

TRANSFORMATIONAL GROWTH AND THE BUSINESS CYCLE

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The recent stagnation of many industrialized economies has revived research on the business cycle and on the effectiveness of measures to control it. Part of this literature has examined various historical measurements of output in order to study the relative volatility of the business cycle in different periods [Altman, 1992; Backus and Kehoe, 1992; Balke and Gordon, 1989; Sheffrin, 1989; Romer, 1986; 1989]. A dominant issue in recent work has been the effectiveness of Keynesian stabilization policy: it is claimed that if stabilization policy has been effective, evidence should show that the volatility of the business cycle has decreased since World War II, compared to earlier periods. One side maintains that there is little evidence of a decrease in volatility; the other, for the most part examining the same data over the same time period, claims that the cycle has been damped.

Implicit in this argument is the view that the only relevant difference between the economy of the late nineteenth and early twentieth centuries, compared to the economy after World War II, is the role of government as a stabilizer of the economy. The question of business-cycle volatility across wide historical periods is not, however, so simple. Not only do the two periods differ structurally, but evidence shows that different economic mechanisms are at work in the economies; that is, the market systems both generate different internal dynamics and adjust differently to external shocks, so that different explanatory principles apply in the two periods.

TRANSFORMATIONAL GROWTH: AN ALTERNATIVE FRAMEWORK

Morris Altman in the *Eastern Economic Journal* [Summer 1992] re-examined volatility measures for several industrialized countries for the periods 1870 to 1928 and 1947 to 1986, and employed new estimates of Canadian GNP to measure the severity of Canadian business cycles. Altman concludes, "The hypothesis that business cycles were prone to much less stability before the Great Depression than after World War II is strongly supported by the volatility estimates for Canada, the U.S. and Angus Maddison's twelve country sample" [1992, 270] Admittedly, this conclusion is debatable with respect to the method of measurement of volatility. Moreover, for the purposes of a thorough historical analysis of the business cycle,

Altman properly recognizes that his evidence "can in no way serve to prove the validity of the Keynesian claim that increased government macroeconomic intervention since World War II contributed towards increased cyclical stability" [ibid., 271]. The reason is indicated, if only obliquely, when he points out that "[t]he extent to which such intervention actually did affect cyclical volatility, as opposed to other factors which might have affected this outcome such as the changing structure of the economy, remains a matter for further empirical research" [ibid.]

Transformational Growth provides an alternative framework for examining the changing nature of the business cycle, including changes in the role of government. It focuses on changes in the mechanisms that govern the working of the economy, as well as the explanatory principles that describe it. For example, in regard to the Canadian economy during the periods pre World War I, post World War II and between the two wars, strong evidence suggests that the focus of recent business-cycle research has been myopic, neglecting critically important historical changes in the nature of business cycles. In particular, cycles in the earlier period were primarily manifested in prices and money wages, and only secondarily in output and employment, whereas in the later period the cycle has become primarily a pattern of fluctuation in output and employment, with prices and money wages relegated to a distinctly secondary role. The business cycle thus changed in *character*, as well as in volatility, and these changes, we suggest, may also help to account for the altered size and roles of government.

THE TRADITIONAL APPROACH

Underlying the recent debate has been the politically charged question of the efficacy of Keynesian-style governmental intervention. It has been claimed that if demand management policies worked the business cycle should be less pronounced in the post World War II era. Historical evidence of the volatility of the business cycle in what we will call the periods of the "old business cycle" (OBC) and the "new business cycle" (NBC) has presented a mixed picture.

Some studies show little discernible improvement in the volatility of output [Romer, 1986; 1989] while others show a marked reduction [Altman, 1992; Balke and Gordon, 1989]. Although these studies make historical comparisons of the business cycle, they do not address, or even seem aware of, the important differences in the economic mechanisms, and therefore in the explanatory principles applicable to the two periods. However, this is not unusual in modern economic analysis.

Traditionally, neoclassical economics has treated intertemporal comparisons of economic behavior without regard to possible historical changes in the underlying market mechanisms, and therefore, explanatory principles. Its fundamental belief in the global optimizing behavior of abstractly-defined consumers and firms does not lend itself to treating historical periods differently. In most contemporary business-cycle analysis, the market, with its "optimizing agents", is taken as given in both the OBC and the NBC periods — that is, the nature of the market is assumed to be the same in both. Neoclassical theory determines equilibrium on the basis of given endowments, preferences, and technology; equilibria, in turn, are shown to be optimal,

at least in a limited sense. Hence government policy interventions tend to be seen as interfering with the efficient operation of freely working markets and therefore attempts to stabilize the economy may be judged misguided. Markets are understood to perform the function of allocating resources to their best uses. The New Classical approach, for example, stresses the ineffectiveness and sub-optimality of government policy intervention.

On the other hand, where markets are imperfect, or when other institutions, in the course of serving legitimate functions, prevent markets from working freely, government action may be called for. This is the perspective of "new Keynesian" analysis, which sees three different ways in which market 'imperfections' may open the door for effective policies to improve welfare. Nominal or real rigidities may exist which prevent markets from adjusting or from adjusting rapidly enough. 'Coordination failures', due to asymmetric information and/or risk aversion, or to confusion caused by the existence of multiple equilibria, may exist which prevent firms from adjusting. Finally, agents may make decisions in terms of 'near rationality', rather than full rationality, on the grounds that it is too expensive to recalculate all the time. Any or all of these may interact with the market structure in such a way that small deviations from perfect adjustment are magnified, leading to large welfare losses. [Mankiw and Romer, 1991]

Unfortunately this approach also assumes that the function of markets, always and everywhere, is to allocate scarce resources efficiently, through 'the price mechanism.' The problems arise when something *prevents* full market functioning. Hence this approach fails to see that *different* economic mechanisms operate in the OBC and in the NBC, even though its adherents see an important role for government in the economy.

In short, traditional economic analysis does not recognize, let alone explain, the differences in the explanatory principles describing the different way markets work in the OBC and NBC. By contrast, the theory of Transformational Growth does. Here we first sketch that theory, and then present a case for the reconsideration of the analytical foundations of recent business cycle research by providing some stylized evidence of the fundamentally different economic mechanisms at work in the OBC and NBC, which call for models based on different explanatory principles.

TRANSFORMATIONAL GROWTH

At the heart of Transformational Growth is the claim that the function of the market is to generate competitive pressures to innovate and to assemble the financial resources to invest in innovations. Allocation of existing resources is of secondary importance; moreover, in practice, competition often generates waste, offsetting allocative efficiency. To make a huge generalization — in the manner of textbooks — one could argue that innovation, driven by competition, is what distinguishes the capitalist West since the Renaissance — broadly, Europe and North America — from all other economic systems, past and present. Such a sweeping claim needs many qualifications — but no more than the equally sweeping claim that markets, always

and everywhere, allocate scarce resources efficiently. And it has the additional advantage of being nearer the truth!

Technology, both directly and indirectly, affects the structure of an economy in ways that influence the working of markets. In the OBC, the nature of technology led to the development of small firms, typically craft-based family firms, that were relatively inflexible in terms of adapting output and employment to changes in demand. Firms grew to an optimal size — the size at which a production team could most efficiently work. Fluctuations in demand were accommodated, on the one hand, by varying the intensity of the production team's effort and, on the other, through price changes dictated by the marketplace.¹ In the first case, output was varied by varying productivity, a solution that could not be satisfactory to either employers or employees. Employers would not wish the slower pace of hard times to become a norm; employees would not wish to be held to the faster pace of booming times. In the second case, output would be maintained, but with fixed supply and weaker demand, for example, prices would be driven down. Again this could not be satisfactory; firms would take losses on their inventory, and the market might become 'spoiled'.

With craft technology varying output in line with the market was not easy. In some cases, the nature of the production process, for example, water or steam power, required full operation or none at all. Some processes simply could not be operated at half speed, or lower intensity. Further, in many cases, all hands had to be present for the process to be operated at all. Employment was thus fixed by the size of the production team, apart from cleanup jobs, and the like, so that output could only be changed through varying the intensity of the inputs — the same labor force would have to work harder and faster when demand was strong, but could take it easy in slack times. Growth in demand was accommodated by adding new firms of optimal size — not through the expansion of existing firms. The fixed nature of the production process did not allow for many economies of scale; when these were exhausted, limits to effective size would be reached rapidly, although the optimal size from the point of view of production might not be the same as the best size from the marketing or financial perspective [Robinson, 1931]. Once its optimal size was achieved, however, there was no economic motive for a firm to expand.

Moderate changes in demand would be met by changes in the utilization of factors and through changes in price. A sharp fall in demand would result in falling prices, which if substantial and sustained, might force many of the small production establishments out of business. Similarly, large increases in demand would be associated with rising prices and the opening of additional, optimally sized, production establishments, employing the same technology as existing firms. (A single firm might operate several establishments, of course, but the family's managerial resources could not be stretched far.) Moderate declines in investment or net exports, for example, would be met with falling prices but relatively stable employment and output — there was little or nothing in the way of Keynesian multiplier effects. Quite the reverse: the lower prices implied a higher real wage, so, with stable employment, the effect would be higher consumption spending, an induced change in the *opposite* direction. Drastic declines in demand, however, would lead to a sharp collapse in prices, resulting in bankruptcies that would or could have successive rounds of

repercussions, but the multiplier, in these circumstances, would be a bankruptcy multiplier — not the traditional Keynesian spending multiplier.²

The adaptability of prices to changes in demand within an environment of stable output, employment and money wages suggests a more complex view of the volatility of the OBC. As suggested above, if an increase in demand drives up prices, real wages fall. Since working-class households in the OBC have few assets against which to borrow to sustain consumption, their consumption is governed by their real earnings. Consequently, the initial increase in exogenous demand would be offset by a subsequent induced fall in the level of consumption. The same offsetting effect would come into play if exogenous demand fell and brought declining prices. Lower prices with fixed money wages imply higher real wages and, hence, increased household consumption. Therefore, the explanatory principle describing adjustment in the OBC portrays an inherent, though limited, *stabilizing* mechanism that is inextricably associated with the nature of technology of that era [Nell, 1992, Ch. 16]. (The financial system in this period appears to have destabilizing propensities — but that is another story.)

In the NBC, technology dictates that firms produce in a mass production mode. Production is performed not so much by teams but through integrated tasks. Batch production is replaced by continuous through-put. [Chandler, 1990] Both output and employment can be varied with demand — output more nearly in exact proportion than employment, since some labor is overhead — while the overall expansion of production is accomplished through increasing the size of the production establishment. Expansion reaps the benefits of economies of scale, which in turn leads to larger firms, differently organized than small production teams, and motivated to grow.

The ability of mass production systems to vary employment and output with demand has led to two very important characteristics distinguishing the NBC from the OBC: prices could be more stable, predictable and controllable, while varying employment and output in response to changes in demand has resulted in typical Keynesian multiplier chains of re-spending. The price adjustment mechanism evident in the OBC is not found in the NBC. But the characteristic output and employment adjustments tend to be destabilizing. A strong expansion — or contraction — in output can lead to adjustments in the capital stock, with further multiplier implications for output. Prominent features of the NBC, the multiplier and capital stock adjustment, are evidently mechanisms that tend to display a degree of inherent instability, in contrast to the OBC.

In the OBC the general trend of prices relative to money wages is downward, reflecting productivity growth. By contrast, in the NBC both prices and money wages tend to rise, with the latter rising faster. The benefits of productivity growth are transmitted to the economy through higher money wages, rather than lower money prices. One consequence of this change is persistent inflationary pressure, arising from the pressure by groups, whose productivity has not risen to maintain traditional relativities. In the NBC money prices either rise or stay steady; they seldom, if ever, fall.

A stabilizing factor in the NBC, however, is provided by the government, playing in a role that did not exist in the OBC, when government's activities were generally supposed to be limited to the duties of a "Night Watchman".³ The greater role that government plays in the NBC is characterized both by its considerable and growing size, and by the steady nature of the activities it undertakes. Both of these characteristics act to dampen the inherent volatility of the NBC. Therefore, when comparing the relative volatility of the OBC and NBC, the different inherent stabilizers in the two periods must be considered.

The period between the OBC and NBC can give us a great deal of insight into how the economy was transformed from the craft-based OBC to the mass production NBC. In Canada, the beginning of the move to mass production took place early in the twentieth century. By the end of World War II mass production prevailed. In the period of transformation, the inherent volatility of the mass production system without the offsetting stability of a large government sector is observed. Only with the emergence of the expanded role for government during and after World War II, did the fully developed NBC present itself.

EVIDENCE OF TRANSFORMATIONAL GROWTH, WITH SPECIAL REFERENCE TO CANADA

In its preoccupation with rational maximizing agents, neoclassical economics may have lost sight of the historical nature of social change. Yet various writers have recognized the differences in the adjustment patterns in the two periods described above. To take an author with views similar to our own: Sylos-Labini [1989; 1992] clearly contrasts the market mechanisms operating in the business cycles of the nineteenth century in the U.K. and the U.S. with those of the twentieth century. He discusses differences in the "wage and price mechanisms over historical time" showing how changes in the way markets adjust affect the ability of the economy to grow through improved levels of productivity, for they result in differences in the "...mechanism for distributing the fruits of technical progress..." But Sylos-Labini finds that it is only in the period after World War II that wages and prices both consistently rise, with wages rising faster than prices. Prior to World War I money wages held steady (or rose very slowly), while prices fell; productivity increases were transmitted to the economy at large in the form of lower prices. Either way, of course, real wages rise; but the monetary mechanisms are different.

Other writers, farther from our concerns, have also found historical differences in the behavior of market variables. Bordo [1981], for example, describes differences in the pre World War I and post World War II periods in terms of output and prices. For the U.K. and U.S., Bordo concludes that prices and output in the short-run are more variable before World War I than after World War II. However, as a Monetarist, he ties these differences to the presumed changing volatility of the money stock. Rich [1988] finds evidence to support Bordo's conclusion in the Canadian case. Altman [1992] also finds evidence of more volatility, using several different volatility measures, in the pre-Depression period than in the period after World War II for Canada.

But Monetarists, like Bordo, treat the differences as reflecting the exogenous volatility of a single variable, the money stock, which is held responsible for causing differences in business-cycle volatility. Why presumably exogenous money should be more volatile in the era of the gold standard than in the time of Bretton Woods is not explained. The possibility that money might be endogenous, or that the system may have shifted from the former to the latter, is not considered.

By contrast, Keynesians consider cyclical volatility to be caused by changes in investment and exports that are passed on through the economy by the multiplier/accelerator mechanism. But they do not clearly distinguish between the price volatility of the earlier period and the quantity fluctuations of the later. Sylos-Labini, however, does, and attributes the changing volatility of the business cycle to the changing organization of production. It is unlikely that historical differences in the business cycle can adequately be described by one of these approaches alone; rather, it is likely to be the combined effect of changing industrial structure, market relationships and institutions, reflecting changes in the nature of production, that has altered the mechanisms behind the business cycle.

To illustrate, we present some reflections on the Canadian economy, concentrating on the 1890-1914 period (OBC) and the 1945-1972 period (NBC). The behavior of several economic variables is considered in the context of identifying general characteristics, or "stylized facts," for the two periods. The interpretation of these stylized facts is meant to identify those areas in which considerably different behavior is observed in the two historical periods. The point is not to measure the degree of difference in the variables but to identify differences in general economic behavior. These stylized facts for the Canadian economy are offered as examples of evidence in support of the theory of Transformational Growth, along with the results that Sylos-Labini and others have compiled with regard to the pre World War I and post World War II periods. But they are not meant to explain the underlying forces determining the changes.

CAPITAL AND THE ORGANIZATION OF BUSINESS

A Transformational Growth perspective leads one to suspect that the movement from the craft-based economies of the late twentieth century to the mass production economies of the mid-twentieth century began in Canada around the turn of the century. The Canadian data shows evidence of the differences in firm size between the two periods. Table 1 reveals that a substantial rise in average firm size occurred between 1890 and 1905, with further increases after World War II.

Although the changes in the number of establishments is striking, differences exist in the collection of data between 1890 and 1905. In 1905 only establishments with 4 or more employees were included. Nevertheless, evidence of growth taking place through increasing the size rather than the number of establishments is still clear. Since the 15,197 largest establishments in 1905 averaged more than 25 employees, there would have had to have been 150,000 small establishments employing an average of three apiece to bring the average over all establishments in 1905 down to the level⁴ of about 5 per establishment that prevailed for all

TABLE 1
Canadian Manufacturing

Year	Number of Establishments	Number of Employees	Employees per Establishment
1870	38,898	181,679	4.7
1890	69,716	351,139	5.0
1905	15,197	382,702	25.2
1951	37,021	1,258,375	34.0
1961	33,357	1,352,535	40.5
1971	31,908	1,628,404	51.0

Sources: Urquhart [1965, 463]; Leacy [1983, Series R795-825].

establishments in the 1870 to 1890 period.⁵ Evidence suggests no such massive growth in the numbers of small manufacturing establishments; on the contrary, it suggests that production was becoming concentrated causing much concern among writers in economics and law at the turn of the century.

In the *Journal of Political Economy* in 1906, W.W. Edger wrote that "... the formation of associations of employers according to their trades has developed greatly in Canada in recent years — a tendency which has been likewise manifest in the United States, England, and other countries" [1906, 433]. As an indication of the extent of these new "associations", Edger observes that "... there are at present [in 1906] 220 employers' associations, of which no less than 84 were formed during the past five years" [ibid.]. It seems safe to say that given the later increases in the concentration of manufacturing, that at the turn of the century in Canada, the organization of production was in the early stages of changing from a system in which many small manufacturers dominated to one in which larger scale producers dominated, especially in manufacturing — consistent with moving from a craft-based economy to a mass-production economy.⁶

If Canada's earliest stage of movement toward mass production did occur around the turn of the century, capital formation that is needed to underwrite mass production processes must have risen. In 1904, the level of capital formation as a proportion of GNP was higher than in any year from 1870 to 1903. Prior to 1904, the proportion of capital formation to GNP had remained relatively constant, but from 1904 to the beginning of World War I, the tendency was clearly upward with a high of 34.1 percent in 1912. The beginning of the concentration of production seems to have preceded the period of intensive capital formation. This is not unlikely given the development of "associations" that first brought several craft-based producers

together, and then developed new integrated mass production processes. This growth in capital formation and the concentration of production strongly indicated the emergence of methods of mass production around the turn of the century in Canada [Urquhart, 1986, 33, Table 2.11].

In the OBC the typically small firm employed relatively few supervisory and office staff; in craft systems of production management was direct and personal, and bureaucracy limited. For example in 1905, 15,107 manufacturing establishments employed 382,702 workers, divided into 347,672 production workers and 35,030 supervisory and office workers, a ratio of ten to one, rising to almost eleven to one by 1910. By 1959 the ratio fell to three to one — 997,907 production workers against 306,049 supervisory and office workers [Urquhart, 1986, 463]. Not only did size increase, but the internal organization of the firm changed [Nell, 1992a, Ch. 17; 1992b].

Prior to the turn of the century market patterns appear to be broadly consistent with the Marshallian picture. Producers in the OBC grew to their optimal size, after which any further expansion occurred through an increase in the number, rather than size, of establishments. As a result of factors not examined here — a shift to new energy sources, permitting new technologies in production and leading to a profound re-organization of manufacturing—the economy moved into a new stage, the NBC. In this new phase, characterized by oligopoly and Keynesian processes of adjustment, expansion predominately occurred through increasing the size of the already existing producers. Such a view is consistent with M.C. Urquhart's judgement that "[t]he Canadian economy developed in a fundamentally different way after 1900 than it had before" [1986, 60]. Business organization is differently structured in the OBC and the NBC.

THE CHANGING STRUCTURE OF INDUSTRY

Chandler [1990] provides substantial evidence of the importance of technological and organizational change in the development of industrial economies in this century. When considering the development of the U.S., U.K. and Germany, Chandler concludes that "...industrial activities played the central role of transforming an agrarian commercial economy into a modern industrial economy" [1990, 3]. The same can be said of Canada. He also identifies the importance of the infrastructure necessary for an industrial economy to develop. "As a result of the regularity, increased volume, and greater speed of the flows of goods and materials made possible by the new transportation and communications systems, new and improved processes of production developed that for the first time in history enjoyed substantial economies of scale and scope" [ibid., 8]. In terms of the organizational nature of industrial economies, Chandler sees the emergence of new production processes leading to the need for changes in the way industry was organized and managed. Therefore, with the emergence of mass production economies, the types of jobs people performed changed. Production moved to industry from agriculture, the role for government grew as did the need for the services to support technologically and organizationally sophisticated production processes.

TABLE 2
Canadian Employment

Industry	1891	1971
Agriculture	46.5 %	5.6 %
Resources	3.7	2.8
Manufacturing	27.9	33.0
(Strictly Manu.)	(15.0)	(19.8)
Services	22.0	42.5
Government ^a	-	8.2
Unspecified	-	7.9

a. Government included in other categories in 1891

Sources: Urquhart [1965, 59] Leacy [1983, Series D8-85].

The changing structure of employment exhibits these substantial differences between the OBC and NBC. This is shown in Table 2. The striking movement is from agriculture to services — including government. Although in both agriculture and natural resources, the proportion of employment declined, due to technological improvement, the levels of output grew enormously. Technology has been a substantial force in expanding the productivity in both agriculture and manufacturing, but along with this came the growth of services to support the mass production economy. Not only did technology play a key role in the structure of the economy, but the impact that government had in the NBC was reflective of the new role that government was called on to play in the era of mass production. Transformational Growth argues that government was required to be more active in the economy due to the nature of mass production technology and organization. This will be examined shortly.

First, however, let's look at the changing components of Canadian Real GNP in Table 3. During the OBC, from 1881 to 1911, manufacturing output stayed constant, but railroads, mining and construction rose, while forestry, fishing and especially agriculture fell, and service output presented a mixed picture. During the NBC, on the other hand, services of various kinds, and utilities, rose substantially, except for public administration, while agriculture, forestry and fishing continued their decline, and manufacturing, mining, transportation, which had risen in the OBC, now began to decrease. The patterns are obviously different.

Altman [1987] shows that around the turn of the century the structure of Canadian manufacturing started to develop in new directions. In addition to changes in its relation to the rest of the economy, the manufacturing sector itself changed internally. The process began with a wheat boom that stimulated economic growth, but, as the theory of Transformational Growth suggests, this led to technologically more sophisticated manufacturing, operating on a larger scale. Using constant dollar measures of value added, Altman calculates that iron and steel, and transportation equipment grew more quickly relative to other manufacturing sectors and, therefore,

TABLE 3
Structure of Canadian Economy: OBC and NBC
Selected Years

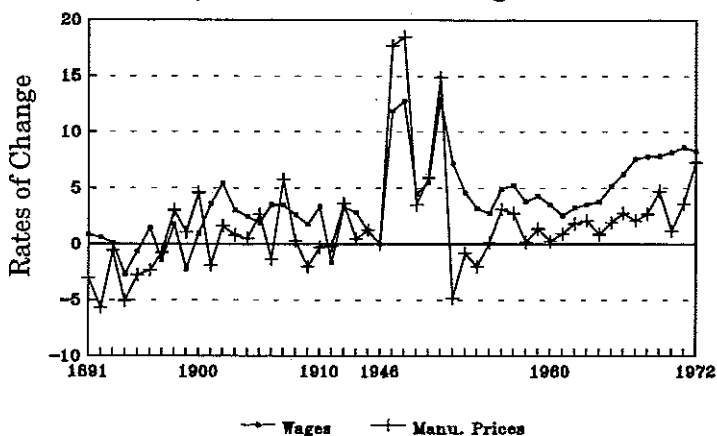
OBC	Components of the Canadian Real GNP							
	1881		1891		1901		1911	
	Billions of Dollars	% of Total	Billions of Dollars	% of Total	Billions of Dollars	% of Total	Billions of Dollars	% of Total
Manufacturing	120651	28.00	172503	31.30	206353	25.90	418651	28.20
Railroad	14337	3.32	28647	5.20	64317	8.07	195689	13.20
Mining	4855	1.12	14971	2.72	48766	6.12	61343	4.14
Construction	21240	4.92	32796	5.95	41486	5.21	131149	8.85
Forestry	10374	2.40	11796	2.14	14542	1.83	16390	1.11
Fishing	9546	2.21	9149	1.66	12340	1.55	11530	0.78
Agriculture	175912	40.80	170881	31.00	246703	31.00	348753	23.50
Whol. & Ret. Output	33385	7.73	50349	9.14	72726	9.13	1 71314	11.60
Comm/Bus/Pers Serv	41310	9.57	59779	10.90	89431	11.20	127589	8.61
Total	431610	100.00	550871	100.00	796664	100.00	1482408	100.00

NBC	GDP at Factor Cost, by Industry							
	1945		1955		1965		1975	
	Billions of Dollars	% of Total	Billions of Dollars	% of Total	Billions of Dollars	% of Total	Billions of Dollars	% of Total
Manufacturing	2954	27.50	7301	28.50	12751	26.10	32035	21.30
Transportation	874	8.13	1903	7.42	3078	6.30	8023	5.32
Mining	323	3.01	1080	4.21	2067	4.23	6157	4.08
Construction	310	2.88	1519	5.93	3124	6.39	11729	7.78
Forestry	208	1.94	486	1.90	499	1.02	1092	0.72
Fishing	77	0.72	64	0.25	105	0.21	198	0.13
Agriculture	1144	10.60	1648	6.43	2258	4.62	6147	4.08
Whol. and Retail Trade	1169	10.90	3207	12.50	5923	12.10	18191	12.10
Comm/Bus/Pers Serv's	924	8.60	2776	10.80	7512	15.40	29973	19.90
Storage	31	0.29	73	0.28	116	0.24	352	0.23
Communications	152	1.41	533	2.08	1265	2.59	3738	2.48
Elec/Gas/Water Util	216	2.01	597	2.33	1357	2.78	4071	2.70
Fin/Insur/Real Est.	755	7.02	2819	11.00	5606	11.50	17313	11.50
Public Admin.	1611	15.00	1624	6.34	3233	6.61	11707	7.77
Total	10748	100.00	25630	100.00	48894	100.00	150726	100.00

Sources: Altman [1992] and Leacy [1983, Table F55-75].

assumed greater importance in Canadian manufacturing [Altman, 1987, 105]. Given that these sectors require technologically sophisticated production processes it is reasonable to suspect that a shift to mass production had begun. These sectors could not expand as craft-based processes, especially given the need to be competitive with contemporary developments in the U.S. It should be emphasized that these were only the first steps — the Canadian economy had a long way to go before it became the sophisticated mass production economy that it was at the end of World War II.

FIGURE 1
Wages and Manufacturing Prices



THE BEHAVIOR OF PRICES, WAGES, OUTPUT AND EMPLOYMENT

The Canadian economy had many of the characteristics in both the OBC and the NBC that Sylos-Labini [1989] identified for similar periods in the U.K. and U.S. Throughout the OBC it was more common for manufacturing prices to fall than for wages to fall. Both fluctuated in both directions, however, but prices declined more. The rates of growth of wages and manufacturing prices displayed no consistent trend — wages were certainly not consistently growing faster than prices. Over the whole period prices remained stable or declined. Productivity growth was therefore transmitted through lower prices with given money wages.

The NBC reveals a very different story. At no time over this period did wages ever fall and from 1950 on both wages and prices rose, with wages consistently growing faster than prices (see Figure 1). This implies, as Sylos-Labini [1989] points out, that the benefits of productivity increases were transmitted to the economy through rising wages, rather than falling prices.

These points can be illustrated in the following sets of summary statistics, analyzing the rates of change in the two periods of the relevant variables: output, implicit prices, real wages, money wages, and manufacturing prices. It is convenient to compare these in two groups of three, for each period. First, consider output, implicit prices and real wages in the OBC and NBC in Table 4.

Price variability, as measured by the coefficient of variation, is greater than output variability in both periods, but in the first period prices were 2.5 times more volatile than output, and only 1.7 times in the NBC. Prices and outputs showed both rises and declines in the OBC — making bankruptcy more significant in the OBC;⁷ by contrast, in the NBC prices and outputs normally only rise (six declines in the OBC, one in the NBC.) Real wages were more volatile than output in the OBC, and inspection of the evidence shows in nine years real wages fall, which we do not find in the NBC. Real wages remained relatively stable in the OBC, but rose fairly steadily in the NBC. (There is some indication of an inverse relationship between real wages

TABLE 4
Implicit Prices and Real Wages

	Mean	St. Dev.	Coeff. of Var.
OBC [1890-1914]			
Output	4.56	5.140	1.127
Implicit Prices	0.947	2.976	3.113
Real Wage	0.364	2.431	6.687
NBC [1945-1975]			
Output	4.915	2.475	0.504
Implicit Prices	4.471	3.831	0.857
Real Wage ^a	2.449	1.195	0.488

Calculated from *Historical Statistics of Canada*, Various series.

a. 1945-72

TABLE 5
Money Wages and Manufacturing Prices
Rates of Change

	Mean	St. Dev.	Coeff. of Var.
OBC			
Money Wage	1.274	2.251	1.767
Manufacturing Prices	-.007	2.751	-.393
NBC			
Money Wage	6.156	2.928	0.476
Manufacturing Prices	4.749	6.325	1.332

and output in the older period, whereas from 1946-56 and 1967-72 changes in real wages corresponded to changes in the same direction in output— see below.)

Next consider rates of change of money wages and manufacturing prices in Table 5. In the OBC manufacturing prices have a slight downward drift; they fluctuate in both directions quite strongly. The mean and standard deviation of rates of change of money wages in the OBC are less than the corresponding measures for output, and fairly close to those for implicit prices. Both money wages and prices show larger average changes and larger standard deviations in the NBC, and both only increase. The coefficients of variation for both wages and prices are smaller in the NBC than in the OBC. The average increases are larger for money wages than for manufacturing or for implicit prices — from 1952 on they are consistently higher — indicating that real wages are rising.

The Canadian evidence, like that of the U.K., is thus consistent with the Transformational Growth understanding of the different nature of market relationships in the OBC and NBC. This has important further implications. If output

and employment in the OBC were relatively fixed and inflexible, then the manner in which the market's activity levels would adapt to changes in demand would be more in keeping with the Marshallian story. A rise in demand would bid up prices, but leave money wages unaffected; the fall in the real wage would first lead to an offsetting movement in household consumption; then, if the demand increase appeared stable, it would lead to a re-organization of production with increased employment. The converse is true for a decline. By contrast, in the NBC, production (and employment) could vary with changes in demand. Therefore, there should be evidence of different aggregate output reactions to autonomous increases in demand in the two periods. If the nature of production does not allow production to vary with changes in demand, then there should not be evidence of a Keynesian multiplier in the OBC. Only in an era when production can effectively change with changes in demand will there be evidence of a Keynesian multiplier [Nell, 1992, Ch. 16].

Considering year-to-year differences in exports and absorption (the aggregation of consumption, investment and government expenditures) reveals no consistent relationship in the OBC but a very consistent and proportional relationship in the NBC. This provides some evidence of the existence of a multiplier effect in the NBC that did not exist in the OBC (see Figures 2 and 3) and thus gives credence to the Keynesian depiction of the NBC. On the other hand, it also suggests that, given the differences in the nature of production, a Keynesian (short-run, demand-driven) multiplier relationship might not have existed in the OBC.⁸

Comparing the rates of change in real output and the real wage also reveals an important difference between the OBC and NBC. In the NBC from 1945 to 1956 and 1967 to 1972, the rates of change in real wages and real output consistently varied together. In the intervening period the rates of change in real output were consistently greater than the rates of change in real wages, but the rates did not vary consistently. Therefore, in the periods in which the rates of change in real output and the real wage varied together, an increase in employment (as indicated by an increase in real output) was matched by increases in the real wage — the real wage and employment varied together.

In the OBC no extended period existed similar to those in the NBC in which real output (and employment) and the real wage varied together. More importantly, for twelve years in the period from 1890 to 1914, the rates of change in real output and the real wage varied inversely. Therefore, in the OBC an inverse relationship between real wage and real output (or a positive relationship between unemployment and the real wage) was far more common than in the NBC (see Figure 4). This points to the existence of the Marshallian stabilizing market mechanism in that era.

The changing nature of the relationship between real output and the real wage is consistent with the Transformational Growth approach to the changing structures in the OBC and NBC. As a reaction to an increase in demand, increases in real output in the OBC, in which production, employment and wages were relatively fixed, would increase the intensity of labor use and thereby increase output. But, with the increase in demand came a rise in prices and therefore a fall in the real wage and a subsequent fall in consumption. Therefore, in a relatively fixed production environment, it is not surprising to find an inverse relation between the rates of change in real output and

FIGURE 2
Year to Year Differences in Exports and Absorption: OBC

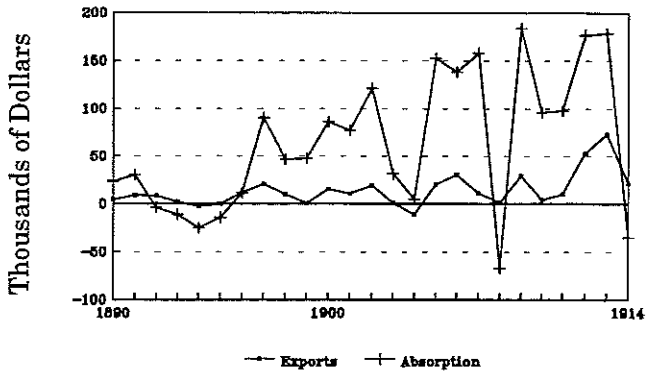


FIGURE 3
Year to Year Differences in Exports and Absorption: NBC

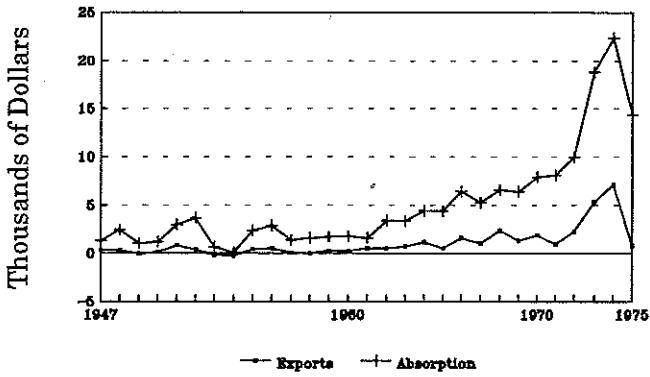
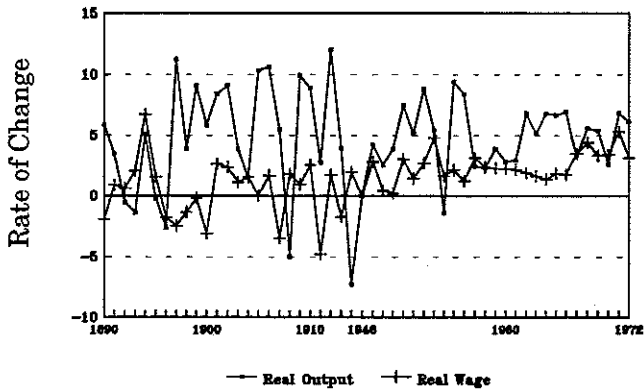


FIGURE 4
Real Output and Real Wage: OBC and NBC
Rate of Change



the real wage, or, in other words, a positive relation between unemployment and the real wage. This characteristic reveals the inherent stability of the OBC, in that demand changes were moderated by the offsetting effects of consumption, but if strong and persistent, led to permanent changes in employment. This is in keeping with the Marshallian description of market behavior.

In the NBC, where mass production can easily be varied with demand, an increase in the real wage will increase demand and output and more labor would be required to increase the level of production. More demand for output increases production and greater demand for labor tends to drive up the real wage. Thus real wages and real output (and employment) will rise together. Also, a rise in employment will tend to be associated with economies of scale in the NBC and therefore with a rise in productivity, which therefore tends to increase the real wage yet again. The overall relationship is one in which the rates of change in real output and the real wage vary together — unemployment and the real wage are inversely related. This is a much more Keynesian story than that of the OBC.⁹

THE CHANGING ROLE OF GOVERNMENT

The OBC and NBC are thus described by very different explanatory principles, which are related to the technology of production in the two periods. But the changes between the two periods are not limited to the technology and organization of production. The changes also imply different roles for government in the two periods. In the newer period government is required to do more than simply stabilize the economy; it must also provide support for the system of mass production. Mass production requires greater theoretical and technical skills and a higher proportion of office and staff workers. Moreover, the skills required are constantly changing, since technical progress and innovation are continuous, rather than sporadic. The system therefore requires levels of education too sophisticated for the producers to provide themselves. In the craft economy skilled workers could be trained in the family — fathers passing on skills to sons — or through apprenticeships. Even engineers could be trained on the job. Not so in the modern era. Government support is required to provide professionally managed education to ensure the supply of adequately trained personnel.

The size and concentration of production also calls for government involvement, and not only to prevent excessive concentration. Increased urbanization brought with it the centralization of production in modern facilities, requiring the provision of the urban infrastructures and services to support producers and the people that work for them. Streets, and street lighting, traffic control, police, sewage and water systems, waste disposal, and public health all become significant issues, in ways they were not in the earlier era. Transportation and communication systems become a necessity of a modern mass production economy that also require the support of government. The change in government's role in the economy, as more than just a stabilizer, is substantial and should be accounted for in any comparisons of the OBC and NBC.

This puts the characteristics of economies at different historical times in a new perspective. If the rates of change in real output and implicit prices in the Canadian

TABLE 6
Total Canadian Government Expenditure
as a Percent of GNP

1889	3.6%
1900	3.6
1914	5.8
1946	15.2
1960	18.7
1975	20.2

Sources: Urquhart [1986, Table 2.1]; Leacy [1983, Series F14-32, 1983]

economy for the OBC, NBC and in the intervening period are considered, the changes in volatility fit very closely to the Transformational Growth explanation. In the period between the OBC and NBC both real output and implicit prices varied more in either the OBC or NBC. That is, the standard deviation of the annual rates of change in both real output and implicit prices were greater in this period than in either the OBC or NBC. [Altman, 1992] This is consistent with Bordo's [1981, 13-6] observations in the U.K. and U.S. and Rich's [1988, 27-8] in Canada: more volatility in prices and output existed in the period between the OBC and NBC than in the periods themselves.¹⁰ This too is consistent with the theory of Transformational Growth. This period of transformation is when the Canadian economy was maturing as a mass production economy but the role for government as a counter force to the natural volatility of the mass production economy had not yet fully developed. Therefore, the instability of the period of transformation can be explained through the inherent characteristics of the emerging mass production system and the lack of any stabilizing force to compensate for its natural volatility. By the time World War II had ended, the governmental structures promoting greater stability were in place and the inherent instability of the mass production economy had been largely suppressed (although it has partially re-emerged in the past decade and a half).

As *prima facie* evidence of the different role of government in the two periods we ran a regression that considered the influence of the rates of change in government spending, private sector capital formation (private sector investment) and net exports on the rate of change of GDP. These were calculated for the OBC and the NBC, respectively and are reported in Table 7.

Clearly the rate of change in government spending had little influence on the rate of change of GDP in the OBC, but, by contrast, it had significant effects in the NBC. Not surprisingly, private capital formation played a considerable role in both periods, although net exports were important only in the earlier period.¹¹

Only in the NBC, then, is there a close relationship between the rates of change of government expenditure and the rates of change in GDP. Although many other factors ought to be considered, this is, nevertheless, an indication that in the later period the activities of government and the activities of the economy as a whole were tied more closely. The fact that government has both become so much larger and come

TABLE 8
Effects of Government, Investment and Trade on Output

Variable	OBC	NBC
Rate of change in Constant	1.237 (1.099)	3.046 ^b (3.812)
Government Spending	-0.002 (-0.042)	0.219 ^b (4.928)
Private Capital Formation	0.293 ^b (6.023)	0.341 ^b (8.884)
Net Exports	0.295 ^a (2.599)	0.0002 (0.222)
R-squared	0.737	0.800
Adjusted R-squared	0.700	0.776
F-statistic	19.662 ^b	33.289 ^b

t-statistics appear in parentheses. a. Significant at the 5 percent level. b. Significant at the 1 percent level.

to be systematically linked to the economy does not, however, explain *why* government's role as an active player in the economy changed so dramatically. Rather than it reflecting a change in people's "tastes" for government involvement in the economy, Transformational Growth sees the altered role for government as a necessary and inherent consequence of the mass production economy of the NBC.

Traditional approaches to the growth of government spending see such things as the growth of per capita income and the income elasticity of demand for public goods, the political acceptance of new "tax thresholds"¹² or issues of political change and new social values leading to more government involvement in the economy. Technological changes, they also claim, lead to new public infrastructure demands on government. But these traditional approaches rarely see the growth of government as necessary to support the age of mass production. All too often the expansion of the role of government in this century is thought to be the result of socially and economically misguided political ideologies. Transformational Growth argues that it is from within the nature of a mass production economy itself that an expanded role for government arises. Indeed, it may be the foundation upon which modern, technologically advanced economies have been built.

CONCLUSIONS

The theory of Transformational Growth proposes that there are different explanatory principles in different historical epochs. In the light of the evidence provided here, the explanatory principles operative in the OBC appear to be

substantially different than those of the NBC. Many factors must be considered in describing these differences.

To understand the contrasting natures of the OBC and NBC it is necessary to begin from, but also go beyond, the structure of the economy. There are fundamental differences in the nature and technology of production, and in the way it is organized by firms. These lead to differences in the market relationships between wages and prices and between output or employment and real wages. There is also evidence that the multiplier works differently in the OBC and NBC. Undoubtedly, the role of government has radically changed over these periods, a change that includes, but is much greater than, its new role as a stabilizer of the modern industrial economy.

These stylized facts provide a sketch of the differences in the Canadian economy over three different historical periods. Other authors observe greater instability in the OBC than in the NBC and even greater instability in the period between the OBC and NBC (to 1928) in Canada. Their evidence also supports our contention that the market mechanisms at work are different, calling for the application of different explanatory principles in each period. The theory of Transformational Growth provides an arguably more sophisticated foundation on which to compare business cycles than can be had from traditional theory, and in the case at hand, reveals some of the forces acting on the Canadian economy, from the late nineteenth century through most of the twentieth century, that have resulted in changes in the market mechanisms.

Neoclassical and Keynesian theory both incorrectly assume that the same explanatory principles apply to both the OBC and the NBC. By contrast, the theory of Transformational Growth provides a theoretical framework for the historical comparison of business cycles: different epochs are typically characterized by different mechanisms of market adjustment, setting up different patterns of competitive pressures for technological and institutional development. Historical analyses of the business cycle would do well to abandon their inhibiting assumptions and widen their focus to include critical differences in the explanatory principles applying to the business cycle in different epochs of economic development.

NOTES

1. Marshall's production function should be understood as a kind of utilization function. When demand drove up prices, money wages remained relatively unaffected, since employment was difficult to change. Real wages therefore fell, making it worthwhile to undertake the disruptive process of adding to the work teams — disruptive because new working patterns had to be developed. Note that this rests on *local* optimizing in historically specific conditions.
2. The difference is that in the case of the Keynesian or macroeconomic multiplier, the funds withdrawn from circulation each round are known as a precise fraction of the level of expenditure. Such funds are saved by businesses or households, and the saving propensity is assumed known and fixed. Hence the impact in each round is determinate. In the case of bankruptcy, however, the withdrawal is involuntary, and neither the amount withdrawn nor the moment of its occurrence can be known reliably in advance. Nor will it be clear exactly what the impact will be on the next round — a decline in expenditure due to bankruptcies may lead to price reductions and increased sales, or to price reductions followed by further bankruptcies, or to a mixture of both.
3. In actual fact in the second-half of the nineteenth century governments played a considerably larger role than the expression suggests. Think of eminent domain and the building of the railroads, or the canals, to say nothing of managing, or mismanaging, the currency. But even so, the size of

- government in relation to GNP, for most advanced nations, tended to lie between 5 percent and 10 percent right up to the years before World War I.
4. Concentration of production was initially accomplished through the development of "associations" that coordinated production for collective ends. This quickly led to the formation of large incorporated associations, an important step toward the modern oligopolistic economy that exists today.
 5. Altman [1987, 104] offers a parenthetical comment that also makes this observation — "... (if one assumes that the percentage of manufacturing output produced by small firms collapsed after 1900)..."
 6. Chandler considers the growth in productivity in the expansion of new industrial enterprises was due in part to "...placing the several intermediary processes employed in making a final product into a single works..." [Chandler, 1990, 22].
 7. Bankruptcy liabilities as a percentage of nominal GNP are much larger in the OBC than in the NBC, as one might expect given that prices are downwardly flexible, while output and employment are more difficult to adjust. (In the NBC variations in output and employment tend to be *voluntary*, in the sense that firms *choose*, for example, when sales are sluggish to lay off workers in an orderly manner. By contrast, in the OBC a higher proportion of variations in output and employment is *involuntary*, in that they occur because firms have been forced to shut down and liquidate.) In the OBC a regression of real GNP on commercial failures reveals a negative relationship that is significant at the 1 percent level, although the R-square is only .27. It may be too much to say that 27 percent of the decreases in GNP is the result of increases in bankruptcies, but it is interesting to note that no such relationship is significant at all in the NBC.
 8. In any economy that can be described by a fixed coefficient input-output system a matrix multiplier can be defined showing the additional direct and indirect inputs and labor that will be required by an increase in final output, or in any component of final output. But such a calculation, by itself, implies nothing about the pattern of market adjustment to changes in demand pressures. The Kahn-Keynes-Kalecki multiplier states that a change in spending, in the short run, will induce additional changes in spending in the same direction, so that the total change is a multiple of the original, and the spending changes will be reflected in changes in output and employment. By contrast, in a Marshallian system, the spending changes will initially and chiefly affect prices, with only small effects on output and employment, and, as a consequence, there will be no additional *induced* effects operating in the same direction. To the contrary, there will likely be induced effects in the *opposite direction* [Nell, 1992, Ch. 16].
 9. Recent studies at the New School have yielded further evidence supporting this picture of systematic differences between the OBC and the NBC for various countries. Ray Majewski has developed some of the contrasts for prices, money wages and output in the U.S.; Thorsten Block has found significant structural changes between the OBC and the NBC in the behavior of product wages in the relation between and in relation to employment and output, consumption and non-consumption (investment, net exports) for Germany, while David Kucera has found the same for Japan. [Nell, 1995, forthcoming].
 10. Altman [1992] shows that volatility was greater in the period 1908-28 than in 1870-1902, but then fell again in the post war period. This is what we would expect on the basis of a Transformational Growth approach. Thanks to Will Milberg for calling our attention to Altman's article, and relating it to Transformational Growth.
 11. As a further check, government expenditures on public capital projects was added to the model. Nothing essential[†] changed. Public capital formation was not significant, and all other variables performed as before.

<u>Variable</u>	<u>OBC</u>	<u>NBC</u>
Rate of change in:		
Constant	1.059 (.872)	2.866 ^b (3.412)
Government Spending	-0.022 (-0.353)	0.216 ^b (4.781)
Public K Formation	0.021 (0.450)	0.043 (0.760)
Priv. K Formation	0.288 ^b (5.780)	0.316 ^b (6.271)
Net Exports	0.312 ^a (2.564)*	0.0003 (0.317)
R-squared	0.737	0.804
Adjusted R-squared	0.688	0.772
F-statistic	14.237 ^b	24.689 ^b

t-statistics appear in parentheses. a. Significant at the 5 percent level. b. Significant at the 1 percent level.

12. Peacock and Wiseman [1961] argued that a threshold was reached by the end of World War II when the tax revenues that once went to the war effort were redirected to expanded social programs since the economy was now able to cope with higher tax levels.

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