaking, the results are very good, with high $\bar{R}^2$'s and satisfactory Durbin-Watson statistics. However, the trend in these dependent variables is much stronger than it was for highways expenditure per vehicle, and this tends to make the $\bar{R}^2$'s look better than they really are.

Income elasticities of demand for all three goods are positive in every province except Newfoundland. Own-price relatives are negative when significant for education expenditures, but for hospital-care and "other" expenditures there are two positive signs in each case, a disturbing outcome. The stock variable, which is *STI* for both education and hospital care, is frequently significant and always positive when it is. Somewhat reassuringly, in view of the common folklore, election variables were rarely significant, in contrast to the highways regressions. By contrast, per-capita income did prove important as an explanatory variable, especially for "other" expenditures. Dummy variables were used three times, when the data showed obvious and large discontinuities: in New Brunswick for education from 1967 and hospital care from 1960, and in Newfoundland for hospital care from 1961. The first of them can be explained by the takeover of local education in New Brunswick by the Province after 1967. The others have no such obvious rationale, to our knowledge.

Simulation Results

The model was simulated for three reasons. The first reason was to test the hypothesis, suggested by several of the provincial officials interviewed, that instability in matching grants for highways, especially Trans-Canada grants, was a source of instability in highway construction expenditures. Second, there was a need to determine the importance to instability of the election variables, which were significant or nearly so in seven provinces. Finally, two other budgetary categories—education and hospital care—were examined to determine whether a smoother pattern of matching grants could contribute to greater stability, especially in construction spending, or perhaps even be used to cause variations in provincial government construction that would compensate for opposite variations in the construction of others. Despite the problems noted in describing the empirical results, the model appeared to fit well enough to be used with fair confidence for these three types of simulation.

Provincial officials suggested that irregularity in the timing of matching grants for highways was a source of instability in highway spending; they felt

Table 2-12

Regression Results for Education Expenditures,[1] 1952-69

Province	Income elasticity	*SSS*	*STR*	*STI*	*ARD*	*AHC*	*AED*	*AOT*	*EV*1	*EV*2	*DNBE*†	*YPN*	$\bar{R}^2$	D.W.
Newfoundland	-6.2			2.73 (7.32)**	1,642,169 (4.43)**	576,546 (2.78)*		336,429 (2.50)*					.9468	1.99
Prince Edward Island	1.2		.081 (2.34)*		-388,178 (-2.07)	420,251 (1.89)	-648,032 (-3.50)**						.8807	1.44
Nova Scotia	0.2	1520.5 (3.37)**	-.117 (-3.89)**	.825 (4.18)**		554,408 (1.87)	-897,641 (-3.30)**						.9765	2.29
New Brunswick	2.8	1305.2 (1.70)	-.123 (-2.34)*				-956,287 (-3.16)**				208.7 (10.09)**		.9635	1.07
Quebec	0.5		-0.334 (-4.11)**	2.16 (4.44)**	-645,092 (-3.84)**	1,241,883 (3.75)**						.254 (4.09)**	.9860	2.98
Ontario	1.9		-.579 (-5.32)**	1.57 (6.86)**			-1,043,358 (-1.99)	-244,579 (-2.30)*	-.798 (-1.94)				.9480	1.93
Manitoba	2.1	1975.1 (2.04)	-.398 (-2.68)*	1.74 (3.08)**				216,746 (1.88)				.266 (3.50)**	.9440	1.48
Saskatchewan	0.2			.858 (16.25)**	-193,903 (-3.07)**	880,249 (4.98)**	-1,046,221 (-5.01)**						.9792	1.63
Alberta	2.1			.469 (4.60)**								.265 (3.91)**	.9585	2.16
British Columbia	2.8		-.296 (-4.07)**	1.43 (5.20)**								.239 (6.43)**	.9281	2.32

1 See Table 2-10 for key.
† Dummy variable, education, New Brunswick.
* Significant at 5-per-cent level.
** Significant at 1-per-cent level.

Table 2-13

Regression Results for Hospital-Care Expenditures,[1] 1952-69

Province	Income elasticity	*SSS*	*STR*	*STI*	*ARD*	*AHC*	*AED*	*AOT*	*EV1*	*EV2*	*DNFH*† *DNBH*‡	*YPN*	$\bar{R}^2$	D.W.
Newfoundland				0.692 (3.65)**					−0.37 (−1.36)		24.0 (1.81)		.9451	3.25
Prince Edward Island	1.3		0.059 (4.84)**					−93,934 (−4.41)**	−0.328 (−1.92)				.9524	1.44
Nova Scotia	2.7	445.8 (2.05)	−0.029 (−1.89)	0.212 (2.70)*		−406,898 (−2.59)*		−102,632 (−4.69)**					.9886	2.80
New Brunswick	1.8	425.5 (1.64)			206,472 (1.58)			−109,001 (−3.32)**			28.15 (2.35)*		.9814	2.59
Quebec	2.9		−0.193 (−2.30)*	1.03 (2.20)*	−510,687 (−3.18)**	757,870 (2.36)*	−485,906 (−2.11)					0.200 (3.40)**	.9814	1.74
Ontario	1.9		−0.174 (−2.49)*	0.799 (3.61)**	−499,392 (−2.93)*			−161,609 (−2.54)*					.9496	1.80
Manitoba	1.6	555.9 (1.81)		0.543 (6.65)**	−364,827 (−4.66)**			−118,608 (−2.61)*					.9788	2.23
Saskatchewan	0.1			0.489 (20.51)**	−150,736 (−5.24)**	106,234 (3.26)**							.9825	1.63
Alberta	0.6		−0.040 (−3.60)**	0.542 (13.38)**	−213,157 (−4.04)**		315,728 (4.03)**			−0.223 (−2.27)*		0.052 (2.84)*	.9976	2.51
British Columbia	2.1					−364,230 (2.8)*						0.056 (2.43)*	.8341	0.57

1 See Table 2-10 for Key.
† Dummy variable, hospitals, Newfoundland.
‡ Dummy variable, hospitals, New Brunswick.
* Significant at 5-per-cent level.
** Significant at 1-per-cent level.

Table 2-14

Regression Results for "Other" Expenditures,[1] 1952-69

Province	Income Elasticity	*SSS*	*STR*	*STI*	*ARD*	*AHC*	*AED*	*AOT*	*EV1*	*EV2*	*DNBE*†	*YPN*	$\bar{R}^2$	D.W.
Newfoundland	-4.1		.123 (3.76)**	1.43 (5.86)**	1,145.303 (4.37)**	723,037 (4.21)**	359,512 (2.90)*						.9668	2.20
Prince Edward Island	1.6		.069 (4.11)**			654,887 (6.33)**				-.951 (-2.22)*		.567 (11.08)**	.9740	2.53
Nova Scotia	4.6	756.7 (2.84)*	-.117 (-9.29)**									.452 (18.98)**	.9858	2.42
New Brunswick	0.4	453.2 (1.02)						-57,827 (-2.15)*			179.7 (11.82)**		.9650	1.42
Quebec	4.1		-.080 (-2.17)*			584.986 (2.49)*	-636,304 (-3.15)**					.386 (8.95)**	.9849	1.63
Ontario	2.5	2600.3 (3.36)**	-.472 (-13.15)**	1.42 (19.49)**			-1,876,527 (-9.21)**	382,831 (0.97)					.9906	2.38
Manitoba	1.5	1207.5 (1.88)	-.335 (-3.42)**	1.55 (4.17)**				160,443 (2.12)	.620 (3.25)**			.199 (3.98)**	.9705	2.04
Saskatchewan	0.2	-1228.7 (-3.43)**		.806 (18.68)**									.9565	1.22
Alberta	1.9			.307 (4.82)**				242,046 (4.20)**				.302 (8.17)**	.9732	2.64
British Columbia	1.0				710,739 (4.02)**							.174 (6.99)**	.8924	1.00

1 See Table 2-10 for key.
† Dummy variable, education, New Brunswick.
* Significant at 5-per-cent level.
** Significant at 1-per-cent level.

that greater advance knowledge of the imminence and amount of grants could guarantee a smoother path of highway spending. To explore this possibility, the model was used to simulate the effect of a pattern of matching grants smoother than the historical one. Since two to three years' advance warning of what was going to happen to such grants was considered adequate by the officials concerned, a five-year moving average of actual grants was taken as representative of the amount of smoothing in the flow of federal matching funds that a two-and-a-half-year advance knowledge would have made possible. The model was then used to calculate the annual constant dollar expenditures which would have resulted from such smoothing. While it is not certain that this procedure will give the right results, because the model's assumptions might be inappropriate for conditions under which more advance planning would have been possible, there is no better alternative analytical technique available.

The smoothing had the greatest effects in Newfoundland and New Brunswick, although even there the changes were small. There were also very small changes in Nova Scotia and Quebec, while in the other five provinces the effects were negligible. Chart 2-3 indicates the effect of the five-year averaging of matching grants on highway spending in Newfoundland, Nova Scotia, New Brunswick, and Quebec.

The Chart clearly shows that in Newfoundland a smoother pattern of matching grants would have made a substantial difference in the actual spending pattern. The sharp peak in 1964 and the sharp trough in 1966 would have both been avoided, with the result that the spending pattern for 1962 to 1969 would have been considerably smoothed. However, the surge in spending from 1962 to 1964 would not have been avoided– it would have simply been displayed backwards two years to the period 1960-62. This implies that the decisions to implement a strong development program for Newfoundland's road network–notably the decision to go ahead with the Trans-Canada Highway–had to result in a sharp rise in spending some time, unless the development process was to be wastefully spread over a very much longer time period. The "instability" resulted largely from the basic decision on priorities, although the simulation results show that a smoother pattern of grants would have helped in the years following that basic decision.

Chart 2-3 shows that in New Brunswick, road spending was reasonably stable despite irregularity in matching grants. Smoother grants would have moderated the cutback in expenditure between 1959 and 1962, and correspondingly lessened the sharpness of the subsequent rise for 1962-64, but apart from this there would have been little effect. In Nova Scotia and Quebec the effect of smoother grants was very small.

The nature of the election variables, and the procedure for simulating their effect, are shown in Chart 2-4.

Variable $EV1$, shown on the left, is the number of months to go before the next election, and peaks in the first month after an election; variable $EV2$,

Chart 2-3

The Effect of a Smoother Pattern of Matching Grants for Highways on Expenditures in Four Provinces

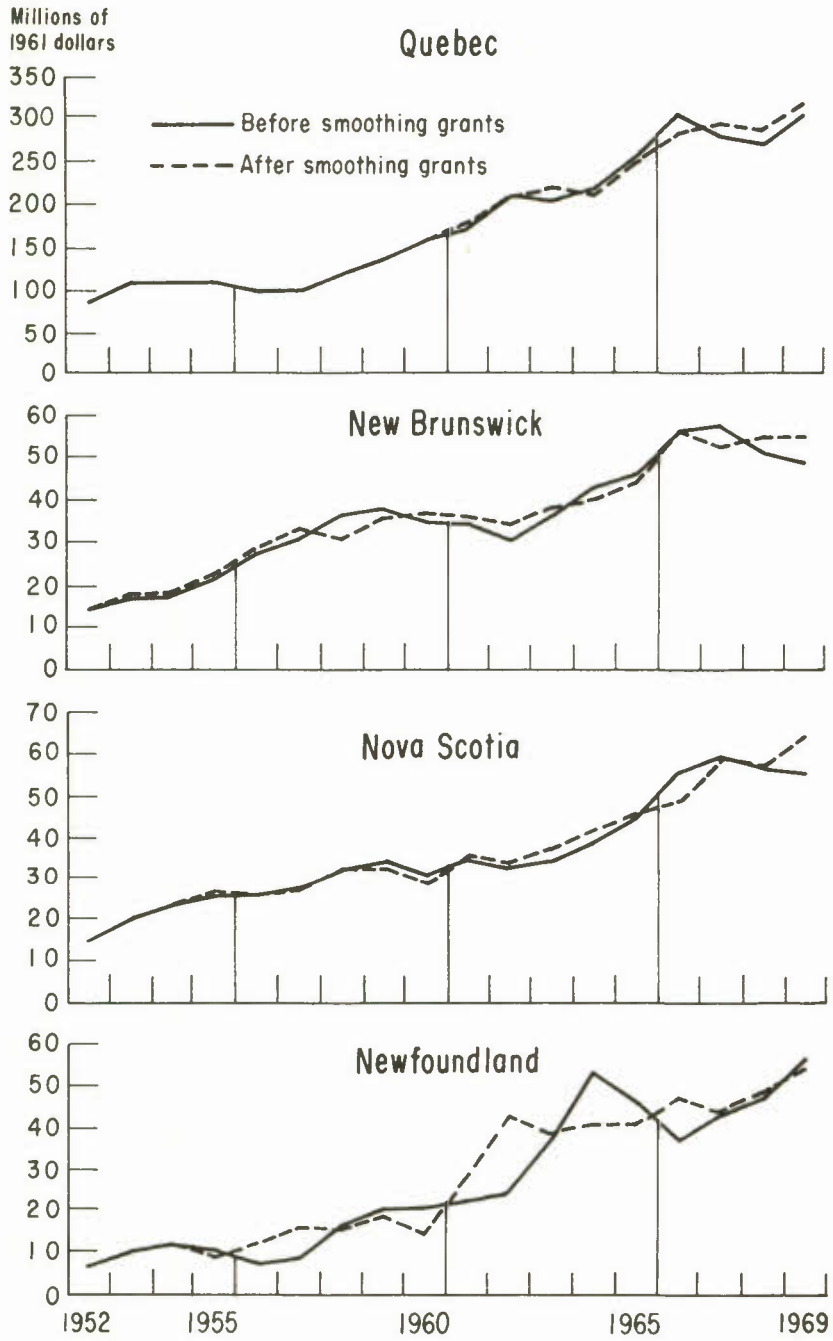
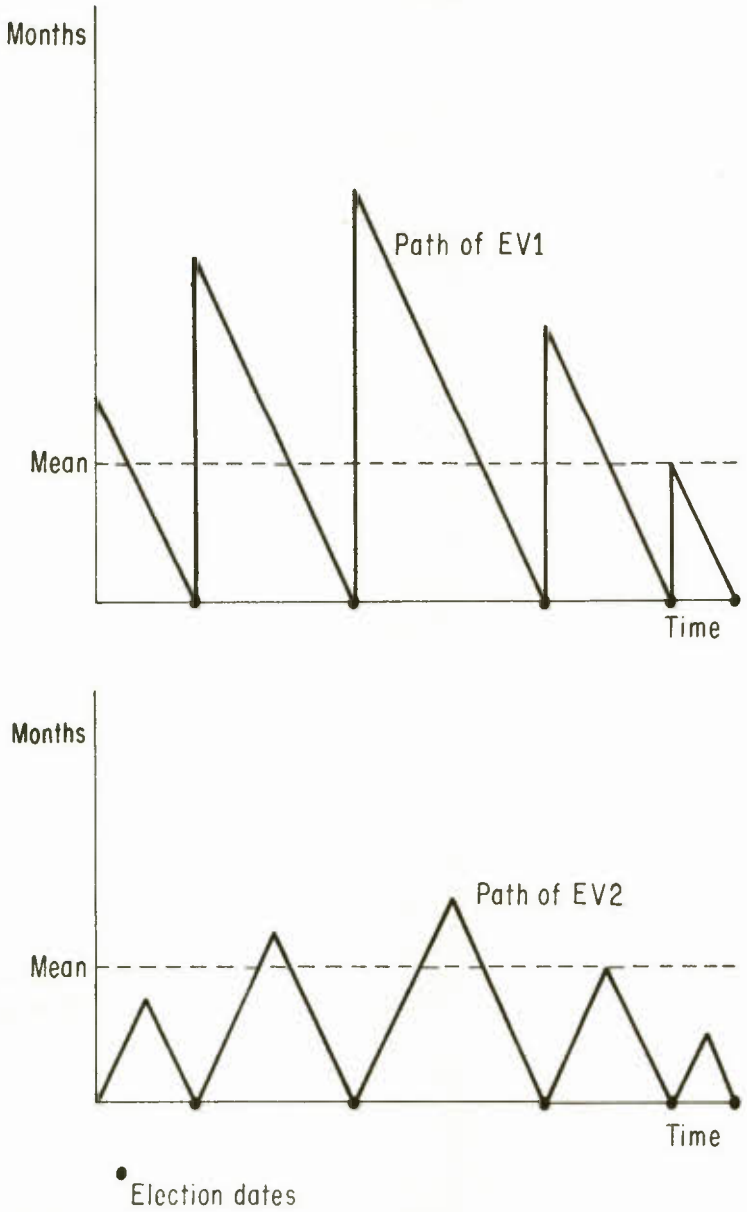


Chart 2-4

Election Variables Simulation



the number of months to the nearest election, past or to come, peaks midway between elections. Simulations were run by replacing whichever election variable was significant by its mean, shown as a dotted line in the diagram; this is the appropriate procedure if one wishes to assume that elections had no effect on the time pattern of expenditures.

In two of the seven provinces where the election variable was significant or nearly so, Ontario and Alberta, its quantitative effect as revealed by the simulations was negligible. The budget was never affected by more than 5 per cent, and in most years the effect was far smaller than this. Among the other five provinces (Newfoundland, Prince Edward Island, Quebec, Manitoba and British Columbia), the effects were more substantial, reaching 10 to 15 per cent of the budget in several years in each of these provinces. These effects are not large, however, relative to year-to-year changes in provincial highways budgets, which are not uncommonly 40 per cent or more in either direction.

It is apparent that the election variables had no systematic effect on cyclical instability in highway spending. This is because elections had no systematic relationship to variations in the other factors influencing highway spending, so they moderated cyclical instability about as often as they increased it.

To determine whether smoother matching grants for education and hospitals might have led to a smoother pattern of budgetary spending, a similar five-year averaging procedure was followed in the simulations. In general the results showed that there would have been almost no difference. However, a highly significant finding concerned the effect in Newfoundland of the smoothing of highways grants on education expenditure. Newfoundland was the only province where the smoothing of *highways* grants made a substantial difference in highway spending, and it also made a substantial difference there to educational expenditure, which became considerably more unstable. Elsewhere this did not happen because of the small quantitative impact of matching grants. If, however, matching grants did increase in importance elsewhere, to the point where they became large enough—or were deliberately made large enough—for potential use as a construction stabilization device, in at least one or two provinces there would be perverse effects on several other categories of expenditure, similar to that observed in Newfoundland. The future use of matching grants for stabilization, while possible, appears to be too risky to recommend as a general policy.

3 The Indirect Influence of Government on Construction Instability

Monetary and Fiscal Policy

The construction industry in its briefs to the Council has repeatedly commented adversely upon what it alleges has been the government's practice of using the industry as a counter-cyclical device. Monetary policy especially is said to have generated ups and downs in construction, especially in residential construction. There is a problem with the industry's view, however: if construction industry recessions and booms were part and parcel of general economic trends, successful stabilization of the economy (operating via the effects of monetary/fiscal policy upon construction and other industries) would also stabilize construction.

If the industry's attitude is correct, it follows that construction does not generally follow the economy-wide business cycle, so that stabilizing the economy usually involves destabilizing construction. Alternatively, it may be that stabilization policy is mistimed more often than not so that, even though construction and the economy generally move together, the attempt to stabilize both actually destabilizes both.

The statistical evidence favours the view that the construction industry and the economy generally move into recessions and booms together, though the relationship is not a tight one.[13] In light of this we may infer that, if destabilization of the industry through monetary/fiscal policy has indeed occurred, the whole economy must have often been destabilized by those same policies. No conflict exists, most of the time, between the two objectives of stabilizing the economy and stabilizing construction. If the industry's view of the past effect of policy is correct, this lack of conflict implies that both construction and the economy could benefit from less use of monetary/fiscal policy, or from improved sophistication in its use.

In trying to assess whether monetary policy[14] has actually destabilized construction, it is necessary to postulate something about what monetary policy might have been if it had not been used as an instrument of stabilization. What defines a *laissez-faire,* or "hands-off", or "neutral" monetary policy? This is difficult: a minimum assumption was made that the amount of high-powered money would have grown at a steady rate. The rate chosen was that implied by the observed total amount of growth between 1951 and 1970. But monetary policy has more dimensions than the amount of high-powered money: interest rate ceilings, secondary reserve ratios, moral suasion, are parts of it too. A truly neutral monetary policy has implications for all of these, although they are not pursued here.

Given a suitable definition of a neutral monetary policy, a question arises: what would have happened to construction if such a policy had been followed? In particular, how much more stable, or unstable, would it have been? The answer to this question requires simulating the neutral monetary policy on an econometric model, or better, on several different econometric models.

Simulations of a neutral monetary policy were carried out on CANDIDE.[15] The simulations on CANDIDE ran from 1955 to 1968, because of the need for long lags with some variables. The results are shown in Table 2-15.

13 While housing *starts* have sometimes but not always been counter-cyclical, housing *construction expenditures,* which lag *starts,* have mostly been cyclical.

14 The use of vigorous fiscal policy has been negligible and it is ignored in what follows.

15 CANDIDE is an acronym for CANadian Disaggregated InterDepartmental Econometric model. For details, see M. C. McCracken, *An Overview of CANDIDE Model 1.0,* CANDIDE Project Paper No. 1, Economic Council of Canada, Information Canada, Ottawa, 1973.

The author is indebted to Drs. L. Auer and S. Ker for this and other simulations. Time and money constraints made it impossible to do a simulation on RDX2, which would have been a better model for this particular job.

Table 2-15

Impact of a Neutral Monetary Policy on the Stability of Construction

	1	2	3	4
Type of construction	Actual instability[1]	Simulated instability[2]	Simulated instability under neutral monetary policy	Per cent reduction in simulated instability caused by neutrality =(100)[(2) − (3)]/(3)
Total construction	5.5	5.3	5.0	6
Residential	7.7	5.5	4.5	18
Nonresidential	10.2	9.5	9.1	4
Government[3]	5.4	3.2	3.2	0

1 Mean percentage deviation from trend.
2 CANDIDE "explains" only part of actual instability.
3 As defined in CANDIDE, i.e. exclusive of construction by government enterprises, such as Hydro-Quebec and CN, which is included in the nonresidential construction category.

Table 2-15 shows that a fair amount of instability remains unexplained by the variables included in CANDIDE (compare columns 1 and 2, which show actual instability and the part of it explained by the model). The relatively weak performance of the model makes it difficult to interpret the results; some part of the unexplained instability could be due to the effects of monetary policy operating in ways not captured by the model's equations.

In the CANDIDE Model 1.0, used for these simulations, "the impact of the financial sector on other sectors of the model is limited to the conventional interest rate effects."[16] Changes in the amount of the monetary base, achieved by open-market operations, affect the three-month treasury-bill yield, and other interest rates then change because they are linked to this one. Interest rates do not, however, have a strong influence on real expenditures in the model, and consequently monetary policy tends to have rather weak effects in CANDIDE. The weakness of monetary policy in CANDIDE may in fact correctly mirror its influence in reality, but it may not. Published simulation results for RDX1—a model simpler in output detail than CANDIDE but with a considerably more complex monetary sector built into it—indicate that the output and employment effects of monetary expansion are stronger than those obtained from similar simulations with CANDIDE.[17] RDX1 would likely have shown a greater influence of monetary policy on construction and thereby have succeeded in explaining a greater part of

16 J. F. McCollum and Tom Siedule, *CANDIDE Model 1.0: Monetary Sector*, CANDIDE Project Paper No. 14, Economic Council of Canada, for the Interdepartmental Committee (Ottawa: Information Canada, 1974) p. 1.

17 The RDX1 simulations are presented in Table 1 of *The Dynamics of RDX1*, by J. F. Helliwell, L. H. Officer, H. T. Shapiro, and I. A. Stewart, Bank of Canada Staff Research Study No. 5, 1969.

observed construction instability. Unfortunately, it was impossible to check this directly.

The effects of "neutralizing" monetary policy on the amount of instability in construction, according to the CANDIDE simulation runs, are shown in column 3 of Table 2-15. The industry turns out to be correct, because instability would have been *less* with a neutral policy than it was with the one actually followed.

Column 4 of the Table shows that, according to CANDIDE, the amount by which instability would have been reduced through using a neutral monetary policy is rather small. In residential construction, simulated instability is cut by 18 per cent and actual instability by 13 per cent. In nonresidential construction, the simulated and actual instability are each reduced by only 4 per cent, and government construction (somewhat narrowly defined in CANDIDE) is not affected at all. For total construction, the simulated instability falls by 6 per cent and actual instability by 5½ per cent.

These reductions in instability may well be understated, but the results for one of two sectors in which simulated instability is too low–residential construction–are not greatly at variance with what Professor Chung found[18] using rather different methods. It therefore seems unlikely that these simulation results are grossly misleading.

It is reasonable to conclude that monetary policy played only a minor role in the instability of construction; the major causes of instability lie elsewhere.

Major Projects

In Section 1 of this chapter it was noted that two major projects–the Northern Ontario Pipeline and the St. Lawrence Seaway–accounted for a considerable part of construction instability in the 1950s. Much of the contribution of these projects to instability has already been attributed to government, in that the Seaway, and the Ontario section of the Pipeline, represented direct spending on construction by federal government crown corporations. There is also an indirect contribution to instability flowing from these projects, which has possible implications for future policy.

Only that part of the Pipeline running through Northern Ontario involved direct spending by the federal government operating through the Northern Ontario pipeline crown corporation. The rest of the pipeline–its major part–was privately financed. Nevertheless, the timing of that spending was partly under the control of the federal government through its power to grant permission for pipeline construction to take place. The timing of the Seaway project was also partly under the control of the federal government, operating in conjunction with the United States government. The bulk of construction

18 J. H. Chung, "Cyclical Instability in Residential Construction in Canada", (forthcoming).

spending on both the Seaway and the Pipeline came at about the same time, so the degree of instability was considerably enhanced.

It might be maintained that this coincidence in timing did not matter very much, because largely different types of resource input were used for each. This is roughly equivalent to saying that there is no such thing as a "construction industry" that builds both "seaways" and "pipelines", only two different industries, a "seaway building industry" and a "pipeline building industry". While there may be some truth in this point of view—with its implication that instability in something as heterogenous as the total "construction" industry is not very meaningful—the problem here is to explain that instability, meaningful or not. In that explanation, the failure of government to avoid the coincidence in timing between these two major projects, one public and one partly public partly private, must be given some weight.

It is difficult to determine how much less instability there would have been without this indirect influence. Gas/oil and marine construction accounted for about 20 per cent of all construction variability over the 20-year period. The Seaway and Pipeline accounted for only about a half to two-thirds of it; a greater time separation would have done little to lessen their contribution. If it is arbitrarily assumed that better timing could have reduced the instability attributable to these projects by one-half, and their total contribution was, say, 12 per cent of all instability, then total construction instability might have been reduced as much as 6 per cent by this means. Using a totally different method based on simulation with CANDIDE, Dr. Auer arrives at a reduction of 25 per cent in the instability of all construction if Seaway, Pipeline *and* resource development had occurred more smoothly. If two-thirds of this is due to the Seaway and Pipeline, and if only one-half of the instability at best could have been eliminated, the reduction in total instability would have been 8 1/3 per cent—not too far from the 6 per cent estimated by the first method. It seems safe to conclude that at least one twentieth of all past instability could have been avoided by greater government care in the timing of major projects. This compares favourably with the increased degree of stability that would have accompanied a "neutral" monetary policy.

Whether such a reduction in instability would have been worth the costs involved in delaying or advancing one or other of the projects is another matter. It is conceivable that, after due consideration of the costs and benefits of a greater separation in time of the Seaway and the Pipeline, the governments of the day might have decided to act as they actually did act, but it appears in retrospect that no such consideration was given. Perhaps in the future it should be.

Dr. Chung's study[19] shows that residential construction has been affected by certain government policies other than general monetary and fiscal

19 *Ibid.*

measures, particularly the ceilings on the National Housing Act (NHA) rate and variations in Central Mortgage and Housing Corporation (CMHC) direct loans. Government did add a little, but not much, to instability in residential construction through the policy of a ceiling on the NHA rate. On the other hand, the policy on CMHC direct lending appears to have had a mildly stabilizing effect.

The federal government has been trying to encourage development in the poorer regions of Canada for many years. Recently the effort has largely been through the Department of Regional Economic Expansion (DREE), with a large and increasing budget. The push for regional development has naturally included efforts to expand industry and to increase the available social overhead capital in certain areas. These aspects involve the construction industry directly, and it seems possible that the federal government might have contributed to instability in construction in its enthusiasm to push ahead with development.

Regional development policy has been and continues to be administered under a variety of programs, even though most of them were brought under the single umbrella of the Department of Regional Economic Expansion in 1969. Of all these programs, only those which used to be administered by the Area Development Agency (ADA) and the Atlantic Development Board (ADB) have enough construction content to be seriously examined as possible causes of its instability. A brief digression on the other programs will indicate why.

The Fund for Rural and Economic Development (FRED) was set up in 1966, with a potential $300 million at its command. Actual spending did not begin until two or three years later and has not been very great. The main programs began in Prince Edward Island and Quebec, with federal spending planned to average $15 to $20 million a year in each, only a small part of which was to be on construction activity.The Agricultural and Rural Development Act (ARDA), as the name might suggest, affects construction very little; of the $32 million it spent in all of Canada in 1968/69, for example, at most $10 million was on construction, spread fairly evenly among provinces—the amount too small to have any perceptible effect on construction instability. Funds under the Prairie Farm Rehabilitation Act and the Maritime Marshland Rehabilitation Act have been largely spent on construction, but the totals have been very small—$18 million under both programs combined in the fiscal year 1968/69.

The Atlantic Development Board (ADB) was much more important for construction than the programs mentioned in the previous paragraph. Although it vanished as an agency in 1969, its work continues under DREE. As the name indicates, ADB programs operated only in the Atlantic provinces and, even if they did increase instability there, the quantitative impact on construction variability in Canada as a whole would be negligible.

Although the ADB was set up in 1962, volume spending did not begin until after 1966; more than 80 per cent of all funds disbursed by ADB were spent

between 1967 and 1969. It is obvious that its responsibility for instability over the whole period of this study could not be more than minimal. In addition, the annual flow of spending by the ADB was not irregular, as it would need to be to generate instability.

Construction in the Atlantic provinces from 1966 to 1969 averaged $830 million a year, so that ADB spending, which was about 90 per cent for construction–mostly highways and electricity–was just under 5 per cent of the total. Given this, and the relative smoothness of the spending shown in Table 2-16, we conclude that the ADB made no contribution to instability in the Atlantic provinces. The kind of infrastructure assistance typical of the ADB and now being continued under DREE could possibly generate some construction instability in the future, but the past record is such it appears rather unlikely.

Table 2-16

Total Expenditures by the Atlantic Development Board

	(Millions of Dollars)
Up to March 31st 1966	25
April 1st 1966–March 31st 1967	44
April 1st 1967–March 31st 1968	43
April 1st 1968–March 31st 1969	40
Total	152

Source: Annual Reports of the Atlantic Development Board

It is difficult to assess the possible past effect of the kinds of programs ADA used to handle. ADA operated, and DREE continues the work it began, by offering incentives to private industry, either cash grants or tax breaks. The effect of such aid to private industry–to the extent that it has worked (and doubts have been expressed about this)–is not necessarily to cause any instability. The aid raises the annual amount of construction above what it otherwise would have been but, as long as the conditions for grants and the effective limit on the total amount available for grants do not behave erratically year by year, there is no reason to suppose that the aid causes instability. This conclusion does not imply that the amount of aid will be fairly stable, or grow fairly smoothly, year to year, because applications for aid are likely to fluctuate in line with fluctuations in investment spending. The point is that investment fluctuations cause fluctuations in the amount of aid rather than the converse. For this reason it is purposeless to collect data on the amount of aid granted year by year to see if it fluctuates, because even if it did nothing would be proved by that.

The degree of fluctuation in terms of aid and potential maxima on aid does not appear to have been a source of instability in construction. As with ADB, a high proportion of incentive grants go to the Atlantic provinces (the

amount going to Quebec is larger relative to the program, but very small relative to Quebec construction), so that even if some instability is generated by them it is quite small for the country as a whole.

There is one way in which industrial incentives, whether given under the older Area Development Incentives Act or under the more recent Regional Development Incentives Act, may have contributed indirectly to instability in the Atlantic provinces. These incentives are strongly biased in favour of capital-intensive industries rather than labour-intensive ones. Oil and gas production and refining are especially capital-intensive and so has been relatively strongly attracted to the Atlantic Region by the incentives program. Further construction by this industry, once established, is likely to be more erratic than the average of other industries, judging from past experience. Therefore, the overall degree of instability in future construction has probably been slightly increased due to this effect of the regional incentives programs. If so the cure is straightforward, and would also be advantageous from the point of view of job creation: the structure of the incentives could be altered to favour industries with a low capital/labour ratio instead of those with a high capital/labour ratio.

Industrial incentives became important even in the Atlantic Region, only in the late 1960s, so they were a factor only in the last few years of the study period. Their potential future effect on instability is greater, but if terms of grants and the total amount available continue not to be subject to substantial and rapid changes, it seems unlikely that instability will in fact be increased.

In summary, regional development policy could in theory cause instability in construction. The amount of instability so generated has almost certainly been very small indeed and been largely confined to the Atlantic provinces; furthermore, it can have occurred only during the last few years. It seems unlikely that regional development programs in the future, though much larger in scope, will cause significant instability problems for the construction industry.

Miscellaneous

Government has in the past contributed indirectly to construction instability in several minor ways; these should be mentioned for the sake of completeness.

From time to time a change of government—or a change of views by an existing government—can lead to a shift in priorities affecting construction of a particular type or in a particular region. For example, Ontario has recently experienced rapid change in its spending priorities from education and highways to mass transit; this situation is likely to cause instability in those Ontario construction companies specializing in institutional building and highway construction. During the last half of the 1960s, hospital construction in Nova Scotia rose very sharply; a similar situation occurred in New

Brunswick during the early 1960s. Other examples can be found. Approximate calculations suggest that the contribution of these "swings in priorities" to instability is quite small but that they have very high visibility, precisely because a government that is changing its priorities wants the public to know it.

Land zoning practices in some cities may have been a cause of instability in construction, but investigation of this possibility is outside the scope of this study.

3 Potential Means of Stabilizing Construction Spending

1 Major Projects

Two mammoth construction projects will be undertaken during this decade, and will probably not be completed until the 1980s. They are the James Bay development, and the construction of pipelines in north and central Canada. A considerable amount of instability in construction – and indeed in the whole economy – might be avoided if expenditure on these projects could be timed so that they do not reach a peak in the same two or three years.

It might be argued that James Bay and the pipelines will not in fact compete for construction industry resources, because the inputs needed for hydroelectric power construction and for pipeline construction are different, and because the two projects will be thousands of miles apart. Granting both points, it seems clear that each project will draw upon labour and capital resources well beyond its own geographical location and, through "ripple" effects, cause something of a boom everywhere. For example, the pipelines may draw labour from Prairie towns, creating relative labour scarcity there and slowing down the normal migration from there to Ontario and British Columbia. This will cause relative scarcity in Ontario and British Columbia, which may even spread in some degree to the Atlantic Region, as easterners are drawn to areas where jobs are plentiful and well paying. Similar arguments can be made regarding nonlabour factors. James Bay will likely also have ripple effects, and both projects will generate a strong multiplier process which will increase housing and nonresidential construction through the standard multiplier-accelerator mechanisms.

The potential instability consists not only of the boom and its ripples, but also of the subsequent slowdown and *its* ripples as the projects approach completion.

Precise details of the annual rate of planned spending on James Bay and the pipelines are not available, but rough estimates suggest that peak spending for the former will come sometime between 1975 and 1978, and for the latter between 1974 and 1977. There is, therefore, a strong likelihood of a major

construction boom in the late 1970s, followed by a sharp slowdown at the end of the decade.

Two possibilities for stabilization come to mind, assuming for the moment that stabilization is beneficial on balance. The federal government, in deciding whether to grant permission for the pipelines, could consider imposing some conditions or limits on how much spending can be allowed in each of the next five years. These conditions or limits would be decided upon after a careful study of how much would be spent each year on both projects combined if no such limits were set. The objective would be to smooth out the flow of spending as far as possible without adversely affecting the other objectives of the two projects. The appropriate body to take responsibility for this might well be Cabinet itself, acting upon the advice of the Minister of Energy, Mines and Resources.

A second method, which might be used alone or be complementary with the first, would be for both federal and provincial governments, especially those of Quebec and the Prairies, consciously to advance or delay other construction that would have normally occurred during the most active years of the James Bay and pipeline construction. The appropriate bodies for making this kind of decision could be the planning and priorities committees of the cabinets or their equivalents. In addition, the federal Minister of Energy, Mines and Resources should inform the provincial cabinets of the full details of projected spending on the two projects as soon as these become available.

2 Stabilizing Particular Categories of Government Expenditure

Interviews were held with the planning or chief engineers of Highways Departments in all provinces except Prince Edward Island.[1] Data on highway spending by provinces has also been examined and formally modelled, as explained in the previous chapter. The following suggestions about possible remedies for instability in highway construction are based on this work.

(a) Many past swings in highway spending have been linked to federal programs, especially the Trans-Canada Highway in the Atlantic Region and Quebec. Several departments commented that, for future programs, committing funds further in advance and for longer periods, even if the total was unchanged, would smooth spending considerably. Five-year commitments were often mentioned as ideal. The analysis indicates that five-year commitments would have only a minor stabilizing effect.

(b) Ontario has standing instructions to its Department of Highways that cash flow not fall by more than 15 per cent in any one year. Preferably coupled with similar restrictions on increases, this is a possible method

1 See Appendix A for details.

of stabilization. In provinces where budget considerations preclude such a policy, federal assistance might be necessary; this would also provide a needed additional incentive to follow such a policy.

(c) Lags in expanding or contracting highway spending are short enough in most places[2] or could readily be made short enough for highway spending to be varied counter-cyclically if this were thought desirable. Such a counter-cyclical policy could be achieved through the creation of a federal fund from which provinces could draw, subject to a set of necessary conditions. The conditions should include: (i) some provincial matching; (ii) annual evidence that planning of highways was flexible enough to cope with substantial ups and downs in the rate of spending (aid might be given for the design staff necessary to ensure this); (iii) the falling below some critical value of the level of both construction and general economic activity in the province; (iv) post hoc evidence that the fund was used to increase total highway spending during the recession. In view of the need to supply an incentive to the provinces to undertake counter-cyclical policy, there would likely be a net increase in the total of highway spending over the years as well as some displacement of it from boom to recession periods. This is not certain, however; arrangements might be devised whereby the federal government paid the cost of part of the total highways budget without actually enlarging it above what the province itself would have spent on average through the years, subject only to the condition that the time path of the spending be altered in the interests of stabilization. Under these conditions the incentive to the provincial government would be that cash saved from the highways budget could be used for other purposes.

Discussions were held with hydro officials in nearly all provinces where hydro is a public enterprise. Although the data suggest that in many places hydro spending is indeed a leading source of instability in engineering construction, the information gathered from discussions suggests rather strongly that stabilizing hydro spending would be both costly and difficult.

The reasons for this costliness are clear. If planned hydro construction is delayed for stabilization purposes there is an increased risk of power failure between three and ten years ahead, depending on the size of the delayed project. This can be avoided only by increasing the average amount of reserve capacity, which apparently needs to be a minimum of 10 to 15 per cent of the peak load; it probably averages somewhat more than this, say 15 to 20 per cent, because it inevitably rises above the minimum from time to time as large individual power stations come on stream. To achieve the same minimum reserve at all times and also permit delays or accelerations in the

2 The major exception is Ontario where problems in land expropriation for the right-of-way increase the lags considerably.

interests of stabilization policy, it would be necessary to carry a larger average reserve. The average reserve would have to increase by an amount equal to the maximum amount ever not completed on time as a result of stabilization policy. For stabilization to be significant, this amount would need to be quite large, perhaps enough to supply 5 per cent of the peak load, implying about a 25-per-cent increase in the average excess generating capacity. The interest cost on this would represent the cost of achieving stability.

As the hydro authorities operate with minimal government control, it is hard to see how the decisions on the amount and timing of capacity installation could be directly controlled without seriously weakening their independence. While control could easily be exercised in all provinces over capital *borrowing,* its exercise in the interests of stability, apart from the independence objection, is very difficult because of the long lags between the borrowing of money and the start of significant construction spending. The lags are one to four years, depending on the size of the facility concerned. For similar reasons, indirect government influence through control of interest rates – even if they could be controlled independently of United States rates – would be useless as a stabilization method.

Public works spending is mostly for building construction; this category offers potential for the appearance of action more than for a significant amount of extra stability.

Use of the Investment Intentions Survey of Statistics Canada, if confidentiality restrictions do not intervene in particular provinces, would show when industrial and commercial building was expected to be low; public works spending could then be concentrated in such periods as an aid to stability.[3] Provincial governments might have to be induced to do their building at times they would not choose otherwise; federal building grants might serve this purpose. Conditions akin to those outlined in connection with highway grants would be required.

Construction by federal departments did not fluctuate much between 1951 and 1970, except that between 1953 and 1954, and from 1961 to 1963, it did drop sharply to levels well below normal, recovering rapidly in subsequent years. Discussions with officials in the Department of Public Works, which handles a good part of federal departmental spending, indicate that it would be possible to maintain a reasonably smooth growth path for this spending in the future. All that would be required would be a formal request from Cabinet to the Department.

3 Scheduling Government Expenditures

In any one province, construction expenditure by all three levels of government is sometimes unusually high or low, possibly in conjunction with

3 Unfortunately, the intentions data have not been good predictors of downturns.

private spending. This feast or famine situation could in principle be lessened through inter-governmental co-ordination of expenditures. Most provincial officials interviewed thought that provincial/municipal co-ordination could be fairly straightforward, through the existing administrative apparatus. It should not be difficult to include the federal government in this co-ordination process. Provincial officials generally thought that co-ordination with private clients of the construction industry was totally impractical for varying but always cogent reasons, although it has worked in some other countries.

If co-ordination were thought desirable it should probably be the responsibility of whatever provincial cabinet body is responsible for planning and/or priorities. In discussing how to stabilize engineering construction, for example, that body would have to collect information on planned engineering construction intentions from the federal government, on planned railway construction from CN and CP, on electricity construction from the provincial power authority, on sewers and waterworks from the municipal authorities, on highway plans from its Highways Department, and on plans for private construction – largely gas, oil, and telephone construction – from the Investment Intentions Survey of Statistics Canada. With this information to hand, stability could be achieved, if desired, by modifying those parts of engineering construction which can be directly controlled by the federal and provincial governments: marine, highway and sewer/waterworks spending. A provincial cabinet committee is also best qualified to judge whether such stability is worth the costs involved at any given time (for example, postponement of needed sewers in boom or early building of not-yet-needed highways in recession), subject to the reservation noted below. Similar comments apply to the stabilization of nonresidential building construction.

The provincial planning and priorities body is in the best position to control stability policy, because it has access to much of the relevant information and it has also the power to act. However, it may not wish to stabilize construction if it considers the benefits are either small or unimportant within the province. Provided stability has benefits beyond those which a provincial government would take into account of its own accord, some kind of federal monetary incentive would be appropriate. Such incentives should induce the planning body to study and act upon the matter of construction instability as often as necessary, say three or four times a year.

4 The Use of Market Incentives and Disincentives

All three of the potential methods of stabilizing construction so far suggested involve planning. Just as the market mechanism is an alternative to planning for operating the whole economy, so it can also be an alternative to planning for the lesser job of stabilizing construction.

Stabilization of construction through time requires that construction be shifted out of periods when it is higher than trend and into periods when it is

lower than trend. If construction is to be shifted from one period to another without expanding its total volume, it must be curbed in good periods, as well as boosted in slack periods. If only the latter is done, the policy is expansionary as well as stabilizing, and will result in a greater average stock of structures than is socially desirable. Some highways would be too little used, some generating capacity seldom if ever called upon, and so on. It is equally clear that a policy of simply curbing construction in good periods is undesirable, because society then ends up with less structures than are socially desirable. There would then be an undue amount of road congestion, electricity blackouts, etc.

It is not a matter of indifference which construction activities are curbed in good times and which ones are encouraged in poor times. In good times the low-priority items among those actually being undertaken should be curbed and in bad times the undertaking of additional items should be encouraged only if they were of high priority. At times of low construction activity it would not be a good idea to build a permanently unprofitable paper mill, or a permanently under-used road, if a more profitable textile mill or more useful sewers could equally well be built. Similarly, in a time of high construction activity, it would be better to postpone a low-profit oil and gas facility than a high-profit hospital (speaking of social profitability) and better to sacrifice a low-profit school (again speaking of social profitability) than a high-profit office building.

One problem with having the *government* sector shift its construction out of high activity periods and into low activity periods, is that it makes two very special assumptions about priorities. The first assumption is that, of all the extra construction that might be undertaken in a slack period, any construction done by or through the government is of *higher* priority than any potential private construction. The second assumption is that, of all the construction that might be discouraged in a good period, any construction that is done by or through the government is of *lower* priority than any private construction being done. Both assumptions do violence to reality.

It does not necessarily follow that planning or scheduling by governmental authorities ought to be ruled out as a method of stabilizing construction. There may be no practicable alternative. Nevertheless, it would be reasonable to try to devise a stabilization method not subject to the distorted view of priorities implicit in planning.[4]

Whether a particular structure is purchased or not presumably reflects a judgment by the buyer of its value in relation to its cost. This holds for both public- and private-sector buyers. Structures, whether private or public, for which the value far exceeds the cost should not therefore be cut out, even in

4 If planning included the authority to pass on private construction as well as public, and if the planners had adequate knowledge about the social desirability of all projects, there would be no distortion of priorities in planning. These are very stringent conditions: they do not apply in Canada at present.

periods of high construction activity. Structures for which the value is only marginally in excess of the cost might well be. Any policy which increased the cost to buyers during high-activity periods would selectively eliminate just those structures which are least worthwhile. The same applies, *mutatis mutandis*, in slack periods: a policy which decreased cost to buyers would selectively stimulate the undertaking of just those projects which are of highest potential value.

It has so far been assumed that instability of construction is socially costly.[5] Given this assumption, when construction activity is relatively high the true construction cost exceeds the amount spent by the buyer, whether that buyer is private or public. When construction is relatively low, the true construction cost is smaller than the amount spent by the buyer. A policy, which collected money from buyers in high construction periods in amounts appropriate to the current additional social cost of construction, and which also returned the monies collected to buyers in low construction periods in amounts appropriate to the current social benefit achievable from construction, would seem to have much to recommend it. Any buyer would be free to purchase during a time of high activity, but would have to pay more to reflect the social cost of doing so. No buyer would be obliged to purchase in a time of low activity, but he would be financially compensated to reflect the social benefit of such a decision. It is important that both government *and* private buyers find construction cheaper in slack periods, and dearer in tight periods.

The social benefit from stabilizing construction accrues partly to the unemployed in all industries, including construction (assuming, as explained in Chapter 4, that average unemployment is lower with stabilization). Part of the benefit goes to the owners in the construction industry, since their revealed preference is clearly for greater stability. Part of it goes to the populace at large, since it can be argued, for example, that inflation might be reduced for a given aggregate unemployment level, and that the level of output for a given input of capital could be raised, because of the lessened need of capacity to meet occasional peak demands. The benefit to the unemployed and to the general public implies that the federal government has some obligation to stabilize construction on behalf of the voters, and, if necessary, to use general tax revenue to this end. Provincial governments are unlikely to wish to set up the machinery required for stabilization, whether achieved by market methods or planning methods or both, thus incurring the displeasure of those whose construction buying schedule is forced to change as a result of the scheme,[6] without some kind of federal incentive. Therefore, some federal contribution to provincial governments would be both necessary and appropriate.

5 Chapters 4 and 5 examine this assumption.

6 Any *successful* scheme *must* change buying patterns, thereby generating such displeasure, and the benefits, especially to the provincial governments, are less obvious and more diffused than the costs will be.

Since both employers and employees in the construction industry would benefit more than the general population as a result of stabilizing construction, it also seems logical, at first glance, for them to pay part of any costs of achieving stability. However, instability may or may not have increased rates of return and earnings in construction enough that instability is presently compensated for. If it has, the restoration of stability will in the long run reduce rates of return and average earnings and it would be unjust to levy an additional charge on the industry to pay for stabilization. If for some reason market forces have failed to generate rates of return and average earnings high enough to compensate for the instability, then it can be argued that rates of return and earnings are too low given the amount of instability, and that removing the instability is a way of remedying this. In this case too it would be unjust to levy an additional charge on the industry to pay for stabilization.

Any stabilization policy requires the early identification of times when construction activity is high and low relative to trend so that stabilizing action can be taken. But such early identification is difficult. The unemployment rate in construction relative to its long-run average would probably be a very good measure, but it is unavailable in the smaller provinces due to the pitiful size of the Labour Force Survey. Alternatively, deviations from trend of either or both of output and employment in construction might be used. A problem with this method will arise, however, if any serious break in trend ever occurs. There is clearly an urgent need for much more detailed information on unemployment at the provincial level than is currently available.

The stabilization policy outlined here would be administered by a sub-committee of the planning and priorities body of each provincial government, referred to as the "Provincial Construction Stabilization Committee".

1 All construction expenditures on materials and labour would be subsidized or taxed according to the procedures described below. The rate of subsidy would be identical for materials and labour. The rate of tax would be the same as the rate of subsidy.
2 Whenever the deseasonalized unemployment rate[7] in construction in the province is *above* its long term average by more than a specific amount (depending on the province) for three successive months, a *subsidy* of 10 per cent would be paid. Whenever the unemployment rate in construction in the province is *below* its long-term average by more than a specified amount (depending on the province) for three successive months, a *tax* of 10 per cent would be paid. When unemployment is between these two limits, no subsidies or taxes would apply.

7 If available; otherwise the Committee will have to use some other measure of the level of construction activity relative to its trend. See the discussion on page 53.

3 Taxes would go into a trust fund and subsidies would come out of the same fund. The taxes, subsidies, and the fund would all be provincially administered.

4 Each month the federal government would contribute to the trust fund an amount equal to 5 per cent of the taxes collected in that month. If no taxes were collected, or if subsidies were currently being paid, no contribution would be due from the federal government.

5 The Provincial Construction Stabilization Committee would have responsibility for spending on construction whatever money remained in the fund after payment of the subsidies, subject to Paragraph 6. No spending from the fund would be permitted during periods when the *taxes* applied.

6 Immediately the deseasonalized construction unemployment rate falls below the lower limit set in Paragraph 2 for three successive months, all money still in the fund *would revert to the federal government* unless the amount so paid would exceed two-thirds of the sum of all past federal contributions with accumulated interest, in which case only the latter amount would revert.

7 The various numbers above could be adjusted by any Provincial Construction Stabilization Committee if the federal government agreed, subject to the following rules:

(i) The rate of subsidy should always be equal to the rate of tax.

(ii) The amount by which unemployment would have to exceed its long-term average in order to trigger the subsidies should not be changed without a similar change being made in the amount by which unemployment had to fall short of its long-term average in order to trigger the taxes.

(iii) The 5-per-cent federal contribution in Paragraph 4 might be 4 per cent or 6 per cent, or some other suitable fraction.

8 If a province adopts the scheme at a time when it would need to pay subsidies before the construction stabilization fund had accumulated any revenues, a loan should be made by the federal government, sufficient to pay the subsidies. The loan should be repayable if and when the scheme is terminated.

The force of provision 4 (that the federal contribution is proportional to the tax collected) is that the size of the federal contribution would be geared to the size of the provincial effort at stabilization. The 5-per-cent figure looks small, but if all provinces adopted the scheme as recommended, it would lead to federal funding to a total of about $75 million (1972), which is reasonable in the light of the net benefits from stabilization. If a province opted into the scheme only weakly – with tax/subsidy rates at, say 4 and 5 per cent – the federal contribution would be low accordingly; the converse would apply for a province opting in strongly.

Paragraph 5 implies that the federal contribution would have to be spent on construction, and Paragraph 6 ensures that this spending would occur when construction was depressed.

Paragraphs 5 and 6 together mean that a participating provincial government would have a strong incentive to plan its construction requirements some years ahead in order to be able to spend the extra federal funds on worthwhile projects. Such planning would not be cheap – it might go as far as the blueprint stage or further – and it would be quite reasonable for the federal government to offer to pick up a portion of documented planning costs. Another incentive to plan is not so obvious at first glance. Since construction under the scheme would be expensive in booms and cheap in recessions for any buyer, including the provincial government itself and its associated enterprises, savings could be made by shifting less urgent spending from booms to recessions.[8] To take maximum advantage of these potential savings, some planning would automatically appear desirable independently of the need to spend the federal contribution fruitfully.

The subsidies and taxes would be applied to materials and labour and not to the full value of construction expenditure, for reasons of administrative convenience. They are identical in order to avoid distorting input choices. The materials tax or subsidy could be superimposed on the present building materials' tax, but it should be borne in mind that both the rate and timing of the tax or subsidy will normally differ from province to province. For this reason, and to avoid public confusion about the provincial nature of the tax, it would probably be better for each province to institute its own separate materials tax and subsidy, although this would not preclude some limited use of federal administrative channels. For example, the materials supplier, who presently collects the federal tax, might also collect each applicable provincial tax, at rates dependent on those in force in the province in which the materials were to be used.

Payment of the tax would be by the user of the materials in the first instance, and then would be included, like any other materials cost, in the charges to the final buyer. Subsidies should probably be distributed directly by the provincial government, in response to applications from users of construction materials in the province. To avoid windfall gains to construction firms there should be a legal obligation to specify and deduct the amount of subsidy received from contract bid prices. Similarly, cost over-runs due specifically to the imposition of a tax after a contract was agreed upon might be legally permissable. Some other minor problems of equity arise in connection with the transition from "no tax" to "tax" periods, from "no subsidy" to "subsidy" periods, and so on, but none should be insuperable.

The tax on labour could be administered through mechanisms similar to those presently employed for income tax or unemployment insurance

8 The same is true for private buyers of course: this is one of the ways the scheme works.

payment purposes. Again, there will be provincial differences. A provincial payroll tax and subsidy system would likely require the development of more sophisticated and expensive provincial administrative machinery than would a similar system for materials. Those provinces not strongly committed to construction stabilization might not consider this machinery worthwhile and might choose to accept the possible input distortions arising from a tax/subsidy on materials only.

The purpose of limits on either side of the unemployment rate mentioned in Paragraph 2 is to avoid switching too frequently from taxes to subsidies and back again in any one province. Limits set at ± two-thirds of the standard deviation of the provincial construction unemployment rate would likely work very well in this respect; however, this is not entirely clear because in the analysis of past data, the estimate of the frequency of back and forth switching was based on experiments with the overall male unemployment rate—the only rate available provincially for a long enough period to permit adequate testing of the probability of frequent switching. The stipulation of three successive months in Paragraph 2 also is designed to prevent too frequent switching.

While the overall male unemployment rate is probably adequate for tests of the frequency of switching, it was not quite well enough correlated with the construction cycle to permit accurate location of the proper periods in the past when taxes or subsidies should have been applied. It seems likely that the construction unemployment rate, had it been available, would have performed better, despite conceptual drawbacks as to the meaning of the rate. (One can be employed in construction, but can one meaningfully be unemployed in construction?) However, because of the uncertainty of this speculation, it can only be tentatively recommended as a "trigger" for taxes or subsidies in the future.

An alternative trigger mechanism—more conservative in that it would seldom have incorrectly imposed taxes or subsidies in the past but would sometimes have failed to do so when it should have—can be based upon deviations of employment and output from trend. Employment data is available monthly, output data annually. One method of using the data would be to impose a tax when both of two conditions held: (i) employment was above trend by more than a specified multiple or fraction of its past average absolute deviation from trend, preferably for three successive months, and (ii) the latest available data for annual output indicated that it too was similarly above trend. Subsidies would be granted when employment and output fell sufficiently below trend. We do not rule out other methods of detecting construction booms and recessions, however; continued research could very likely improve the trigger mechanism.

The tax rate in Paragraph 2 is set equal to the subsidy to make the scheme self-financing: it should pay out just about what it takes in. The trust fund aspect (Paragraph 3) would assist in achieving this also, as well as permitting a

clear linking of taxes to subsidies in the minds of buyers as a group; this would make it easy to drop the scheme if it did not work or became too unpopular. Without the trust fund there would be some danger, at a later period, of the subsidy vanishing but not the tax (benefiting the government), or of the tax vanishing but not the subsidy (benefiting construction). The force of Paragraph 8, especially the last sentence, is to allow provinces to institute the scheme any time while making it impossible to use entry and exit from the scheme to gain a federal subsidy.

While subsidies are always acceptable, taxes seldom are. In provinces with serious secular employment problems, notably in the Atlantic Region, periodic taxes might be unacceptable even in times of relatively high activity and when confined to construction alone.

In this case an alternative policy – which would seem to be a distinct second-best from the point of view of allocative efficiency–might be adopted. This policy would differ from the one proposed above only in that the necessary input of monies to the fund during high-activity periods would be derived from the provincial government's general revenue, with the federal government contribution still available at 50 per cent of the provincial input. All other provisions of the scheme would still apply.

It should be noted that the alternative scheme is actually not much more expansionary from the point of view of aggregate demand than the original one, because the provincial part of the revenue required for the fund has to be obtained from taxes of some kind. The first scheme gets the revenue from taxes on construction labour and materials used in the province; the second scheme gets it partly from general taxes in the province, which are as contractionary in their aggregate demand effect as the taxes on construction would be, and partly (via revenue sharing) from taxes on other provinces, which are not contractionary in their effect on the province concerned (except very indirectly through "exports" to other provinces).

It is also likely that, in periods when the tax applies, governments will come under particularly strong criticism for taxing home-ownership. If such criticism is an unacceptable price to pay for stabilizing construction residential construction might be exempted; but if this is done, the subsidy should not be paid either.

5 Monetary and Fiscal Policy

Chapter 2 contained a consideration of the extent to which monetary and fiscal policies were responsible for past instability in construction. The concern here is whether they might be used in the future for stabilizing construction–how such policies might be used and whether they would work–not whether these policies are the best available way of stabilizing construction. The relative merits of various possible policies for stabilizing

construction, including general monetary and fiscal policy, are discussed in Chapter 5.

The meaning of "monetary policy" in this section is taken to be control of the money supply; matters such as secondary reserve ratio requirements, moral suasion, interest rate ceilings, etc., are ignored. Interest rate policy, insofar as it can differ from what is implicit in control of the money supply, is touched upon in other studies, notably "Cyclical Instability in Residential Construction in Canada" by Professor Chung. Credit availability might have been studied by means of a simulation on RDX2, the Bank of Canada's econometric model of the economy, but lack of time and money prevented this.

Fiscal policy is taken to mean general taxation measures, such as income-tax changes; variations in taxes specific or nearly specific to the construction industry itself, such as the building materials' tax, are not studied here. Public works policy, commonly taken as a part of fiscal policy in textbooks, is not treated because, in a sense, that is what the whole study is about.

To speak of monetary *and* fiscal policy is probably unrealistic in the Canadian context. At best Canada may be able to, in theory, use *either* monetary *or* fiscal policy, but not both; in practice, the degree of independence in the use of even one of the two may be quite severely limited. At the present time the exchange rate is floating, so that monetary policy can in principle operate independently of U.S. policy, while fiscal policy is unlikely to be effective in altering output[9] and employment and, through them, the construction industry. Even monetary policy may only be theoretically usable, however; if Canadian interest rate differentials were more than a few points from U.S. rates for long enough periods to influence construction or other spending significantly, a steady *rate of change* of the exchange rate (constantly appreciating or depreciating) would likely be involved. The Canadian government might not be prepared to tolerate this much freedom for the value of the Canadian dollar. Different but equally serious problems would exist if the exchange rate were fixed. Thus it could be that policies analyzed in this section cannot actually be implemented, because of Canada's close dependence on the monetary and fiscal policies of the United States government.

In Chapter 2 a "neutral" monetary policy was defined and its effect on construction demand was found to be relatively minor. A monetary policy, actively counter-cyclical to the construction cycle, and a counter-cyclical fiscal policy must also be considered.

The counter-cyclical monetary and fiscal policies were simulated on CANDIDE, the Economic Council's econometric model; Drs. Auer and Ker

9 The problem is largely one of leakage into imports—see, for example, the simulations in *The Dynamics of RDX1*, by J. F. Helliwell, L. H. Officer, H. T. Shapiro and I. A. Stewart, Bank of Canada Staff Research Study No. 5, Ottawa 1969.

performed these simulations. For monetary policy, the counter-cyclical policy involved raising the amount of high-powered money–the relevant exogenous policy variable in CANDIDE–in years when construction demand was noticeably below trend, lowering the amount of high-powered money in years when demand was above trend, and leaving the high-powered money supply unchanged if construction was about on trend. The amount of raising or lowering was 10 per cent in all cases. The period covered was 1955-70; annual data was used, since CANDIDE is an annual model.

No attempt was made to make the counter-cyclical policy lead the cycle by one or more years, even though some work suggests that monetary policy especially works with a long lag; a policy that required forecasting a coming recession 15 months or more in advance would not be very practical. The extra three months is required for lags other than that between completion of the change in money supply and its impact on demand–that is, the time required to institute the necessary open-market operations.

The counter-cyclical fiscal policy involved changing the rates of both personal income tax and corporation tax by 15 per cent. In years of low construction demand, both taxes were cut and in years of high demand they were raised, except for the two years 1966 and 1967. In those years residential construction was below trend but nonresidential construction was above, so that the tax with a *comparative* advantage in stimulating residential construction (the corporation tax, oddly enough, according to the CANDIDE equations) was lowered, and the tax with the comparative advantage in stimulating nonresidential construction (the income tax) was raised. The results of the simulations are shown in Table 3-1.

Table 3-1

CANDIDE Simulations of the Effects on Construction of Counter-Cyclical Monetary and Fiscal Policies, 1955-70

Type of construction	Actual Instability	Simulated Instability	Instability as simulated by CANDIDE: Counter-cyclical monetary policy	Counter-cyclical fiscal policy	Counter-cyclical monetary and fiscal policy
			(Per cent)		
Residential	8.0	5.2	4.2	4.7	4.3
Business nonresidential	9.4	9.5	9.5	8.6	8.8
Government nonresidential	6.2	4.9	4.8	4.5	4.4

The first column of Table 3-1 gives a measure of the amount of instability from 1955 to 1970 in each of the three categories of construction demand–residential, business nonresidential, and government non-

residential. As is usual in CANDIDE, the business nonresidential category includes some spending which elsewhere in this report is put in the government category–for example, hydro construction–but that does not matter for the present purpose. The numbers in the column are the average absolute values of percentage deviations from trend.

The second column indicates the instability in the values of construction as estimated by CANDIDE. The number 5.2 opposite residential construction, for example, indicates that only 5.2 of the actual instability of 8.0 could be accounted for by the variables included in CANDIDE to explain residential construction. Similarly, only 4.9 out of the 6.2 instability measure for government construction was accounted for. CANDIDE did succeed in explaining instability in business nonresidential construction–too much so, in fact, with 9.5 for the simulation versus 9.4 actual.

The third, fourth, and fifth columns in the table show what the simulated instability becomes after the application of, respectively, counter-cyclical monetary policy, counter-cyclical fiscal policy, and counter-cyclical monetary and fiscal policy. An appropriate measure of the effectiveness of each policy is the difference it makes to simulated instability expressed as a percentage of actual instability;[10] for example, counter-cyclical monetary policy decreases simulated instability in residential construction by 5.2 – 4.2 = 1.0, which is 12½ per cent of actual instability (1.0 is 12½ per cent of 8.0).

While the chosen counter-cyclical monetary policy reduces instability in residential construction by 12½ per cent, it does not affect business nonresidential construction at all (9.5 with or without the policy), and reduces government instability by a negligible 2 per cent (0.1 out of 6.2).

The impact of counter-cyclical monetary policy is clearly small according to CANDIDE. For reasons given on pages 38-39, the impact is probably somewhat understated because of the limited nature of the monetary sector block in the model. The chosen swings in high-powered money are very large; a 10 per cent change in it implies a change in the quantity of money that is much larger and maybe even close to or beyond the amount of annual change acceptable to the monetary authorities. Thus, judging from the period from 1955 to 1970, even the most vigorous use of monetary policy could not be relied upon to achieve more than a moderate degree of greater stability in construction demand.

Fiscal policy is also not as helpful as might have been hoped. As expected, it is weaker in coping with instability in residential construction, reducing it by only 6 per cent (100 x (5.2-4.7)/8.0), but it is somewhat better on other construction than monetary policy, reducing instability in business non-residential construction by 10 percent, and in government construction by 6½ per cent. The chosen swings in fiscal policy are very substantial; year-to-year changes of 15 per cent, up or down, in personal and corporate

10 See Chapter 2, Part 3, for why this measure is appropriate.

tax rates are well beyond anything Canadian governments have thought acceptable up to now. Given their very small effect, it may be concluded that fiscal policy, defined as general taxation policy, is a weak method for stabilizing construction demand.

There was a tentative assumption that a combined monetary and fiscal policy might do a substantially better stabilization job, but the final column shows that this is not so. The policies do not appear to be even additive, let alone multiplicative, in their effects. Applying both policies together gives roughly the same results as monetary policy alone in the case of residential construction, and as fiscal policy alone in the cases of nonresidential and government construction.

In sum, general monetary and fiscal measures are inadequate, unless considerably supplemented by other methods, for stabilizing construction spending. This conclusion is subject to the reservation that the CANDIDE model might be somewhat misleading as a guide to the power of monetary and fiscal policy, but this seems unlikely to modify it seriously.

6 Measures Specific to Residential Construction

Residential construction can be influenced by government through several measures other than general policy. These include interest rate policies insofar as they can be separated from decisions about money supply, CMHC direct lending policies, winter works when related to housing, and direct building of low-income housing by both the federal and provincial governments, which has become important in the last few years and is likely to grow in importance in the near future. Dr. Chung's study on residential construction offers a detailed treatment of potential stabilization methods in this area.

7 Matching Grant Policies

The federal government gives matching grants to the provinces which can affect construction decisions, and which could be used as a stabilization tool. However, in light of the simulation results, it appears that this would be an extremely risky technique to use.

4 Costs and Benefits of a Stabilized Construction Industry

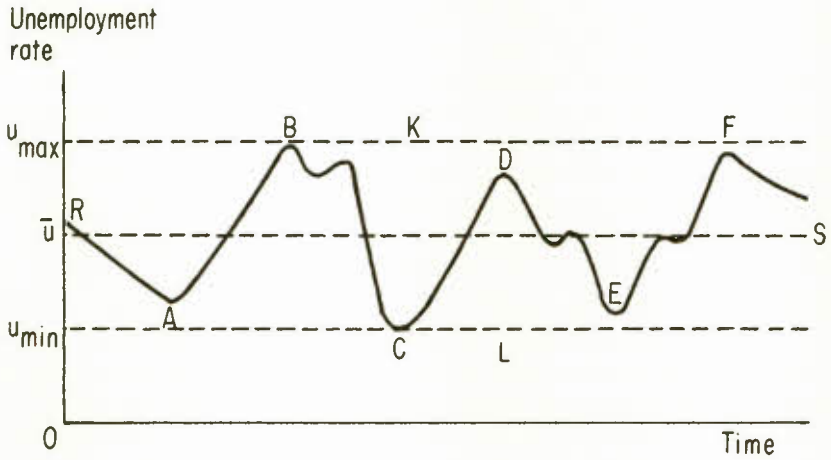
1 Benefits

Rate of Construction Unemployment

Suppose that the annual unemployment rate in the industry fluctuates cyclically, as in Chart 4-1.

Chart 4-1

Hypothetical Time Path of the Construction Industry Unemployment Rate



In the Chart, points *A*, *C*, and *E* represent booms, and points *B*, *D*, and *F* recessions. The line *RS* represents the average unemployment rate observed in the industry, $\bar{u}$. The line *BK* represents the maximum observed unemployment rate, u_{max}, and the line *CL* the minimum observed, u_{min}.

Perfect stability would appear to imply that the unemployment rate would always be $\bar{u}$, which is not far from being an average of u_{max} and u_{min}. However, the number of construction workers is higher in a situation of instability than it would be with stability, because a reserve is needed to draw

upon during booms. With instability eliminated, the reserve would not be needed, and would eventually disappear. The size of the reserve, as a percentage of the labour force in construction, is $(\bar{u} - u_{min})$. With this reserve gone, the unemployment rate would be u_{min} rather than $\bar{u}$, so that the average unemployment rate would be reduced by $(\bar{u} - u_{min})$.

But there is no possibility of achieving perfect stability in practice, so the benefit in terms of a reduced unemployment rate is less than $\bar{u} - u_{min}$ – probably considerably less. Let us suppose that the best policies that can be devised reduce instability, as measured by the gap between u_{max} and u_{min} by 100δ per cent. Assuming u_{min} cannot fall–being the seasonal plus the frictional plus the random part of unemployment–u_{max} falls by an amount δ $(u_{max} - u_{min})$ to the new value $(1 - \delta)u_{max} + \delta u_{min}$. Average unemployment is now approximately $\frac{1}{2}[(1 - \delta)u_{max} + \delta u_{min} + u_{min}]$, and before was $\frac{1}{2}(u_{max} + u_{min})$. The difference, which is the reduction in the unemployment rate, is:–

$$\begin{aligned} & \tfrac{1}{2}\delta(u_{max} - u_{min}) \\ &= \tfrac{1}{2}\delta(u_{max} + u_{min} - 2u_{min}) \\ &\simeq \delta(\bar{u} - u_{min}) \end{aligned}$$

Values for $\bar{u}$, and u_{min} are not difficult to find for Canada. Between 1951 and 1970, u_{min} was about 9½ per cent (9.3 in 1953, 9.9 in 1956, and 9.3 in 1966), while $\bar{u}$ was about 14 per cent. The saving from stabilization, in terms of percentage points off the unemployment rate, is therefore 4.5δ.

The degree of success of the policy, measured by δ, is anybody's guess. It would probably not be realistic to expect a reduction of more than one-third in instability from any acceptable stabilization policy. If so, the upper limit to the benefit in terms of unemployment in the industry might be placed at a reduction of 1½ points in the average rate of construction unemployment. The rate would not be lower by this amount every year, but on average over the years this is the maximum likely reduction.

In terms of foregone earnings at 1972 rates of pay, the cost of 1½ percentage points of unemployment in the construction labour force might be put at about $66 million a year.[1] This is a maximum, since the degree of success of the stabilization policy could be much less than one-third. On the other hand, the social cost of unemployment may be somewhat underestimated by valuing it at just foregone earnings.

It seems reasonable to conclude that the benefit from the impact of stabilization on the unemployment rate of construction workers is worth somewhere between zero and $66 million a year, depending on how successful the policy turns out to be.

1 1½% x 550,000 x $8,000 = $66 million.
(labour force) (foregone earnings)

Capacity Utilization in the Construction Industry

Construction equipment is subject to varying rates of "unemployment", much as labour is, although this fact is more normally expressed by saying that the rate of capacity utilization varies. The average degree to which capital is unemployed will not be the same as labour's average unemployment rate, for various reasons, only some of which are understood. Similarly, it is likely that the variations in the rate of capacity utilization[2] differ from the variations in the employment rate of labour in the industry. Nevertheless, the same type of analysis may be applied here, with the single difference that it is more convenient to work with the employment rate of capital–the capacity utilization rate–than its unemployment rate.

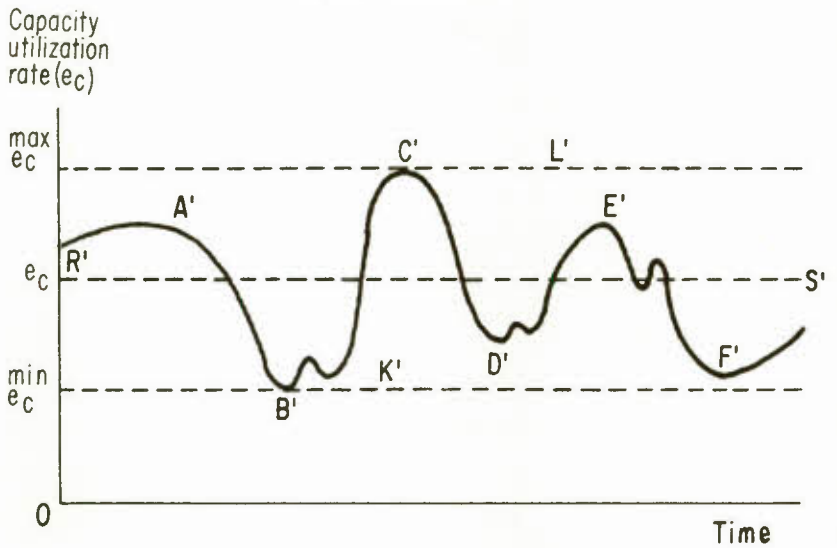
Fluctuations in the capacity utilization rate (e_c) will appear as in Chart 4-2, where the vertical scale (broken at the origin) shows the values of e_c. Booms occur at A', C' and E', recessions at B', D' and F'. The maximum rate of capacity utilization, e_c^{max}, is shown by the line $C'L'$, while the line $B'K'$ shows the minimum rate, e_c^{min}. The average rate, $\bar{e}_c$, is shown by $R'S'$.

Using exactly the same argument as before, a policy with a success rate of δ will increase the average rate of capacity utilization by

$\delta\ (\bar{e}_c - e_c^{min})$.

Chart 4-2

Hypothetical Time Path of the Construction Industry
Capacity Utilization Rate



2 The reference is to the utilization rate for the industry as a whole. The widespread practice of renting equipment will permit every individual firm to have a greater rate of utilization of *owned* capital than the average rate of utilization of all capital specific to the industry.

As in the case of labour, the way in which the increased rate of utilization comes about is that less "spare" capacity for boom periods is required, so that the same average amount of capital services can be obtained by having a smaller capital stock in the industry. The same symbol δ is used for the rate of success of the stabilization policy; the assumption is that it is equally effective in stabilizing the use of capital and labour.

A dollar value can be found for the annual saving by multiplying the amount of capital saved by the rate of return on *capital outside the industry*, since that is where, in the long run, the saved capital will go.

Since the proportion of the existing capital stock in the construction industry that would no longer be needed as a result of the increased utilization rate is $\delta(\bar{e}_c - e_c^{min})$, if the stock of capital in the industry is denoted as K, its replacement price per unit as p_K, and the rate of return on capital elsewhere as r, then the saving from stabilization due to better capital utilization would be

$$\delta(\bar{e}_c - e_c^{min})\, Kp_K r.$$

If the rate of return to capital in the industry is r^*, based on replacement cost of capital, then the present annual earnings of capital are $Kp_K r^*$. Thus the savings as a fraction of existing earnings of capital are

$$\frac{\delta(\bar{e}_c - e_c^{min})\, Kp_K r}{Kp_K r^*}$$

$$= \delta(\bar{e}_c - e_c^{min})\, r/r^*.$$

One would expect r^* to be higher than r if the industry is riskier than others, because of its seasonality and greater sensitivity to cycles, provided the market has adjusted for these things.[3] If the market has not, for whatever reason, r^* could be the same or lower than r. In the absence of hard data it can be assumed that $r^* = r$.

The difference between $\bar{e}_c$ and e_c^{min} is also not obtainable from observed data. The amount the employment rate varies and the amount output varies around trend are known but similar information for capital equipment is unavailable. One indicator is that, for industries where information is available, fluctuations in the rate of capacity utilization considerably exceed fluctuations in either the employment rate or in deviations of output from trend. In the United States, for example, the capacity utilization rate for all manufacturing fluctuated between 94 per cent and 72 per cent over the

3 One might argue that if r^* is high enough to compensate for all risk, including that due to cycles, the industry suffers no loss, and so gains nothing from stabilization, since r^* would fall to allow for the decreased risk. This is quite true, but there is still a *social* gain from the decreased risk which is measured in fractional terms by the last algebraic expression. If the value of r^* does reflect the cost, the social gain of stabilization accrues to the general public; if it does not, the gain accrues to the industry, as it should, since in this case the industry would have been paying the social cost by itself.

period 1951-70, a range of 22 percentage points. For employment, the corresponding range was only about 5 percentage points, less than one-quarter as great. It can be assumed, perhaps rather conservatively, that for the Canadian construction industry as a whole the range of fluctuations in the employment rate is one-half as great as the range of fluctuations in the capacity utilization rate. This assumption makes the value of $\bar{e}_c - e_c^{min}$ equal to 9 percentage points.

Assuming that the maximum value of δ might be one-third, it can be concluded that stabilization would mean that the saving in social cost from better utilization of capacity would be $1/3 \times 9 = 3$ per cent of the annual dollar returns to capital in the industry.

Typically, capital's share of value-added net of capital consumption allowances over the last ten years has been about 16 per cent, so that the future dollar payments to capital might reasonably be expected to average $100 \times \frac{16}{84}$ per cent of the dollar payments to labour. Three per cent of this would be saved, at a maximum, by stabilization, giving a saving of

$$.03 \times \frac{16}{84} \times \text{payments to labour.}$$

In the previous section payments to labour were roughly estimated at $4,400 million (for 1972 wage levels), so the maximum likely saving on account of better utilization of capital, in 1972 prices, would be

$$.03 \times \frac{16}{84} \times \$4{,}400 \text{ million}$$

$$= \$25 \text{ million.}$$

If this saving is added to the previous value of $66 million found for labour, the potential savings from stabilization would be $91 million per annum.

Up to this point it has been implicitly assumed, that there are constant returns to scale to labour and capital combined in the construction industry, as expansion occurs from cyclical troughs. But this assumption would by no means be universally accepted. The phenomenon of short-run increasing returns in manufacturing to labour alone (Okun's law) is well known.[4] Part of this phenomenon is undoubtedly due to more intensive use of the capital stock as expansion occurs—an element already captured in the estimates, while part of it is due to better utilization of "overhead" labour, which is probably a higher proportion of all labour in manufacturing than it is in construction. Moreover, within manufacturing, some industries show increasing short-run returns to labour and some do not, according to data from Britain and Australia.[5] Nevertheless, some workers have concluded that

4 See, for example, Frank Brechling and Peter O'Brien, "Short Run Employment Functions in Manufacturing Industries: An International Comparison", *Review of Economics and Statistics* (August 1967), and references therein.

5 See R. J. Ball and E. B. A. St. Cyr, "Short Term Employment Functions in British Manufacturing Industry", *Review of Economic Studies*, (July 1966); and D. J. Smyth and N. J. Ireland, "Short Term Employment Functions in Australian Manufacturing", *Review of Economics and Statistics* (November 1967).

short-run increasing returns to scale do often exist in manufacturing industries, and this possibility cannot be ruled out for construction. Estimates of returns to scale depend on the branch of manufacturing or on the country concerned,[6] but vary around a median value of 1.3 to 1.4.

The estimates used in this study of the cyclical relationship between output and inputs in construction in nine Canadian provinces are rather inconclusive.[7] The hypothesis of constant returns to scale could not be rejected in any province, but the fits were not quite tight enough to reject a hypothesis of moderately increasing returns to scale either–for example, a sum of factor input exponents of, say, 1.3 or 1.4 rather than 1.0. The point estimates were very close to unity in six of nine provinces, and all six of these regressions fitted quite well. Point estimates distant from unity were found for Ontario, Alberta, and Newfoundland, but only Alberta's regression fitted reasonably well. Given a Bayesian approach to probability, in which evidence from other industries and countries would lead to a prior expectation of greater than unity returns to scale, the results certainly leave open the possibility of moderately increasing returns to scale in the short run (over the cycle) in Canadian construction.

If construction did display returns to scale of the order of 1.3 to 1.4, the estimated savings of $91 million would need to be increased as much as 40 per cent, to $127 million. If constant returns obtained, the original estimate of $91 million would stand.

All of these calculations are extremely crude, and it is probably better to avoid a spurious air of precision by giving a single rounded estimate of $100 million.

It may then be concluded that the estimate of savings made possible by reducing the average unemployment rates of labour and capital in the industry through stabilization would be approximately $100 million (1972 dollars) per year. To the extent that the industry grows or contracts in real terms in the future, this upper limit on savings would grow or contract at the same rate.

Productivity in Construction

The level of productivity in the construction industry would rise as a result of successful stabilization due to more intensive use of both labour and capital. If stabilization were achieved through a smoother trend path of construction, with no increase in the average amount constructed beyond what would have occurred without stabilization, then the increased produc-

6 *Ibid.*

7 Based on fitting to annual data (quarterly not being available) the regression $E_t = a + bt + cQ_t + dE_{t-1}$, in which "$E$" is employment and "$Q$" is construction output. The modified Hildreth-Lu method was used.

tivity would appear in the form of less input for the same output. This is what was assumed in the two previous sections, and the value of such increased productivity has already been calculated there, at a range of $90-$130 million a year. If stabilization were achieved through filling in troughs without chopping off peaks, as it might be, so that the society ended up with more structures than before, the increase in productivity would then appear as more output for the same input. The value of the productivity increase remains the same as before, with the only difference being that the $100 million saving is spent on construction goods rather than on a mixture of all goods and services.

There may be other ways for stability to enhance productivity beyond what is achieved through saving input idleness. It is possible that technological methods could be better under stability, and that the rate of improvement of technological methods could be faster. Arguments can also be made that they would be, respectively, worse and slower. These matters are taken up in other studies; there will be no attempt here to put a dollar value on the resulting benefits (or costs) from this particular spin-off of greater stability.

Bankruptcy[8]

It seemed plausible at the beginning of the work of the Reference to suppose that the bankruptcy rate in construction would be high relative to other industries and that it would be linked to cyclical instability in the industry. The evidence gathered on these matters is rather slender, but it indicates that only the second supposition is correct. Bankruptcy is not more common in construction than in other industries. Moreover, while bankruptcy is usually both a serious loss and a traumatic experience for the entrepreneur concerned, the economic loss to the economy as a whole is normally quite negligible, because the real assets of the bankrupt firm remain within the construction industry and its unfinished projects are usually completed by other firms. The loss to the economy consists exclusively of the interest foregone on the capital tied up in delayed projects; this is very small. The reduction in this social loss resulting from greater stability is not likely to be great, so that the savings from greater stability will be extremely small. Very crude estimates suggest that the maximum possible saving, using as generous a set of assumptions as possible, would not exceed $2.0 million a year. Even if a very generous additional allowance were made for the extra utility accruing to individual entrepreneurs from a reduced risk of doing business, it is probably fair to say that, in considering the benefits of a policy of greater stability in construction, the effects on bankruptcy can be ignored.

8 This section is based on W. F. Barnicke's "The Industrial Organization Dimensions of Cycles in the Construction Industry", Economic Council of Canada, Discussion Paper No. 14, October 1974.

Unemployment Outside the Construction Industry

At first glance it seems unlikely that stabilization of construction spending would affect unemployment outside the construction industry at all. Extra construction spending in what would have been construction recessions would, through the multiplier process, create extra employment in other industries, but reduced spending in what would have been booms would fail to create the extra employment that formerly would have been created. Therefore, the net effect of stabilizing construction on unemployment in other industries would be zero, averaged over the years. Despite this, there are two ways in which such unemployment might be reduced by greater stability in construction demand.

First, the construction labour force now is larger than needed to meet average demand for the industry's output, because "spare" labour must be available during boom periods. Similarly the labour force in materials-supplying industries servicing the construction industry will have to be larger than needed to meet average demand. Stabilization, by obviating the need for some of this spare labour, would reduce the average unemployment rate in the construction industry itself; for the same reasons the average unemployment rate would also be reduced in the materials-supplying industries. But the construction industry is an important customer for only a very few materials suppliers and this particular effect of stabilization would not have a significant effect on the overall unemployment rate.

The second way in which unemployment outside the industry might be reduced is through the achievement of what amounts to a better trade-off curve between unemployment and inflation, at least in the short run. If the trade-off curve is moved in by stabilization, a given average rate of inflation will be accompanied by a lower average unemployment rate. This is not a reference to that inward movement of the aggregate trade-off curve implied by the earlier conclusion that the average unemployment rate in the construction industry itself would be lowered by stabilization. This lowering would cause a shift in the economy's trade-off curve because of a reduction in what might be called "spare capacity" unemployment in the construction industry, and the benefits of that shift are already included in the $100 million saving mentioned above, the calculation of which involves an assumption that the same inflation rate is maintained along the new short-run trade-off curve. The shift considered here is a further inward movement of the trade-off curve coming about as an indirect result of stabilization. It can be viewed as a reduction in the amount of inflation at a given rate of unemployment, rather than as a reduction in the amount of unemployment at a given rate of inflation.

The General Rate of Inflation

A situation where there is high demand for goods and services in one region of Canada—whether for construction or anything else—accompanied by low

demand in the rest of Canada, is likely to cause more inflation and pressure than the same aggregate demand evenly spread across the country.

In an economy where all prices were perfectly flexible, up *and* down (and which therefore had permanent full employment), high demand in one region and low demand in another would generate a relative price differential, with prices up in the high-demand region and down in the low-demand region. The price differential would act to spread the high demand around in the short run, and to shift resources in the longer run, until the price differential was removed. At all times the higher level of prices in one region would be offset by a lower level elsewhere, so that no aggregate rise in the price level would occur.

In an economy where all prices are quite flexible upwards, but generally inflexible downwards, the price differential will still occur, temporarily, as a result of high demand in one region and low demand in another. But this time it will be because prices rise in the high-demand region but do not fall or—at least not much—in the low-demand region. This is clearly inflationary on balance for the country as a whole.

Some unemployment may also occur in the low-demand region, with the precise amounts of unemployment and inflation depending on government policy on the creation of more money to validate inflation. Just as before, there will be an adjustment to the demand differential, with the difference that an employment differential as well as price/income differential between the regions will play a role in that adjustment.

The same analysis covers the situation where inflation occurs before the shift of relative demand among regions; it is more complex but the result is similar: the rate of inflation is temporarily increased above its former level.

In Chapter 2 construction demand in any one region of Canada was seen to be only moderately well correlated with demand in any other region. Construction demand can be high in some regions, low in others, and at the same time normal in Canada as a whole. In those circumstances, some inflation will be generated which would not occur if the construction demand was at a normal level in each region separately.

Any successful stabilization scheme will almost certainly include action to stabilize construction at the provincial level; this should reduce the frequency with which construction demand, even though not high in total, is considerably higher in some regions than in others. To the extent that it does do this, it will reduce the amount of inflation in Canada as a whole.

Given the existence of a short-run trade-off curve, government policy could achieve a reduction in the rate of unemployment rather than a reduction in the rate of inflation. Some theorists would argue that in the long run, a reduced unemployment rate is the *only* choice; they would claim that there is a "natural rate" of unemployment, independent of the choice of inflation rate.

In his study, Professor Chung points to another reduction in the average rate of inflation from stabilization. Even if the aggregate or any subsector

trade-off curve does not shift, stabilization means that the variation around the average unemployment rate will be reduced. If the trade-off curve is convex, the total amount of wage or price increase over any period which results from any given average unemployment rate will be smaller. This effect appears to be significant in housing and has implications for low-income housing needs, although, of course, with no shift in the trade-off there is no resource saving at a constant *steady* rate of inflation.

2 Costs

Extra Costs to Clients

The major cost of a stabilization scheme is that it stops people constructing when they want to and makes them construct when they do not want to. This is true whether stabilization is done through planning and scheduling of all construction, through planning and scheduling of government sector construction alone, through subsidy incentives and tax disincentives, through lending policies and interest rate controls, or through any other method.

Stabilization may require, for example, that some residential developers not build houses at times when they believe it would be profitable to do so, and that others build houses at times when they do not believe it will be profitable. The stabilization method of choice may work through manipulation of market or other variables so as to change profitability as seen by clients, but the reference is to profitability exclusive of such devices. Stabilization may require that a municipality postpone the construction of sewers, schools, and hospitals which in its view are needed right away. It may require a provincial highways department to construct a road before the amount of traffic warrants it, or a provincial power commission to install capacity beyond necessity.

In short, stabilization requires the clients to construct either earlier or later than the time they think is best and thus, in their own opinion at least, to incur unnecessary costs.

Both shortages and surpluses of housing are costly; the absence of needed sewers, schools and hospitals—even for a time—is costly, and so would be an excess supply of them; an excess of highways or power capacity is costly, and so would be a shortage of either.

It might be argued that the clients' judgment about the needed volume of construction at any point in time is often wrong. The developer who thinks it is a bad time to build may be wrong. The municipality which thinks that a sewer is needed now may be mistaken. The Highways Department, or the provincial Cabinet deciding its budget, may misjudge how much highway is required. The Power Commission may over- or under-estimate the amount of capacity required. Decisions on government construction are especially

prone to error, although the argument for this view, and indeed the view itself, are seldom spelled out explicitly.

If clients' decisions about the appropriate volume of construction are in fact quite often faulty, and if in addition the decisions implied by the implementation of a stabilization scheme are quite often right or close to right, then no real costs would be imposed through the frustration of clients' decisions by a stabilization scheme. This amounts to asserting that on criteria *other than the previously covered benefits of stabilization,* construction recessions are generally a better time to construct than clients think, and construction booms are generally a worse time to construct than clients think. There is no reason to suppose that this assertion is correct: it seems just as reasonable to suppose that better decision-making by clients would generate even greater instability than is actually observed. Nor is there any real reason to suppose that the timing decisions made by individual construction clients (private or public) are so inaccurate that there is no cost involved in altering their preferred timing.

It has not been possible to put a dollar estimate on the costs to clients of having their timing decisions thrown off by a stabilization scheme. However, this inability to estimate what is probably the major cost of stabilization should not be permitted to obscure its seriousness.[9]

Implied Restrictions on Monetary/Fiscal Policy

General monetary and/or fiscal policy could be used to try and stabilize construction. If they were used for this purpose they would then be unavailable for other purposes, except by chance. Even if they were not used themselves to stabilize construction, a commitment to such stabilization could inhibit their free use for other objectives.

The problem is most acute with regard to monetary policy and residential construction. While it is hard to uncover evidence that monetary policy

9 An objection may be raised against the view that clients are faced with significant costs consequent upon stabilization, applicable especially to instability in residential construction. I am indebted to Dr. André Raynauld, Chairman of the Economic Council of Canada, for raising the point, although I am not certain he would agree with the way I express it. The argument is as follows. Part of instability in housing is due to shifts in the supply of funds, and thus in the supply of new housing. Any stabilization method that moderated these supply shifts would not force buyers either to change their demand curves or move off them, and would therefore be costless to buyers. More generally, the elimination of supply curve induced instability in construction expenditures would not generate costs for buyers. Two comments seem appropriate: first, most instability does seem to have been demand-induced rather than supply-induced, though the relative importance of demand was somewhat less in housing than in other types of construction; second, there may be costs if stabilization frustrates supply curve shifts, even for those shifts that might otherwise have been induced by deliberate policy – some of these costs are commented upon in the immediately following section. Nevertheless, the costs to clients of altering the timing of their expenditures, especially in housing, would be less than implied, to the extent that stabilization used methods that moderated supply shifts which would otherwise have caused instablity.

significantly destabilized residential construction during the last 20 years, uninhibited monetary measures might have this effect in the future.

Difficulties could also arise from the complementarity between investment in structures and investment in equipment—for example, a factory building needs machinery. Greater construction stability imposes greater stability in other kinds of investment spending, even if this is not itself desirable.

However, if construction stabilization could be achieved by construction-specific measures, and if the impact of monetary/fiscal policy in construction has not been seriously understated by the CANDIDE model, and if no structural change occurs in the future, then a policy of stabilizing construction would not require any restrictions on the use of monetary/fiscal policy for other purposes. This indeed seems to be the case.

The Stock of Structures

A by-product of certain stabilization policies could be a higher average level of construction. The policies involved are those which subsidize construction buyers in recession, in whatever way, without taxing them at other times. While such policies would stabilize construction, they would also raise its long-term average level, except when buyers voluntarily made fully compensating reductions in spending during nonrecession periods.

Subsidies without corresponding taxes on construction would have to be paid from general tax revenue, and people would then lose what they could have bought if taxes had been lower. They would gain the extra structures. Provided, however, that the judgment of buyers (both private and public) about how much construction they would have wanted without the subsidy was not too inaccurate, the extra structures would not be adequate compensation for the taxes paid.

Estimating the size of such a loss is straightforward in principle, but difficult in practice. Only moderately plausible guesses can be made about the values of certain parameters, notably the long-run price elasticity of demand for construction as a whole and the extent to which subsidies in construction recessions would generate corresponding declines in demand at other times. In Appendix C the conclusion is reached that the loss would probably be rather small, perhaps between $5 million and $75 million a year at 1972 prices and construction levels or, in future years, between one-thirtieth and one-half of one per cent of the value of construction sales.

The Mix of Structures

The mix of construction activities curbed by a stabilization policy in good times and the mix encouraged in poor times is a matter of considerable importance. It seems clear that the cost of stabilization is greater the more inappropriate these mixes happen to be.

Freedom to Switch Priorities and Adaptability

To the extent that stabilization works, it places constraints on the freedom to switch priorities, especially by governments but also to some extent by private firms and households. In the past there have been times when priority changes destabilized construction, not in an especially cyclical way but more or less irregularly. One example was the 1972 decision by the Ontario government to downplay educational expenditure, with a resulting slowdown in school and university building. Another example was the decision by many private individuals and firms to move out of Montreal in the early 1970s, as a result of the FLQ crisis and related problems; this may have dampened building construction there. Stabilization policies aimed at dampening cyclical swings in demand will inevitably impinge also on swings due to such changes in priority. In addition, stabilization would hinder the adaptability of the industry to changes in similar trends. Effective stabilization measures would make sudden changes of any kind more difficult in one way or another. To those who wish to make them, this represents a real cost.

The Level of Government Intervention

A commonly held philosophical view maintains that any government involvement in private decision making is inherently undesirable and costly. While the present writer does not subscribe to this laissez-faire view, it should be included for completeness. The amount of interference with private decision making is likely to depend on the method chosen for stabilization; consequently, the cost of it will also depend on the method chosen.

3 Uncertain Aspects of Costs and Benefits

More than once it has been impossible to derive a numerical estimate of the costs and benefits from stabilizing construction. The problems for clients in having to advance or to postpone the timing of their projects, the advantage of reduced sectoral-shift inflation pressure, the handicapping of policy instruments, are all examples of consequences of stabilization which cannot be evaluated in dollars. The uncertainty is compounded because there will almost certainly be other costs and benefits not considered here. The net benefit or cost is uncertain enough that a decision on whether or not to stabilize is a matter on which reasonable men could validly disagree, and probably will. This fact itself is important and is of possible relevance to the decision itself.

From the industry's point of view, instability due to seasonality and to the irregular flow of business and employment associated with the contract system--itself a consequence of aspects of the construction process too

complex to enter upon here—probably outweighs in importance that part of instability due to cyclical variations in demand. For this reason, a set of policy recommendations based on an investigation and cost/benefit analysis which examine only the problem of cyclical instability may be viewed by the industry as peripheral or even irrelevant to its major problems. It may then become impatient with, or even hostile to, the federal government as the instigator of the whole procedure. If this happened it would represent a cost to the government of unknown magnitude. On the other hand, it would probably represent little if any cost to the community as a whole.

5 The Relative Merits of Different Methods of Achieving Stability

1 The Critical Role Played by Factor Mobility

In this section, the question of why construction stabilization policies need to be region-specific is considered. Little loss of generality is incurred by examining only two regions, of roughly equal size, Ontario and Quebec.

The issues may be clarified by imagining that a perfect forecast has been obtained: residential construction is expected to be 20 per cent above trend next year in Quebec, and 20 per cent below trend in Ontario.[1] All other construction activity is expected to be on trend.

If stabilization does not need to be region-specific, no action is needed because the degree to which Quebec is above trend just balances the degree to which Ontario is below. If it does need to be region-specific, residential construction must simultaneously be stimulated in Ontario and checked in Quebec.

It is possible to delineate two alternative sets of conditions where no action would be needed. One such set is that all factors of production used in residential construction are completely and costlessly mobile between Ontario and Quebec. In that case, labour, equipment, and entrepreneurs, can move and none need become unemployed. However, mobility is in practice both limited and costly. Land cannot move at all. Construction workers can and do move sometimes, but for short-term swings the costs can easily outweigh the benefits, especially given the distances involved in Canada and the availability of unemployment pay. Additionally, for union workers, the probability of being hired in another province is often quite low, or seen to be low, even if jobs are relatively plentiful. Finally, there are often serious language and/or cultural barriers to interprovincial mobility, especially in the short run. Some equipment can move, but again not at zero cost. Entrepreneurs, especially the smaller ones most vulnerable to the drop in Ontario construction, would find it very difficult to shift to Quebec and operate there, especially on a temporary basis. For all these reasons,

1 If demand for construction never moved differently in one region from another, there would certainly be no need for region-specific policies. The data cited in Chapter 2 rule out this possibility.

interprovincial mobility of construction factors of production in the short run (over the cycle) is almost surely too low to obviate the need for region-specific stabilization.

However, there is another possible method of avoiding the need for regional stabilization. Suppose that all the factors of production used in construction in a province are in completely elastic supply, even in the short run, because they can be pulled into construction from other activities within the province when construction activity rises, and can move out of construction into other activities within the province whenever construction activity falls. If this were so, a high demand for residential construction in Quebec would move workers into construction from other industries or even into the labour force from activities such as schooling or retirement (it is assumed that there is no unemployment in either province before the change being studied). The number of construction entrepreneurs would also grow, and the necessary extra equipment would be produced.

The mechanism that could in principle bring this about is the standard market process. The high Quebec demand for labour in housing could generate an improvement in wages and working conditions relative to those in other industries; if labour were sensitive, even in the short run, to such improvements, it would flow into residential construction. The same is true for equipment; with sufficiently elastic supply, even a small rise in demand–raising its market price just a little–would result the supply being increased as much as necessary. The high demand could also brighten the prospects of any potential entrepreneurs, attracting a sufficient number of them into house building. In principle, even land could be in highly elastic supply, since residential housing is only one of the many uses for it, but this obviously would not be true for construction as a whole.

In Ontario, the opposite conditions could obtain. The drop in housing demand would cause potential or actual payments to all factors used in housing construction to fall relative to what was obtainable elsewhere. Possibly, under general inflation, the mechanism would be a failure of their payments to rise as fast as those in other Ontario industries. Workers and entrepreneurs would leave the industry for jobs in other industries; production of equipment would fall; the rate of development of housing land would slow down.

These adjustments to uneven regional demand, which will occur with perfect mobility of factors among industries *within* the province, actually require conditions beyond those so far outlined. In the example, in Quebec when demand is above normal, full employment was assumed as a starting point.[2] The transfer of resources into construction then requires at least a

2 If there is not full employment there would be no interest in dampening demand in Quebec with any policies, whether or not such policies were region specific. "Full employment" here is used in the sense of "target full employment", which might involve a substantial amount of unemployment if the government feared inflation strongly.

minimal amount of increase in construction wages, in profits, and in residential land prices within Quebec. This also generates a reduction in the labour, capital, land, and entrepreneurs available, at existing rates of return, to the other industries in Quebec. However, since the reason for the boom in Quebec housing demand has to be that Quebeckers have temporarily shifted their demands to housing from other goods, it is possible that fewer factors are needed in total outside construction in Quebec. This is a possibility rather than a certainty, because the demand of Quebeckers might have shifted to housing from goods previously bought in Ontario rather than Quebec.

In the case where the shift is away from goods or services produced in Quebec, there is no presumption that the factors thereby in reduced demand will be those that are moving into construction. Workers might move into construction from farming, while the switch in demand was from entertainment to housing, not from farm products to housing. What is then required is that the mobility among *all* industries in the short run is high enough that factors do quickly become fully employed: for example, workers might move to vacated jobs in farming from textiles, and the displaced entertainment workers then take textile jobs. Obviously the process would in practice be highly complex. The point is that, given fast and costless mobility of factors among industries, and given that the demand shift to housing is from other goods made in Quebec, no problem arises as a result of the increase in housing demand. The same is true, *mutatis mutandis*, of the fall in housing demand in Ontario.

If the shift to housing demand in Quebec is at the expense of goods imported from Ontario, then no factors are freed in Quebec to permit an expansion of housing production via a shuffling of factors among Quebec industries. Under these conditions, all factor and goods prices will edge upwards in Quebec because of the excess demand. If the shift away from housing in Ontario is in favour of other Ontario goods (and there is interindustry mobility there), aggregate demand by domestic residents in Ontario will be unchanged, and aggregate demand in total will be down due to the loss of exports to Quebec. Prices in Ontario will then fall, or rise more slowly than before. If the demand shift in Ontario should be from housing towards goods made in Quebec, all the effects are in the same direction but even stronger. The combined price effects in the two provinces must eventually switch the demand of Quebeckers to Ontario goods after all, though a considerable alteration of relative prices might be needed to do this. If prices everywhere happen to be rigid downwards, the same effects will be achieved by a temporarily faster inflation in Quebec than in Ontario, generating a net increase in inflation in Canada as a whole.

It is clear that perfect interindustry mobility of factors within each province, coupled with flexibility of all wages and prices, would make separate regional stabilization unnecessary. If wages and prices are inflexible downwards but all the other conditions hold, separate regional stabilization

would not be ncesssary to keep factors fully employed, but it would help in avoiding some inflation.

A test of the adequacy of interindustry factor mobility, at least for labour, may be possible. Such mobility implies that (a) changes in the construction unemployment rate should be equal to those in the general unemployment rate, both nationally and by region; (b) that the difference between changes in the construction unemployment rate and those in the general rate should not be correlated with changes in construction output, both nationally and by province. This second requirement says that only the general state of the economy determines the construction unemployment rate (frictional and seasonal factors apart), and not the state of the construction industry itself.

Formally, if U_C represents the construction unemployment rate and U the unemployment rate elsewhere, in the regression

$$U_{Ct} = a + b\,U_t + e_t,$$

b should not be significantly different from unity.[3] The value of a might be interpreted as a measure of the extent to which the noncyclical part of the unemployment rate in construction exceeds the noncyclical part of the unemployment rate in other industries. If ΔQ represents changes in construction output, then we should also find that $(\Delta U_{ct} - \Delta U_t)$ is not correlated with ΔQ_t.

Empirical work by others indicates that b is significantly and substantially greater than unity i.e., 2.0 or more, and also that $(\Delta U_{Ct} - \Delta U_t)$ is in fact correlated with ΔQ. These results appear to hold both nationally and provincially, although they can only be found for the larger provinces, due to the unreliability of unemployment rate data in the other provinces.

It may be inferred that mobility of labour between industries is too slow or too insignificant to make a national stabilization policy as good as a regional one from labour's point of view. It seems likely that other factors of production within a province—equipment, entrepreneurs, and land—are even less mobile than labour when it is a matter of moving out of the construction industry, into other industries, and back again during the two- to seven-year span of a construction cycle.

It can be concluded that the relative immobility of most construction factors, both interindustry and interprovince, makes a region-specific stabilization policy preferable to a Canada-wide policy. Only if a Canada-wide type of policy like interest-rate policy had distinct advantages in other ways would it be worth implementing. It is perfectly possible for such advantages to exist: for example, some Canada-wide policy might be so much more effective in influencing demand for construction industry output than any conceivable region-specific policy, or so much more politically acceptable, that it would be worth using, despite the difficulties arising from relatively immobile factors.

3 Common measurement error will bias $\hat{b}$ towards unity.

Up to now "construction industry" factors of production have been discussed as though one kind of construction was pretty much the same as another. This obviously not true: carpenters can work in building construction but not in hydro construction; road-grading equipment is of little use in building houses. Even within the construction industry in a given province, a fair amount of factor immobility remains. Unskilled labour is, however, mobile across different types of construction and some of the skilled tradesmen, while unable to work in all branches of construction, can certainly work in more than one of them. Capital equipment and small entrepreneurs are relatively immobile.

Because of this factor immobility even within the industry, there is some advantage in trying to stabilize different sub-sectors of the industry within each province. It is doubtful that a slump in house-building in Ontario, for example, could be adequately compensated for by a boom in Ontario highway construction. Yet the difficulties of any stabilization policy rise very rapidly as the degree of disaggregation required increases. A practical compromise might be to aim at separate stabilization of residential and nonresidential construction within each province, but not to aim specifically at separate stabilization of sub-sectors of nonresidential construction, although it might happen that the stabilization methods chosen in one or more province did actually have this effect.

2 The Benefit/Cost Ratio of the Particular Policy

A given amount of stabilization could be achieved by many policies or combinations of policies. Although the benefits achieved would, by assumption, then be the same, most of the costs would likely differ. The extra costs incurred by clients from having to adjust the timing of their construction in the interests of stabilization will be invariant to the particular stabilization technique adopted, but some of the other costs detailed in Chapter 4 will vary according to the technique used. This point may be illustrated by contrasting the costs of achieving a given degree of stability either by market price incentives (a tax/subsidy scheme) or by planned scheduling of government spending.

Scheduling would require each provincial government to devote considerably more skilled manpower to it than would a market-price scheme: it would thus cost more to run in terms of real resources. Because of this extra expense, the incentive required to induce provincial governments to adopt a stabilization policy would be greater for scheduling. If that incentive took the form, explicitly or implicitly, of subsidizing provincial construction on balance over all future time, as it might well do, the average stock of structures with stabilization would exceed the average stock without. The excess would be greater for the scheduling scheme than for the market-price

scheme as a result of the greater incentive required, and the costs associated with an excessive stock of structures, detailed in Part 2 of Chapter 4, would also be greater. The costs associated with having an inappropriate *mix* of structures would also be greater for a scheduling method of stabilization than for a market method.

Table 5-1 indicates, for the types of policies detailed in Chapter 3, and for those of the types of costs mentioned in Chapter 4 that differ importantly among policies, whether the cost exists and if so how high it is. The Table may be used—if the judgments in it are accepted—to order some of the possible policies in terms of their benefit/cost ratios. In the next paragraph we comment on some of the judgments made in the Table.

The last row in the Table indicates that all policies are somewhat risky or uncertain in effect but that matching grant policies are much worse than the others from this point of view, as indicated by the results of analysis described in Chapter 3. The first row shows that no significant cost is incurred from an implicit restriction on general monetary/fiscal policy unless that policy is itself the method used for stabilizing construction. The cost of using monetary/fiscal policy is very high, mainly because the low effectiveness of this policy (as described earlier) implies that to achieve a significant degree of stabilization requires an extremely vigorous use of monetary/fiscal tools, and this would seriously handicap the achievement of other goals which could be reached by using these tools in a somewhat different manner. In the second and third rows, policy (4) is ranked as costlier than policy (3), simply because policy (4) does not permit high government construction in one area, e.g., highways, to be offset against low construction elsewhere, e.g., dam construction. Since there will normally be some offsetting in the natural course of events, method (4), which does not take advantage of it, will tend to cause more distortion for any given degree of stabilization. On the other hand, stability in each type of construction is somewhat better than overall stabilization, but this advantage does not seem great enough to offset the extra cost.

Table 5-1 shows at once that policy (1) has the lowest costs. Policy (2) is less costly than policies (3) and (4), and (3) is less costly than (4), but it is not certain that any of these three are less costly than either (5) or (7). The costliness of policy (7) in terms of restricting other uses of monetary fiscal policy must be weighed against certain advantages; for example, it will cause no increase in the long-term average stock of structures. These advantages do not seem to come close to offsetting that high cost, and monetary/fiscal policy is ranked as costlier than any other policy in the table. Similarly the high cost of uncertainty associated with matching grant policies appears to outweigh any of its other cost advantages except with respect to monetary/fiscal policy; policy (5) is therefore ranked next to last. (Policy (6), about which little is known, could conceivably rank anywhere, but it would not likely be inferior to either (5) or (7)).

Table 5-1

Level of Certain Costs Incurred by Various Policies for a Given Degree of Stabilization

	Type of Policy[1]						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Source of Costliness[2]	Major projects	Market-type incentives	Scheduling government spending	Stabilizing particular categories	Matching grants policy	Residential specific measures	Monetary/ fiscal policy
Restricts monetary/fiscal policy	–	–	–	–	–	?	Very high cost
Causes excess stock of structures	–	Low cost	Medium cost	High cost	–	?	–
Causes faulty mix of structures	–	–	Medium cost	High cost	Medium cost	?	–
Is risky or uncertain in effect	Low cost	Low cost	Low cost	Low cost	Very high cost	?	Low cost

1 See Chapter 3 for details: only those important costs which *differ by policy* are included here. Costs which are the same for any policy, such as the cost to clients of either bringing forward or deferring their projects, are omitted as irrelevant in this context.

2 See Chapter 4 for details.

The conclusion here is that, policy (6) apart, the costs of the policies are in ascending order as listed in Table 5-1, and that the benefit/cost ratios are therefore in descending order as listed. "Major projects" and "market-type incentives" have the highest benefit/cost ratios, "scheduling" and "particular categories" come next, and the lowest benefit/cost ratios, possibly below unity, attach to "matching grant" and "monetary/fiscal" policies.

3 Sensitivity to Lags

In Chapter 3 the long lags of one to four years between the decision to go ahead with hydro-electric developments and the start of significant construction spending were noted. The federal Department of Public Works has estimated that for public building projects valued over $25,000 there is an average lag of nearly two years between Treasury Board approval and volume spending on the site; that lag could not be shortened by more than a few months, especially under circumstances where it was desired to advance the timing of all projects at once. For provincial/municipal building, the lags are probably similar, while for private building they are unlikely to be much shorter, except in the somewhat smaller category of speculative office building. For highway construction, and for lesser marine works, the lags are only a few months in most areas, or could be reduced to that if necessary. In residential building, other than high-rise dwellings, the time lapse between a recognition that construction would be profitable in a certain location and volume spending on the work itself is only a few months, provided serviced land is available, but much longer if it is not.

It is clearly not possible to generalize about lags in construction, and assert that they are typically of one length or another; and there is much variation according to the type of construction and local circumstances. Long lags, defined as a year or more between the decision that a project should proceed and the build-up of significant on-site construction, are nevertheless common enough to create difficulties with most types of stabilization policies.

Other lags affect how easy it is to stabilize the economy in general or one industry in particular, like construction. Of special importance in the Canadian context, given the sparseness or absence of the kinds of data on a quarterly or monthly basis which could allow an informed judgment about the stock of construction activity in particular provinces, is the lag between the start of a construction recession or boom and the time when its presence is recognized. Output data is available only annually, and appears about seven months after the year end; "intentions" data are available five months ahead of the year to which they refer, but they are not reliable in picking up turning points. Unemployment rate data, collected monthly, are extremely unreliable for a single industry like construction, so they are not published by

province.[4] Employment data can be obtained on a quarterly basis, with a lag of two to three months, but pose the greatest conceptual problems for use in judging the state of the industry. In general there is a minimum lag of five months to the point where a construction boom or recession can be detected with any reliability.

Two of the several policies for stabilization that might be adopted (detailed in Chapter 3) are quite insensitive to the problems created by lags. One is the timing adjustment for the spending on the Mackenzie Valley and James Bay developments: both projects are so big that it is possible to determine ahead of time whether or not they will create a construction boom in a particular year; this means that there is adequate time to adjust the pattern of spending appropriately if it seems desirable to do so. The other policy is the stabilizing of particular categories of government spending; as that is a permanent process, planning can always be done far enough in advance to avoid problems with lags.

All the other stabilization policies would be sensitive to the lags detailed above, and some may involve additional ones. The basic problem is that attempts to stabilize can become destabilizing in practice if the lags are long enough relative to the length of cycles to be stabilized, because a stimulus intended to cure a recession can actually aggravate a later boom, or a cutback intended to moderate a boom can actually exacerbate a later recession. Moreover, the variability in lag length and cycle length through time can mean that a given type of policy will sometimes succeed and sometimes fail.

The policies of scheduling government spending and market-type incentives are equally vulnerable to the recognition lag. However, the relative seriousness for each policy of the lag between decisions to construct and the resultant spending is impossible to evaluate; it depends on the particular mix of projects affected in each case, which in turn depends on a vast array of variables which are likely to differ from cycle to cycle and from province to province. There appear to be no grounds for thinking either type of policy superior to the other in its degree of sensitivity to lags. For two other policies–varying matching grants and the use of general monetary/fiscal measures–there are more types of lags involved than the two detailed above. Even when a need for action has been recognized, monetary and fiscal policy take some time to reach the point where they impinge upon decisions about whether or not particular projects should go ahead. With matching grants, quite substantial delays could occur between the time when a decision was made to change them and the time when the changes were complete and had affected provincial decisions on construction. On the other hand, matching grants and monetary/fiscal policy tend to exert their strongest influence on types of construction where the delay before volume construction begins is

4 This situation is changing; they may soon be published for all but the smallest provinces.

rather shorter than average (highways and residential construction respectively), so that their overall sensitivity to lags may be no greater than that of scheduling or market-type incentive methods.

It may be concluded that, of the possible stabilization methods, only amendments to the timing of future major projects and the stabilizing of particular categories of government spending offer significant advantages over other policies in their ability to cope with lags.

4 Political Acceptability

The appropriateness of considering the political acceptability of policies in a work of economic analysis might be questioned. Many economists hold the not unreasonable view that political judgments should be made by politicians, and that an economist should conclude his work with a set of recommendations, all of which will do the economic job required. The policy maker can then choose from them according to his judgment, which will be partly influenced by the varying political acceptability of the recommendations. However, the various possible stabilization policies discussed here are not all equally good from the economic point of view; some which are relatively weak economically may be much stronger politically. If so, the point should be made clear, even at the risk of incorrect judgments on the economist's part about the political aspects. Second, it seemed desirable to keep the number of final recommendations low, partly to avoid confusion and partly to ensure close consideration of their merits. To do this it was necessary to select the best from the possible, and political acceptability is relevant to this selection.

Many of the issues determining the political acceptability of a particular policy may be clarified through a comparison of two of the stabilization policies mentioned in Chapter 3. One is the policy of using market price incentives and disincentives through subsidies and taxes, and the other is the policy of scheduling or planning the spending on construction by all governments. Both policies would be operated at the provincial level.

One advantage of planning over a market method shows up in construction booms. The taxes which would curb such a boom under the market scheme are inevitably highly visible and highly unpopular; the re-scheduling that dampens the boom because governments do not spend as much as they had originally intended is, by contrast, almost completely invisible. On the other hand, in recessions the subsidies will be very visible and popular, while the re-scheduling of government spending into recession periods will not be. The net effect, taking good and bad times together, will probably be that the market type scheme is less acceptable politically than the scheduling scheme.

The achievement of stability by planning is more easily understood than its achievement by market-price incentives. Moreover, both the difficulty of

planning and the price elasticity of market demand tend to be underestimated by the general public, with the result that planning seems to most people to be both simple and more effective than the somewhat esoteric technique of manipulating market prices. This view of planning's simplicity and effectiveness gives it political acceptability.

A disadvantage of scheduling all government spending at the provincial level is that it requires regular federal/provincial/municipal co-ordination which could be difficult at precisely those times when it is most required. During booms, the scheduling process requires that some government construction not be done, and there is an obvious possibility of severe conflict among the three governments about who should cut spending. The problem in recesssions is less obvious but still present: which level of government should expand construction beyond the level it considers is really justified? These problems of intergovernmental co-ordination do not arise with the market-price method.

Another problem with planning is that much of what is thought of by the public, and referred to in this report, as "government" construction is actually undertaken by government enterprises such as Hydro-Quebec and Air Canada which are relatively independent of their parent governments, especially in day-to-day decision making. Only on certain major issues, when the general public is clearly adversely affected, are governments willing to intervene in decisions made by their own enterprises: a recent example is the conflict between power needs and preservation of the environment. The scheduling of construction in the interest of stability would require governments to influence the decisions by these enterprises more frequently, and the level of intervention required might be politically undesirable.

It seems clear that the stabilization of particular categories of government spending has precisely the same advantages and disadvantages as the scheduling of government spending as a whole. The policy of adjusting the timing of expenditure on major projects appears to have the political advantages associated with the scheduling/planning method but does not have its disadvantages. There may be other political problems with adjusting the timing of major projects but they are probably not too serious. Much the same is true of monetary policy, which is probably just as acceptable from the political point of view. A policy which would likely run into very serious political problems is the stabilizing of construction by varying rates of matching grants. It would almost inevitably be construed, perhaps correctly, as an unwarranted interference by the federal government in provincial and municipal decisions.

In general, monetary policy and adjustments in the timing of major projects appear to be the least difficult politically. Scheduling and the stabilizing of particular categories are more difficult politically than either of these, but probably less difficult than a market-type incentive scheme. Matching grant variation may well be the most difficult of all.

5 Staffing

Not all methods of stabilizing would be equally demanding of administrative staff for their implementation. Smoothing out major projects would require highly qualified staff–engineers, economists, and others–but such people are readily available within the federal government and on the projects themselves. The staff required for smoothing individual categories of construction could also readily be found among existing personnel. The semi-automatic character of an established market-type stabilization method would minimize the need for permanent highly qualified staff, although experts would be needed at its inception. The use of monetary or fiscal policy for stabilization would be possible without supplementing existing staff at all.

The two methods that might run into serious problems due to shortages of qualified staff would be the scheduling of all governmental spending, province by province, and the use of matching grants to achieve stability. Scheduling would require continuous expert monitoring of developments in construction by all government levels within each province. Governmental construction decisions by all three levels, including both enterprises and departments, would then have to be modified to achieve a smooth overall growth path for total government construction. It is not certain that provincial governments could spare, on a continuous basis, the highly qualified staff needed to do all this. Continuous monitoring of government construction is also a problem which arises with the use of matching grants to stabilize construction, but it is one the federal government might be able to cope with. However, detailed and sensitive consultation among provincial, municipal, and federal governments would be required, in a field where consultation is already fraught with problems, and the necessary skilled consultants might be very hard to find.

6 The Merits of Various Policies

The five most important criteria whereby a policy should be judged are: ability to cope with regional differences in cycles of construction demand; the benefit-to-cost ratio; the robustness of the policy in the face of lags in information and implementation; political acceptability; and the policy's requirements of highly qualified administrative staff.

On each of these five criteria a particular policy's effectiveness in satisfying the criterion might be judged as high, medium or low. The judgments made in this section are based on the previous discussion in the chapter, and are set out in Table 5-2. The seven possible policies discussed in Chapter 3 are shown in the seven columns of that table.

Matching grants policies, shown in column (6), are dominated or matched on every single criterion by any of the policies listed in the columns (2), (3), and (4). Moreover, the evidence indicates that using matching grants is risky.

Table 5-2

A Ranking of the Relative Merits of Various Construction Stabilization Policies on Several Criteria

Criteria	Type of policy						
	Major projects (1)	Market-type incentives (2)	Scheduling government spending (3)	Stabilizing particular categories (4)	Residential specific measures (5)	Matching grant policies (6)	Monetary/ fiscal policy (7)
Ability to cope with regional differences	Low	High	High	High	?	High	Low
Benefit-to-cost ratio	High	High	Medium	Low	?	Low	Very low
Robustness against lags	High	Low	Low	High	Low	Low	Low
Political acceptability	Medium	Medium	High	High	?	Low	Medium
Insensitivity to shortage of qualified staff	High	High	Low	High	?	Low	High

For both reasons they are ruled out of further consideration. Policy (7), monetary and fiscal measures used specially to stabilize construction, is not dominated by the other policies in all respects, but it has such a very low benefit-to-cost ratio that it too may be ruled out for further consideration.

As there is insufficient information to make an informed judgment about the policy in column (5), measures specific to residential construction, that kind of policy is left aside in this study. Professor Chung makes a strong independent case for using such policies.

Among the remaining four policies, no single policy dominates or matches any other in all respects. For example, government scheduling has a worse benefit/cost ratio than market-type incentives but a higher degree of political acceptability. Thus it is not possible to immediately reject or choose any one of them.

Rating the remaining four policies therefore is not quite so simple, but they can be compared two at a time in the table. For example, in comparing the scheduling of government spending with the use of market-type incentives, these two policies do not differ in their ability to cope with regional differences and in their sensitivity to information and decision lags. These two criteria may therefore be ignored in a choice between the two policies, and attention focussed on whether or not the higher benefit/cost ratio and higher insensitivity to lack of qualified staff are sufficient, for the market method, to offset its lesser degree of political acceptability.

The first policy, major projects, differs from the second, market-type incentives, only in being more robust against lags (in fact lags are not a problem at all for it) and in being less able to cope with regional differences. Regional differences in the construction cycle at the time of application of the major projects policy are not likely to be great, because the tremendous size of the Mackenzie Pipeline and James Bay projects will tend to generate a *nationwide* construction boom and later recession through ripple and multiplier effects. Thus the chance that changes in the timing of some of the Pipeline spending will worsen instability rather than lessen it in some region or regions seems to be quite low. In light of this, it seems that the superiority of the policy in terms of insensitivity to lags outweighed its inferiority in terms of regional specificity. Thus the first policy is preferred to the second.

Market-type incentives (the second policy) differ from scheduling government expenditure (the third policy) in having a higher benefit/cost ratio, a higher degree of insensitivity to staffing problems, and a lower level of political acceptability. What appears to be a very considerable benefit/cost advantage for the market-type incentive method, together with its greater administrative practicality as implied by its insensitivity to staffing problems, appears to more than outweigh its disadvantages of lesser political acceptability. On these grounds, the second policy is preferred to the third.

The final comparison is between the third policy of scheduling government spending and the fourth policy of stabilizing particular categories, and it

proved the most difficult. It is not easy to say whether a greater robustness in the face of lags and staff shortages outweighs a lower benefit/cost ratio. On balance, policies three and four seem to be about equally good.

In conclusion, policy (5), stabilizing residential construction, should almost certainly be undertaken in light of Professor Chung's analysis. The remaining policies in Table 5-2 rank in the same way in terms of overall desirability as they are in the Table itself. It should perhaps be added that an earlier version of Table 5-2 had the policies in a different order: only after applying this analysis was the ranking in the Table rearranged to conform with its results.

It is probably not realistic to press more than one or two policy recommendations, even though all of the seven policies here considered could in principle be implemented. In view of the relative ranking just established for the policies it can be concluded that policies (1) and (2) in Table 5-2 should be seriously considered for implementation; that is, the timing of spending on the Pipeline and James Bay should be adjusted as far as possible in the interests of stability, and a market-type incentive scheme should be adopted, the details of which are given in Part 4 of Chapter 3.

APPENDIXES

Appendix A

Persons Consulted About the Governmental Role in Construction Instability[1]

Alberta

Mr. A. O'Brien, Director of the Budget Bureau
Mr. R. Cronkhite, Chief Engineer, Department of Highways

British Columbia

Mr. H. Ferguson, Supervisor, Finance, Research and Statistics, Department of Finance
Mr. R. Strachan, Minister of Highways
Mr. H. Miard, Deputy Minister of Highways
Mr. T. Chambers, Chief Financial Officer, B.C. Hydro and River Authority
Mr. W.M. Walker, Acting Chief Engineer and Chief Executive Assistant to the Chief Engineer, B.C. Hydro and Power Authority

Manitoba

Mr. M. Elieson, Assistant Deputy Minister, Department of Finance
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Mr. G. Reeleder, Chief Engineer, Department of Highways
Mr. F. H. Ryder, Chief Planning Engineer, New Brunswick Electric Power Commission
Mr. W. A. Williamson, Treasurer, New Brunswick Electric Power Commission

1 These positions were held at the time the study was undertaken.

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Mr. D. Vardy, Director of Economic Planning
Mr. H. Conroy, Newfoundland Planning Task Force for Construction
Mr. G. MacDonald, Chief Engineer, Department of Highways
Mr. G. Hobbs, General Manager, Newfoundland and Labrador Power Commission

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Mr. P. Kent, Treasury Board
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Quebec

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Saskatchewan

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Appendix B

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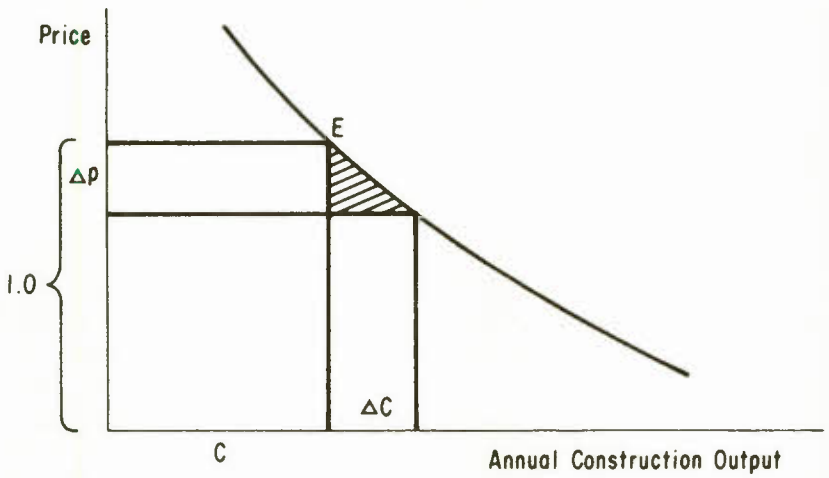
Appendix C

A Note on Consumer Surplus Loss[1]

The distortion from extra structures beyond what people would choose without the subsidy arises from a loss of consumers' surplus in construction and elsewhere, but not from a loss of producers' surplus if constant returns to scale (long run) may be assumed. Since the surplus loss in each product is related to the square and higher powers of the distortion, the loss of surpluses outside construction are ignored, for they will be relatively small even in total. Graphically, the loss is the shaded area in the diagram below,



where ΔC is the extra output imposed, the initial output is C, units are defined to make the initial price unity, and Δp is the change that would be required in the demand price to bring an extra demand of ΔC.

1 See Chapter 4, Part 2, "The Stock of Structures".

Let the elasticity of demand at E be $|m|$. Then,

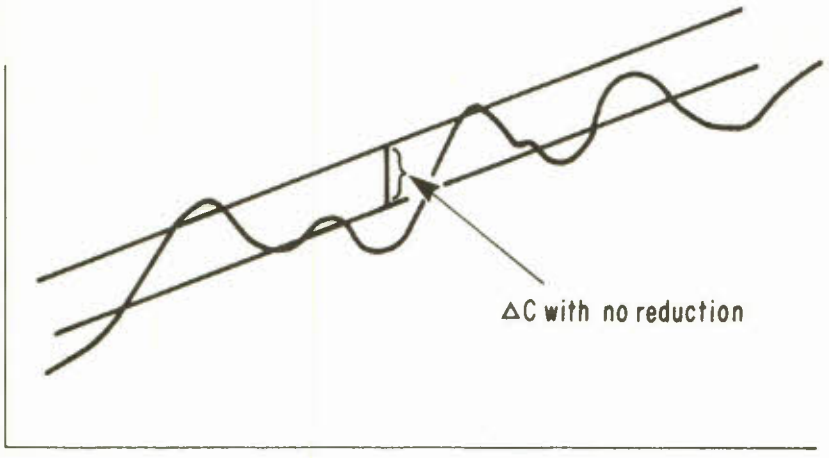
$$\frac{\Delta C}{C} = m\Delta p$$

The shaded area is approximately

$\Delta p \Delta C$ dollars per year.

Eliminating Δp, the loss is $\Delta C \times \frac{\Delta C}{mC}$.

The value of ΔC is difficult to estimate, because a subsidy during recessions will considerably reduce construction demand during later nonrecession periods. If the reduction is dollar for dollar, ΔC is zero. If the reduction is zero, ΔC will be the average difference between values along a trend fitted to peaks or nearly so and values along a normal trend, as in the diagram below.



In that case the data show that ΔC would be of the order of 8 per cent of C itself. Suppose that the reduction in the later periods is eighty cents for every dollar of subsidy in recession. Then diagrammatic experimentation soon shows that the actual ΔC will be about one-tenth of the amount involved if such an eighty-cent offset did not occur. This puts ΔC at 0.8 per cent of C itself.

The value of m, the long-run price elasticity of demand for construction as a whole, is also hard to estimate. Slutsky's inequality would imply if the income elasticity is, say, 1.25, that $|m|$ exceeds $1.25 \times C/GNP \simeq 1.25 \times .16 = 0.20$: $|m|$ is put at 0.40. With C being (1972) about \$16 billion a year,

$$\text{Loss of surplus} = \Delta C \times \frac{\Delta C}{mC}$$

$$= \frac{.008 \times .008 \times 16 \text{ billion}}{.40}$$

$$= \$25.6 \text{ million a year.}$$

This result is quite sensitive to the assumptions underlying it, but it seems likely that $75 million would be a reasonable upper bound ($0.70 offset, elasticity = | 0.3 |), and a lower bound might be $5 million ($0.90 offset, elasticity = | 0.5 |). This is where the figures in the text come from.