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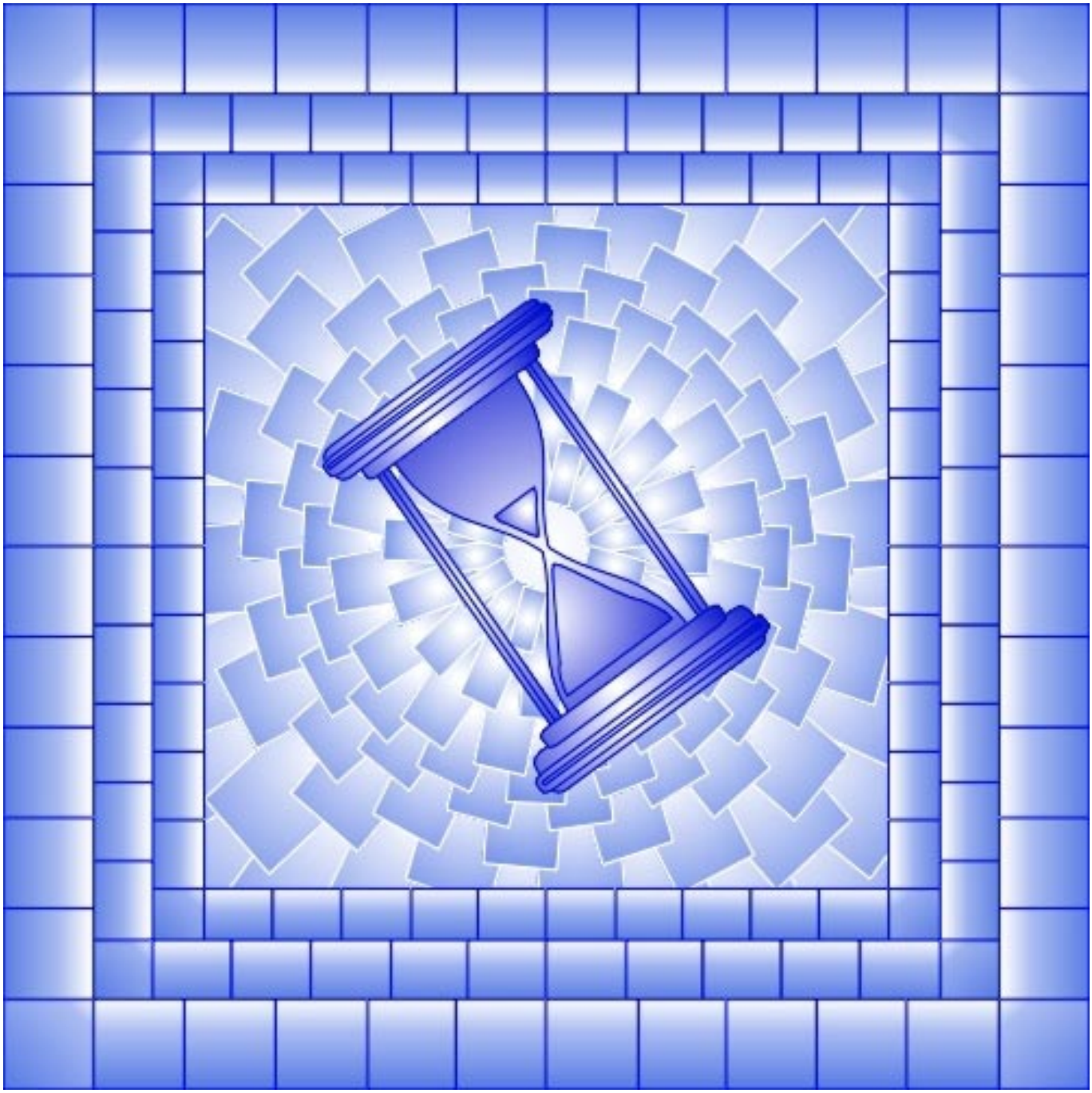
Service Inflation: Why Is It Higher? A Partial Examination of the Causes

By Marc Prud'homme and Klaus Kostenbauer

No.5



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Service Inflation: Why Is It Higher?
A Partial Examination of the Causes

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Preface

Prices Division first started publishing the Analytical Series in December 1996 as a means to convey conceptual and applied research undertaken by its staff, and at times, by other persons from within or outside Statistics Canada on the subject of price indexes.

All papers are reviewed by a panel of experts from within Statistics Canada or outside the agency. Views expressed in the papers are those of the authors and do not necessarily reflect those of Prices Division or Statistics Canada.

The purpose of the series is to disseminate knowledge and stimulate discussion. Questions and comments on any aspect of the papers are welcome and can be forwarded to Louis Marc Ducharme, Director (Internet email: ducharl@statcan.ca; telephone (613) 951-0688), or to Robin Lowe, Chief, Quality Assurance (Internet email: lowerob@statcan.ca; telephone (613) 951-9495), Prices Division, Statistics Canada, Ottawa, Ontario, K1A 0T6.

Abstract

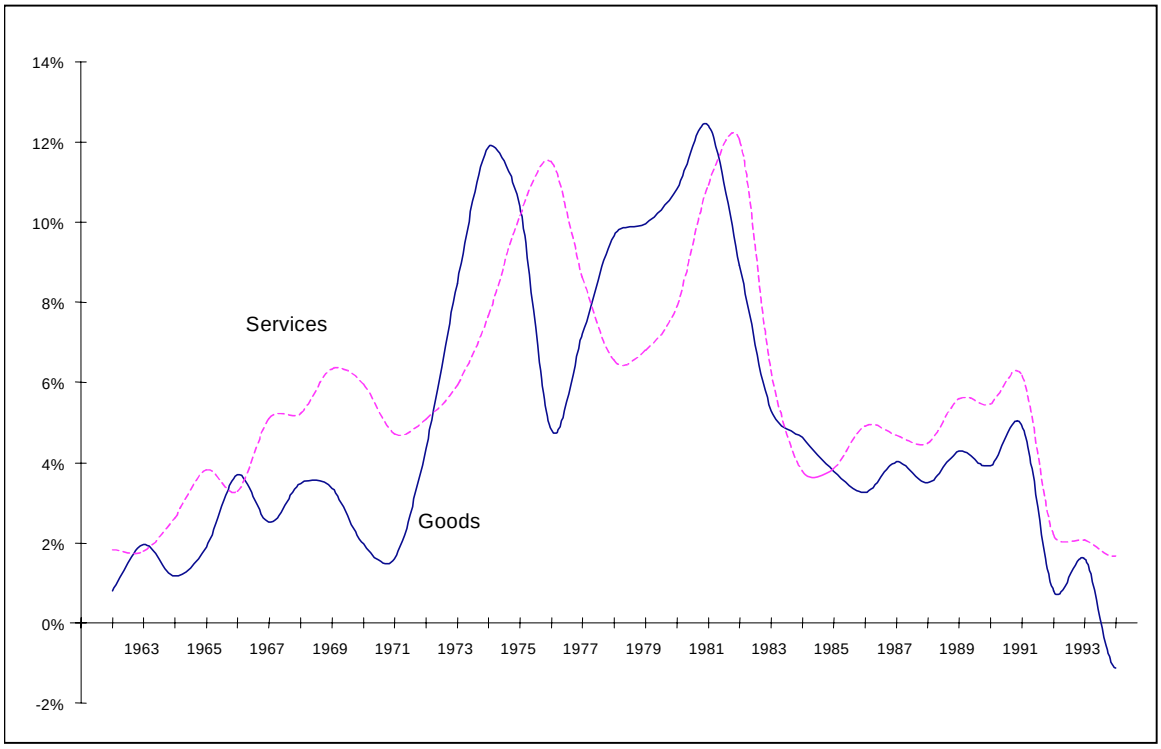
Since 1961, the service component of the Canadian Consumer Price Index (CPI) has generally shown a higher rate of increase than the goods component. Furthermore, when some of the more volatile components of the CPI are removed the spread widens. For instance, during the same period, core goods inflation (excluding food and energy) increased at an annual rate of 4.3% compared to 6.1% for services (excluding shelter). The literature on service sector inflation suggests five explanations for this phenomenon. Although all these sources of the inflation differential are interesting and important in their own right, this paper will examine two. Some believe that service inflation is a statistical artefact stemming from the inherent difficulties in measuring the output of services and hence their price changes. This issue will be examined first. Indeed, the measurement problem appears more serious for services; however, it cannot be held completely responsible for the inflationary gap. William Baumol (1967) originally suggested the other cause for higher service inflation whereby unbalanced sectorial growth would be the cause of the divergent inflation rates. This explanation will be the focus of the second part of the paper. In spite of the attractiveness of Baumol's model, empirical evidence rejects the hypothesis.

TABLE OF CONTENTS

1.0 Introduction

For a number of years, the service component of the Canadian Consumer Price Index (CPI) has generally shown a higher rate of increase than the goods component. From 1961 to 1994, the average annual increase of service prices was 5.8% as opposed to 5.0% for goods. Years of rapidly rising oil prices and rapidly falling mortgage interest rates marked the only departure from this trend (see Figure 1). Furthermore, when some of the more volatile components of the CPI are removed the spread widens. For instance, during the same period core goods inflation (excluding food and energy) increased at an annual rate of 4.3% compared to 6.1% for services excluding shelter (see Figure 2).

Figure 1: CPI Inflation - Goods vs. Services



The literature proposes five explanations for the phenomenon of rapidly rising service prices:

1) some believe that service inflation is a statistical artefact that stems from the inherent difficulties in measuring service output and hence price changes;[1]

2) continued economic prosperity has put additional upward pressure on the demand for services which raises their prices;[2]

3) unbalanced sectorial growth – originally suggested by Baumol (1967) – is, according to some, the principal cause for the divergent inflation rates between both sectors of the economy;

4) many services are categorised as untradable and are much more isolated from foreign competition than many tradables such is the case of many goods;[3] and

5) the last thesis is a combination of 2) and 4), whereby increased competition from emerging economies lowers the prices for manufactured goods in rich countries, raises the real money supply and in turn boosts spending on other goods and services, which raises their prices.[4]

Each source of service sector inflation has different macroeconomic policy implications. They range from "no possible action" if the problem is one of measurement, to "more specific inflation control policies" aimed towards the real source of inflation, the service sector.

Although the above five sources of the inflation differential are important and interesting, this paper will examine only two. In the first section, we will briefly examine the measurement issue. The second section will deal with the idea first suggested by Baumol in his seminal 1967 article "The Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis". The last section will offer some concluding remarks.

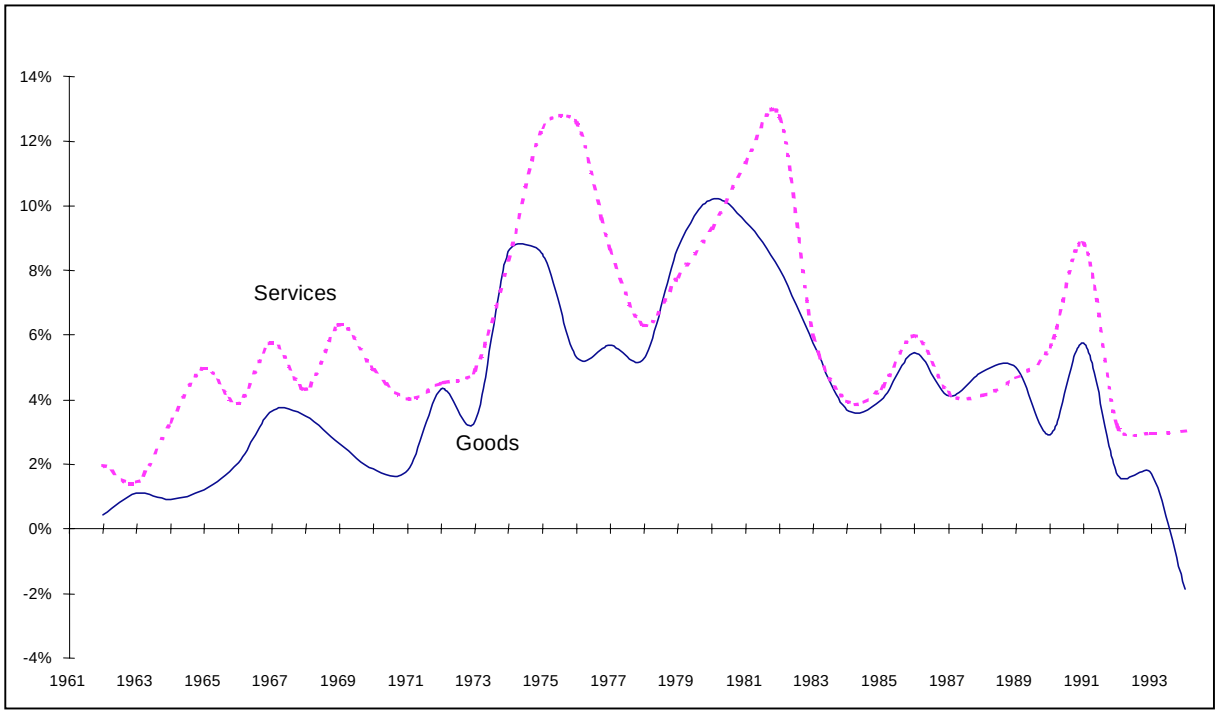
[1] *See Rappoport (1987).*

[2] *See Brauer (1993).*

[3] *See Riet (1993)*

[4] *See* ***The Economist*** *(April 13, 1996).*

Figure 2: CPI Inflation - Goods excluding Food and Energy vs. Services Excluding Shelter



2.0 Measurement

It is a well-established fact that quality adjustment is one of the more serious problems facing price statisticians. It can be even more challenging in the case of services where output units are not always well defined. Furthermore, when output and prices cannot be observed directly, an index of earnings is sometimes used as an imputation. This approach does not take into account improvements in labour productivity. Both quality change and imputation can potentially lead to an overstatement of measured inflation.

Rappoport (1987) and Brauer (1993) examined the severity of mismeasurement in consumer service prices by observing how price indexes of related goods and services have evolved over time. The basic assumption in their thesis is that some consumer expenditure categories contain goods and services that are complementary. Consequently, demand growth for goods and services should change at about the same pace, resulting in roughly the same inflation rates. If, however, quality adjustment were a more serious problem for goods than for services, we would expect to see differences between the two inflation rates.

Table 1 shows that service inflation has been systematically higher than goods inflation for every expenditure category and for every period. Before concluding that there is a measurement bias in the service area, it is important to realise that the assumptions are somewhat restrictive. Firstly, some goods and services do not always possess the complementary nature that was assumed at the start. For instance, automobile services and new automobiles can be substitutes if individuals decide to keep their cars longer. Secondly, increased competition from foreign goods in the new globalised marketplace may help explain why the prices of goods have not been increasing as fast as service prices. Lastly, contrary to the implied assumption of stable supply conditions, relative supply shifts for products within the same expenditure category can occur. This would also lead to different rates of inflation for goods and services.

Although some measurement problems appear to be more serious for services than for goods, they cannot be held completely responsible for the inflationary gap that exists between goods and services. Other factors are at play, one of them being an explanation first advanced by William Baumol in 1967.

Table 1
Average Annual Inflation Rates of Goods and Services in the CPI

	1961-1994		1971-1994		1979-1994		1986-1994	
Category	Goods	Services	Goods	Services	Goods	Services	Goods	Services
Food	5.3	6.5	6.6	7.2	4.1	5.4	2.0	4.2
Housing	5.9	9.0	6.0	9.9	4.4	6.4	3.6	4.7
Household furnishings	..	..	..	..	3.9	6.0	2.3	4.5
Clothing	4.2	5.8	4.9	7.0	4.3	5.7	3.5	4.4
Private transportation	3.7	..	5.3	..	4.9	7.9	3.1	8.0
Personal care	..	6.6	4.5	7.3	4.2	5.8	2.4	5.3
Sports	..	..	..	..	4.2	6.8	3.2	6.1
Photography	..	2.6	..	3.0	0.7	3.3	1.0	1.7
Television	..	..	-1.4	..	-1.5	6.5	-2.5	5.5

3.0 Baumol's Productivity Hypothesis

The attention turns now to one possible economic cause for the inflationary gap between goods and services. One prominent explanation is that service prices rise faster than goods prices because there are inherent limits to productivity growth in the service sector. According to Baumol's thesis, technological improvements in the manufacturing sector have achieved continuous and significant growth since the industrial revolution. Important contributing factors for such growth have been the division of labour, substitution of capital for labour, and economies of scale. Productivity growth in turn has allowed real wages to rise. Following Baumol's example, if output per hour worked in the auto industry rose by 4% annually, then employers in that industry could offer their workers a 4% annual wage increase without having to raise prices, and still maintain their profit margins.

Many services, by contrast, are very labour intensive. Barber shops or home cleaning services are examples of businesses where (skilled) labour is the most important input. However, there exists only limited room for productivity growth in these areas. It is not clear how a barber could increase productivity, short of spending less time on the customer, thereby reducing the (perceived) quality of the service.

Hypothetically, if productivity is the only factor determining wage levels, then wages in manufacturing should rise over time while wages in the service sector should remain the same. Such unequal wage growth could only develop however if labour is not mobile. If labour is free to move among industries, then sectors with higher-than-average wage growth will attract workers from other sectors. To avoid the labour drain, service industries must increase their wages. Baumol infers that over time we could expect wages to increase at the same rate for all industries.[5]

If Baumol is correct, then most wage increases in the service industry are caused by wage increases in manufacturing. The important difference is that wages in the service sector are increasing without the underlying productivity growth that exists in the manufacturing sector. Thus, we would expect inflation to be higher in the service sector.

Baumol's hypothesis has intuitive appeal. For it to hold empirically though, two conditions must be met. First, manufacturing sector wage growth should lead service sector wage growth. Second, the rate of real wage growth in a manufacturing industry (but not in services) should, in large measure, depend on that industries' own productivity growth. If the data confirm the second proposition but reject the first, then there is evidence of weak labour mobility.

[5] *This is of course a long-run result and subject to qualifications (e.g. wages that must be adjusted for skill levels).*

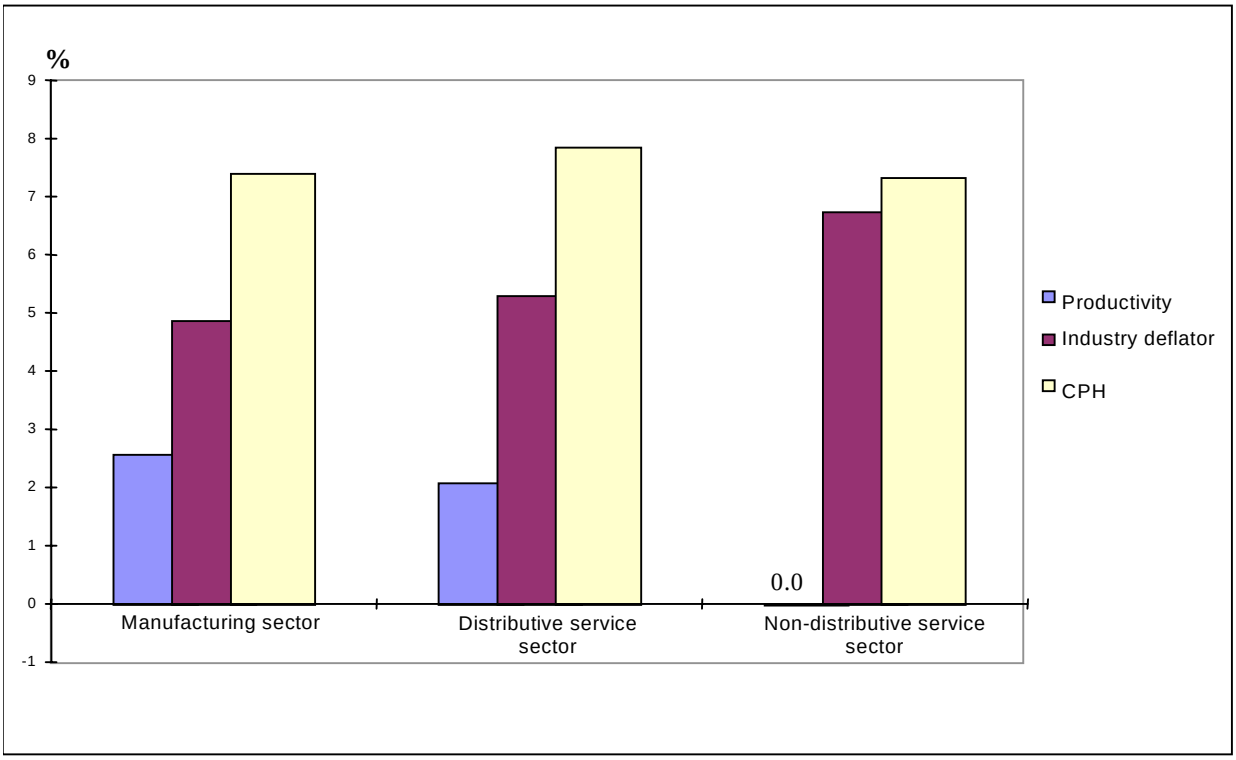
Casual observation is consistent with the Baumol hypothesis[6] (see Table 2 and Figure 3). Average compensation per hours (CPH) growth (1961-1992) has been similar in all sectors. As a group, the so-called "distributive" service industries, most of which are capital-intensive, have an inflation rate comparable to the manufacturing sector. By contrast, inflation in the "non-distributive" service industries, most of which are labour-intensive, was almost two percentage points higher than in manufacturing. Interestingly, productivity growth in the non-distributive service sector was nil while its inflation rate was the highest. We now turn to the formal tests of the Baumol hypothesis.

Table 2
Deflators, Productivity and Wages 1961-1992

	Deflator	Productivity	Compensation per hour
Manufacturing sector	4.9	2.6	7.4
Distributive service sector	5.3	2.1	7.8
Non-distributive service sector	6.7	0.0	7.3

Source: Statistics Canada

Figure 3: Measures of Industry Performance 1961-1992



[6] *These measures are variable-weighted rather than fixed-weighted indexes such as the CPI. Consequently, these indexes do not measure pure price change but also include substitution effects.*

3.1 Manufacturing and Service Sectors Wage Growth

Below we present two models of wage determination, which differ in their assumption on labour mobility. If labour were very mobile, then a wage increase in one industry would cause an immediate wage increase in all other industries. Following Rappoport (1987), we specify an instantaneous response function between labour markets:

$$W^s = \beta_o + \underset{(+)}{\beta_1 W^m} + \underset{(+)}{\beta_2 W^{m-1}} + \underset{(+)}{\beta_3 P^s} + \underset{(+)}{\beta_4 P^{s-1}} + \underset{(-)}{\beta_5 U^{male}} + \underset{(-)}{\beta_6 U^f} + \underset{(+)}{\beta_7 D^s} + \varepsilon^s \quad (1)$$

$$W^m = \gamma_o + \underset{(+)}{\gamma_1 W^s} + \underset{(+)}{\gamma_2 W^{s-1}} + \underset{(+)}{\gamma_3 P^m} + \underset{(+)}{\gamma_4 P^{m-1}} + \underset{(-)}{\gamma_5 U^{male}} + \underset{(-)}{\gamma_6 U^f} + \underset{(+)}{\gamma_7 D^m} + \varepsilon^m \quad (2)$$

Where:

m, s: indicates a manufacturing (m) or non-distributive service (s) sector;
W: growth rate of nominal compensation per hour;
P: labour productivity growth rate;
U: growth rate of prime age male and female unemployment; and
D: growth rate of the industry-specific price index as a measure of rational inflationary expectations.

If labour were less mobile however, the simultaneous equation model would be a poor description of labour markets. Alternatively then, a wage increase in manufacturing may cause a wage increase in the service sector with a lag:

$$W^s = \beta_o + \underset{(+)}{\beta_1 W^{m-1}} + \underset{(+)}{\beta_2 P} + \underset{(-)}{\beta_3 U} + \underset{(+)}{\beta_4 D^s} + \varepsilon^s \quad (3)$$

The *Hausman Specification Test* was selected in order to choose between the simultaneous wage determination model and the single equation model.[7]

The regressions include annual observations (1961-1992) on manufacturing and 14 non-distributive service industries. All time series are stationary except for compensation growth in manufacturing. The solution to this problem was found by using a manufacturing subgroup whose compensation growth closely resembled that of the overall manufacturing sector, yet was statistically stationary. The machinery-producing industry satisfies these two requirements.

[7] *For an explanation of the test and a step-by-step procedure see Berndt, E., **The Practice of Econometrics**, Addison-Wesley, 1991, pp. 379-80.*

Table 3
Final Stage Results of Hausman Test

Sector	Simultaneous	Sector	Simultaneous
banks	yes	oamus	no
trusts	yes	ops	no
ins	yes	photo	no
obuss	no	mis	no
prbus	no	taxi	no
education	yes	film	no
hospitals	no	laundries	no
hotels	no		

* Abbreviations are defined in the appendix.

The results in Table 3 show that workers do not immediately switch between sectors in response to monetary incentives. This is not surprising. Labour mobility is limited because jobs in different sectors are not perfect substitutes. It takes time to acquire new skills and search for different work. The financial service sector is an outlier. At this stage, we believe that the notorious difficulties in measuring the output of that sector are a more likely explanation than is perfect labour market integration between manufacturing and financial services.

Since the data reject the simultaneous equation model for most industries, it appears that the single equation model (3) better describes real-world labour markets. We report point estimates and standard errors in Table 4. Coefficients are bold-printed at the 5% level, and underlined at the 10% level. To test for first-order and higher-order autocorrelation, we plotted the sample autocorrelation function of the error term $\rho_i = corr(e_t e_{t-i})$, and reported the first three autocorrelations. The 95% probability limit ρ_i^* is ~0.32.

First, it is useful to examine the elasticity of expected productivity growth and expected inflation on compensation growth. Productivity growth might be rare in the non-distributive service sector. If management and labour foresee productivity growth, however, then real wages should follow swiftly, and in full proportion. Wages should also fully respond to inflationary expectations. Therefore, the coefficients β_2 and β_4 in equation (3) should take a value close to unity. Indeed, the two coefficients are positive and significant throughout and within two standard errors of unity in most industries.

Baumol suggested that a change in the manufacturing wage will cause (i.e. lead) a change in the service wage. After having controlled for inflation and productivity growth, Canadian evidence shows that wage growth in manufacturing leads to wage growth in only 4 out of 11 service sectors. Within a time frame of one year then, labour markets appear poorly integrated. To gain further insights into labour market dynamics, a Granger-Sims causality test was done to see if manufacturing wages cause service wages[8] (see Table 5). The results support the earlier findings. Over any one-year period, labour markets in the non-distributive service sectors appear segmented from those of the manufacturing sector.

Table 4
Statistical Results

W^s	Constant	W^m-1	P^e	U^{male}	U^f	D^s	R^2	P_1	ρ_2	ρ_3
obuss	**2.60**	0.00	**0.73**		-0.86	**0.92**				
	(0.96)	(0.13)	**(0.05)**		(0.68)	**(0.10)**	0.9	-0.12	0.02	-0.2
prbus	1.36	0.29	**0.98**		-0.76	**0.63**				
	(0.93)	(0.16)	**(0.10)**		(0.69)	**(0.12)**	0.8	-0.15	-0.08	-0.01
hospitals	0.55	-0.26	**0.51**		-0.74	**0.96**				
	(2.25)	(0.30)	**(0.07)**		(1.54)	**(0.14)**	0.76	-0.19	-0.13	-0.11
hotels	0.95	0.01	**1.07**		0.34	**0.83**				
	(1.12)	(0.18)	**(0.15)**		(0.80)	**(0.16)**	0.68	-0.14	0.28	-0.08
film	-0.90	**0.47**	**0.69**		-0.37	**0.63**				
	(1.68)	**(0.21)**	**(0.08)**		(1.08)	**(0.11)**	0.74	-0.05	-0.08	0.09
oamus	3.45	0.40	**0.72**		-2.18	0.03				
	(3.47)	(0.53)	**(0.15)**		(2.46)	(0.44)	0.45	-0.31	0.11	0.04
laundries	1.32	-0.08	**0.90**		0.30	**0.85**				
	(0.87)	(0.14)	**(0.08)**		(0.68)	(0.11)	0.87	-0.05	0.19	-0.17
ops	-0.59	0.09	**0.68**	0.85		**1.04**				
	(1.76)	(0.24)	**(0.12)**	(0.78)		**(0.24)**	0.7	-0.22	0.17	0.02
photo	0.25	-0.04	**1.04**		0.97	**1.18**				
	(2.00)	(0.30)	**(0.13)**		(10.46)	**(0.19)**	0.74	0.13	-0.04	-0.13
mis	-0.70	0.43	**0.95**		-1.85	**0.73**				
	(1.22)	(0.25)	**(0.08)**		(1.00)	**(0.23)**	0.84	**-0.43**	**0.11**	**-0.03**
taxi	-0.53	0.33	**0.98**	-0.90		**0.77**				
	(2.42)	**(0.34)**	**(0.14)**	(10.17)		**(0.24)**	0.68	-0.12	-0.09	0.29

* Abbreviations are defined in the appendix.

[8] *If 'X causes Y', then two conditions must be met. First, lagged values of X help predict Y. Second, lagged values of Y do not help predict X. If the test reveals that X predicts Y and Y predicts X, then the likely explanation is not that X and Y simultaneously cause each other, but rather a third variable causes both X and Y. A simple step-by-step procedure is described by Pindyck, R.S. and D.L. Rubinfeld,* ***Econometric Models and Econometric Forecasts****, 3rd ed., McGraw-Hill, 1991, pp. 216-7.*

Table 5
Granger-Sims Causality Test Results

Non-distributive service sector	W^m to W^s	Non-distributive service sector	W^m to W^s
Obuss	no	Laundries	No
Prbus	no	ops	no
Hospitals	no	photo	yes
Hotels	yes	mis	no
Film	no	taxi	yes
Oamus	no		

* Abbreviations are defined in the appendix.

3.2 Productivity Growth and Real Wage Growth

To shed light on the relation between productivity and compensation growth, cross-section and time series data were pooled and the following equation from the point of view of workers and the firms was estimated:[9]

$$(\text{Rate of real compensation growth})_{it} = \sum_{i=1}^{I} \delta_i \, D_i + \beta(\text{rate of productivity growth})_{it} + \varepsilon_{it}$$

Where:

i: industry (i=1,...,I);
t: period (t=1,...,T); and
D: dummy variables allowing for industry-fixed effects.

Real compensation per hour from the workers' point of view was obtained by deflating nominal compensation per hour with the CPI. To obtain the real cost of employing a worker, each series was deflated by its own producer price index. The regressions include annual observations (1962-1992) from 41 industries (20 manufacturing, 16 non-distributive service and 5 distributive service sectors). The first three autocorrelations of the error term $\rho_{1\text{-}3}$ are insignificant throughout (see Table 6).

[9] *This specification captures systematic differences in the way productivity growth affects real wage growth by industry-specific intercepts. Within the class of industry-specific intercept models, we chose a fixed-effects specification over a random-effects one because the latter would attribute variations in compensation growth to unknown stochastic factors rather than to productivity growth. A reference is Johnston, J., McGraw-Hill,* ***Econometric Methods****, 3rd ed., 1984, pp. 396-407.*

The error terms of pooled regressions are autocorrelated within and between cross-sectional groups, and heteroskedastic. We used a corrective procedure outlined in Kmenta, J., ***Elements of Econometrics****, MacMillan, New York, 1971, pp. 508-18.*

Table 6
Real Wages and Productivity

	Workers' view					Employers' view				
Industry	*B*	R^2	ρ_1	ρ_2	ρ_3	*B*	R^2	ρ_1	ρ_2	ρ_3
Manufacturing	0.09 (0.06)	0.12	-0.00	0.04	-0.03	0.51 (0.01)	0.41	-0.00	-0.08	-0.08
Distributive services	0.41 (0.05)	0.34	0.02	0.00	-0.03	0.83 (0.05)	0.63	0.04	-0.15	-0.03
Non-distributive services	0.46 (0.02)	0.39	-0.01	0.11	0.11	0.80 (0.01)	0.80	-0.09	0.02	0.05

Standard errors are in parentheses.

Baumol predicts that productivity growth should explain the bulk of wage growth in manufacturing, but not in the non-distributive service industries. Therefore, the coefficient of determination R^2 should be much lower in the non-distributive service sector. The data soundly rejects this hypothesis.

4.0 Conclusion

Price increases for services have exceeded price increases for goods for at least 30 years. Some of the divergence is probably explained by the inherent measurement problems associated with quality adjustment which are probably more serious for services than for goods. From a purely economic point of view, the explanation advanced by Baumol for the inflationary gap has intuitive appeal, but it is inconsistent empirically.

Our results confirm Brauer's report (1993), which rejected the Baumol hypothesis for the United States. On balance, we conclude that Baumol's explanation is either invalid or insufficient to explain the inflation differential between goods and services. An alternative explanation, supported by Brauer and others, is the growing demand for services. This question and also the role of foreign competition remain to be examined.

Appendix

Stationarity

All data used in the regressions are statistically stationary. Estimates of the autocorrelation functions and Augmented Dickey-Fuller tests are available.

Wage Data

An ideal measure of wage growth for the purpose of this analysis would be a fixed-weight index of employee compensation – a kind of CPI for total wages and benefits. Because the weight given to wages in a particular industry or occupation is fixed, employment shifts between occupations or industries will not affect the index. The U.S. Employment Cost Index follows this methodology, but this type of labour compensation information does not exist in Canada. The most comprehensive measure of nominal labour cost to employers available on an industry basis in Canada is the Total Labour Compensation Per Hour (CPH) series from the System of National Accounts. It represents the market value (inclusive of wages and benefits) of labour input divided by total labour input (Ritter, 1996). Some data originates from the Survey of Employment, Payrolls and Hours (SEPH). These measures are not ideal for short-term analysis, as compositional shifts in the employment mix will affect movements in the overall wage rates. Mainly because it is believed that compositional shifts will cancel-out in the long run, the CPH was chosen for this study since it includes non-pecuniary benefits such as employer sponsored health insurance and other benefits.

Granger-Sims Causality Tests

The regressions include annual observations on compensation growth (1961-1992) from 11 non-distributive and 15 distributive service industries, and the machinery-producing industry as a proxy for manufacturing at large.

Sector Abbreviations

banks	Banks, Credit Unions and Other Deposit Institutions
ads	Advertising Services
educ	Educational Service Industries
film	Motion Picture and Video Industries
hospitals	Health Services
hotels	Accommodation and Food Service Industries
ins	Insurance Industries
laundries	Laundries and Cleaners
mis	Miscellaneous Service Industries
oamus	Other Amusement and Recreational Services
obuss	Other Business Service Industries
ohealth	Other Health Services
ops	Other Personal Services
photo	Photography
prbus	Professional Business Services
rtrade	Retail Trade Industries
taxi	Taxicab Industry
trusts	Trusts, Other Finance and Real Estate
wtrade	Wholesale Trade Industries

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