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MEDIAN WAGES AND PRODUCTIVITY GROWTH IN CANADA AND THE UNITED STATES

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Abstract

In 2008 Sharpe, Arsenault and Harrison attempted to explain why the median earnings of full-time, full-year workers in Canada rose only \$53 dollars, from \$41,348 (2005 dollars) in 1980 to \$41,401 in 2005, while over the same period, total economy labour productivity gains were 37.4 per cent. They identified four key factors: measurement issues, rising earnings inequality, falling terms of trade of labour (the relationship between the prices workers receive for output and the cost of living), and falling labour share. That study in some sense raised more questions than it answered about the relationship between real wages and labour productivity.

This paper expands on Sharpe, Arsenault, and Harrison (2008) in order to shed additional light on the relationship. First, it decomposes the relationship between the growth rates of labour productivity and real wages in the United States in order to quantify the relative importance of the key factors in that country, and compare results with those in Canada. Second, it explores in more detail the drivers of increasing income inequality in Canada and the United States, with particular attention to the market failure resulting from principal-agent problem in individual compensation. Finally, it explores in more detail whether gross domestic product is the correct basis on which to compute the labour share or whether net domestic income might offer a more meaningful interpretation.

Median Wages and Productivity Growth in Canada and the United States¹

In 2008 Sharpe, Arsenault and Harrison attempted to explain why the median earnings of full-time, full-year workers in Canada rose only \$53 dollars, from \$41,348 (2005 dollars) in 1980 to \$41,401 in 2005, while over the same period, total economy labour productivity gains were 37.4 per cent. They identified four key factors: measurement issues, rising earnings inequality, falling terms of trade of labour (the relationship between the prices workers receive for output and the cost of living), and falling labour share. That study in some sense raised more questions than it answered about the relationship between real wages and labour productivity. This paper expands on Sharpe, Arsenault, and Harrison (2008) in order to shed additional light on the relationship.

This paper is divided into three sections. The first section sets reviews the findings of Sharpe, Arsenault, and Harrison (2008) with respect to the relationship between labour productivity and real wages in Canada in the period 1980-2005. The second section extends that analysis in three ways. First, it decomposes the relationship between the growth rates of labour productivity and real wages in the United States in order to quantify the relative importance of the key factors. Second, it explores in more detail the drivers of increasing income inequality in Canada and the United States, with particular attention to the market failure resulting from principal-agent problem in individual compensation. Finally, it explores in more detail whether gross domestic product is the correct basis on which to compute the labour share or whether net domestic income might offer a more meaningful interpretation. The third and final section summarizes and concludes.

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Findings from Sharpe, Arsenault, and Harrison (2008)

This section reviews the key findings of Sharpe, Arsenault, and Harrison (2008), in order to lay the foundation for the new findings presented in the following section.

An Accounting Perspective on the Relationship between Labour Productivity and Real Wages in Canada

In May 2008 Statistics Canada (2008) reported that the median earnings of full-time, full-year workers in Canada rose only \$53 dollars, from \$41,348 (2005 dollars) in 1980 to \$41,401 in 2005. Over the same period, total economy labour productivity gains were 37.4 per cent. This section decomposes of the gap between stagnant median real earnings and labour productivity growth.²

Some of the gap between the growth of median real earnings and the growth of labour productivity is a result of inconsistent measurement. The two measures embody different definitions and concepts that are either not comparable, or cannot be meaningfully compared as they lack consistency. As shown in Summary Table 1, about one-fifth of the 1.26 per cent gap between annual median earnings growth and annual labour productivity growth over the 1980-2005 period was due to measurement issues.

Summary Table 1: Factors Explaining the Difference Between Median Real Earnings and Labour Productivity Growth in Canada, 1980-2005

	Absolute (points)	Relative (per cent)
Median Real Earnings and Productivity Gap, of which:	1.26	100.0
Measurement Issues	0.25	19.8
Inequality	0.35	27.6
Labour's Terms of Trade	0.42	33.3
Labour Share	0.25	19.8

Source: Summary Table 2

First, to make a meaningful comparison between real earnings and labour productivity, the same unit of labour input must be used. While census earnings are reported for full-time full-year workers, productivity is reported for all workers and is best expressed on an hourly basis. In our analysis, the transformation from full-time, full-year workers to hours for all workers was divided in two steps (Summary Table 2). First, the average earnings of full-time full-year workers grew at about the same rate as the earnings of all earners, where an earner is defined as anyone with earnings during the

² As was shown in Sharpe, Arsenault, and Harrison (2008), the relationship between real wages and labour productivity, when both can be compared meaningfully (exempt of measurement issues), is mediated by the labour share and labour's terms of trade:

$$\Delta \text{Consumption wage} = \Delta \text{Labour productivity} + \Delta \text{Labour share} + \Delta \text{Labour's terms of trade}$$

In our analysis, we use median real wages, which adds the inequality dimension to the comparison (difference between average and median real wages measures). See Sharpe, Arsenault, and Harrison (2008), for full algebraic details.

year. Second, the number of hours worked per earner has increased slightly over the 1980-2005 period, up 2.25 per cent, or 0.09 per cent on an annual basis.³ Adopting a more appropriate measure of labour input, hours worked, thus increases the gap by 0.10 percentage points (7.9 per cent).

Summary Table 2: Reconciling Growth in Median Real Earnings and Labour Productivity Growth in Canada, 1980-2005

Earnings and Productivity Growth Gap	Compound Annual Growth Rates (per cent)	
	Real median earnings of full-time full-year workers	0.01
Labour productivity (Real output per hour)	1.27	
Total gap	1.26	
Contribution to Median Real Earnings and Productivity Gap	Absolute (points)	Relative (per cent)
From median to average earnings	0.35	27.6
Change in definition of labour input, of which:	-0.10	-7.9
from full-time full-year workers to all earners	-0.01	-0.6
from earners to hours	-0.09	-7.3
From earnings to total compensation	0.35	27.3
From CPI to GDP deflator	0.42	33.3
Change in the labour share of nominal GDP	0.25	19.8
Total – All Factors	1.26	100.0

Source: CSLS calculations based on Statistics Canada data.

Second, the census definition of earnings excludes supplementary labour income (SLI). On an annual basis, average labour compensation grew 0.35 percentage points faster over the 1980-2005 period than average earnings, in part because labour compensation includes SLI and earnings do not. This difference in growth rates explains slightly more than one-quarter (27.8 per cent) of the gap between the growth in real median earnings and labour productivity.

The use of median earnings instead of average earnings accounted for about one-quarter (27.6 per cent) of the gap between median real earnings and labour productivity growth. This difference reflects increasing earnings inequality in Canada over the period.

The use of different price indexes to deflate nominal GDP and labour compensation accounted for one-third of the median earnings/ labour productivity growth gap between 1980 and 2005. From a consumer perspective, labour compensation must be adjusted using the CPI in order to obtain an indicator of purchasing power that is comparable over time. Over the 1980-2005 period, the CPI grew faster than the GDP deflator. Yet, for consistency the link between real wages and labour productivity requires that both variables be deflated using the same price index. When both measures are deflated using the GDP deflator, a further 0.42 percentage points, or 33.3 per cent, of

³ The number of hours worked per earner tends to be pro-cyclical, i.e. favorable labour market conditions tend to increase the average number of hours worked for individuals working in a given year. Over the 1980-2005 period, the number of hours worked per earner per year reached a trough in 1982 at 1,463 hours and peaked in 1998 at 1,593 hours (Labour Force Survey). In this context, the difference between 1980 and 2005 is relatively small at 35 hours per year, from 1,521 hours in 1980 to 1,556 in 2005.

the gap is explained. This difference between the rate of growth of the price of output, measured by the GDP deflator, and the rate of growth of the price of consumption goods, measured by the CPI, is known as labour's terms of trade.

The remaining 0.25 percentage points (19.8 per cent) of the median earnings/labour productivity gap were due to the falling labour share. In an accounting sense, faster growth in the non-wage components of GDP explains the falling labour share. During the 1980-2005 period, average annual growth of nominal wages, salaries and supplementary income was 5.77 per cent, slightly slower than nominal GDP growth of 6.08 per cent per year, and significantly slower than the 6.42 per cent per year rate of increase of nominal GDP excluding wages. Of the six largest non-wage components of income-based GDP (accounting for 97.4 per cent of GDP excluding wages), five grew faster than wages and thus contributed to the faster growth of GDP relative to wages. Profits, growing at a robust 6.59 per cent per year, made a large contribution.⁴ In 1980, profits represented 12.2 per cent of GDP. By 2005, the share had risen to 13.8 per cent.

Factors Affecting the Drivers of the Gap between Median Real Earnings Growth and Labour Productivity Growth

Sharpe, Arsenault, and Harrison (2008) identified a number of potential explanations for the trends in factors accounting for divergence between the growth rates of real wages and labour productivity in Canada.

Supplementary Labour Income

As was just noted, the inclusion of SLI accounts for a quarter of the difference between median earnings and labour productivity growth over the 1980-2005 period. Statistics Canada defines SLI to include employer contributions to pension plans (private or public), supplementary health benefits, Employment Insurance (EI) and workers' compensation. Since 1980, SLI has risen from 8.35 per cent of labour income to 12.9 per cent in 2005 (Summary Table 3). This increasing importance is attributable primarily to (1) a significant increase in contribution rates for the Canada and Quebec Pension Plans, particularly since 1998, and (2) the increasing importance of welfare benefits such as private health and dental benefits plans, which represented 3.0 per cent of labour income in 2005, up from only 1.8 per cent in 1980. All other components of SLI also increased in importance over the 1980-2005 period: private pensions (3.4 to 3.8 per cent); Employment Insurance contributions (1.0 to 1.5 per cent); retiring allowances (0.0 to 0.7 per cent); and workers' compensation payments (1.0 to 1.3 per cent). Any estimate of the growth in wages which does not include SLI is likely to be an underestimate.

⁴ Nominal net income of unincorporated businesses including rent grew at a 7.54 per cent average annual growth rate between 1980 and 2005, with capital consumption allowances increasing at a 6.42 per cent average annual rate, and net taxes (taxes less subsidies) at a 7.75 per cent rate. Interest and miscellaneous investment income advanced at only a 3.28 average annual rate. In relative terms, the faster growth of corporate profits account for 34.5 per cent, or 23.13 percentage points, of the 67.1 percentage point difference between the growth of wages and the growth of GDP minus wages for the 1980-2005 period. Net taxes contributed 36.2 per cent, capital consumption allowance 25.9 per cent, unincorporated businesses 29.5 per cent and interest and investment income, which grew slower, had a negative contribution of 51.7 per cent.

Summary Table 3: Supplementary Labour Income, Canada, total economy, current dollars, 1980-2005

Type of Employer Contribution	Share of Labour Income		Change in Share	Contribution to Change in Share
	1980	2005		
	(per cent)		(percentage points)	(per cent)
Pensions	3.4	3.8	0.31	6.87
UI/EI	1.0	1.5	0.44	9.74
CQPP	1.0	2.7	1.67	36.97
Workers' Comp	1.0	1.3	0.24	5.33
Welfare	1.8	3.0	1.18	26.19
Retiring Allowances	0.0	0.7	0.67	14.90
Total SLI	8.35	12.86	4.51	100.00

Source: Sharpe, Arsenault and Harrison (2009:Summary Table 4)

Labour's Terms of Trade

The Consumer Price Index (CPI) advanced 3.6 per cent per year between 1980 and 2005 compared to 3.2 per cent for the GDP deflator. The CPI measures changes in the prices of a basket of goods and services purchased by consumers. The GDP deflator is a measure of the change in the prices of all components of output in the economy. It is the weighted average of deflators for personal consumption, government consumption, investment, exports, and imports. Changes in labour's terms of trade are equal to changes in the GDP deflator less changes in the CPI. For example, if the prices of the goods produced by workers, which are measured by the GDP deflator, rise more quickly than the goods consumed by workers, measured by the CPI, then the workers are better off; their terms of trade have improved.

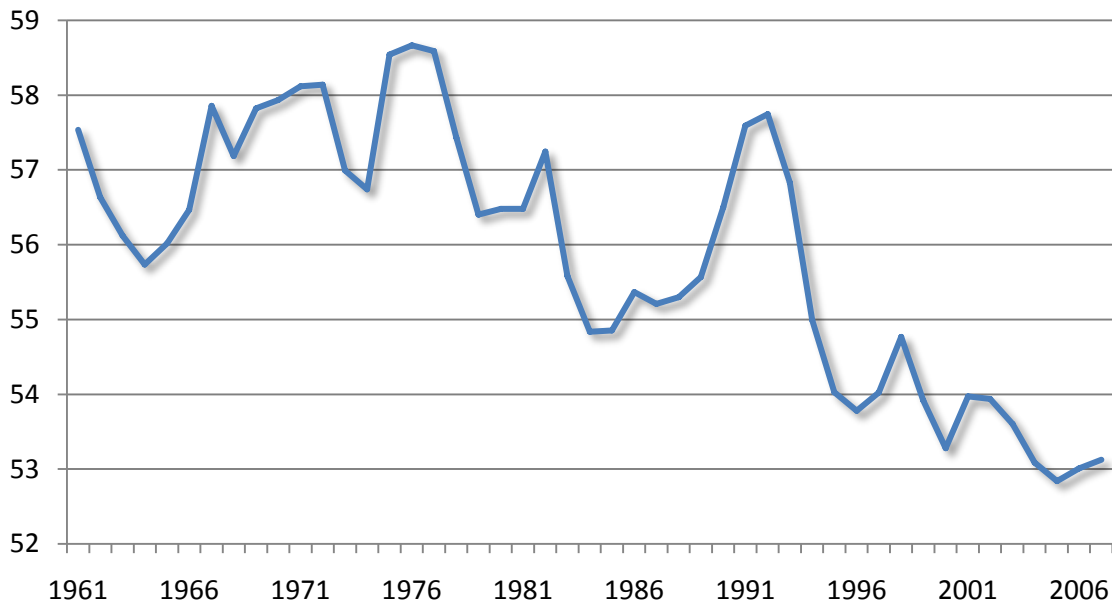
Summary Table 4: Decomposition of Labour's Terms of Trade, Canada, 1980-2005

Labour's Terms of Trade	CPI	Domestic Economy Deflators				International Trade Deflators		
		GDP	Consumption	Current Government Spending	Investment	Total	Exports	Imports
Compound Annual Growth Rate (per cent)								
-0.42	3.62	3.19	3.42	3.67	2.16	..	1.85	1.66
Absolute Contribution (percentage points)								
-0.42	..	..	-0.11	0.01	-0.32	0.01	-0.58	-0.59
Relative Contribution (per cent)								
100.0	..	..	25.3	-2.3	74.5	-1.9	134.8	136.6
Source: Statistics Canada, National Accounts and Consumer Price Index								
Note: Some figures may not add due to rounding and to small exclusions from GDP								

Labour's Share

Labour's share, including an imputation for self-employed workers,⁵ fell 3.7 percentage points from 56.5 per cent of GDP in 1980 to 52.8 per cent in 2005 (Chart 1). It should be noted that with the large labour income increases of top earners, the labour share of the bottom 80 or 90 per cent of workers fell even more than represented by average figures. The potential causes of the decrease in labour share in Canada since 1980 are multiple. The brunt of the shift in the relationship between labour productivity and real wages finds its source in the 1990s, and especially between 1992 and 1996 when the share fell from 57.7 per cent to 53.8 per cent. The following sub-sections outline an explanation for the downward trend in labour's share in terms of three key drivers: the declining bargaining power of workers, rising commodity prices, and an increasing share of GDP going to capital consumption allowances.

Chart 1: Labour's Share, Canada, Total Compensation as a Share of GDP, Current Dollars, Per Cent, 1961-2007



Source: CSLS calculations based on Statistics Canada data.

The Declining Bargaining Power of Workers

The fall in labour share in the 1992-1996 period coincided with a major policy shift in Canada. In 1991, the Government of Canada adopted an inflation target of 2 per cent. A rise in short-term interest rates was engineered to lower inflation expectations,

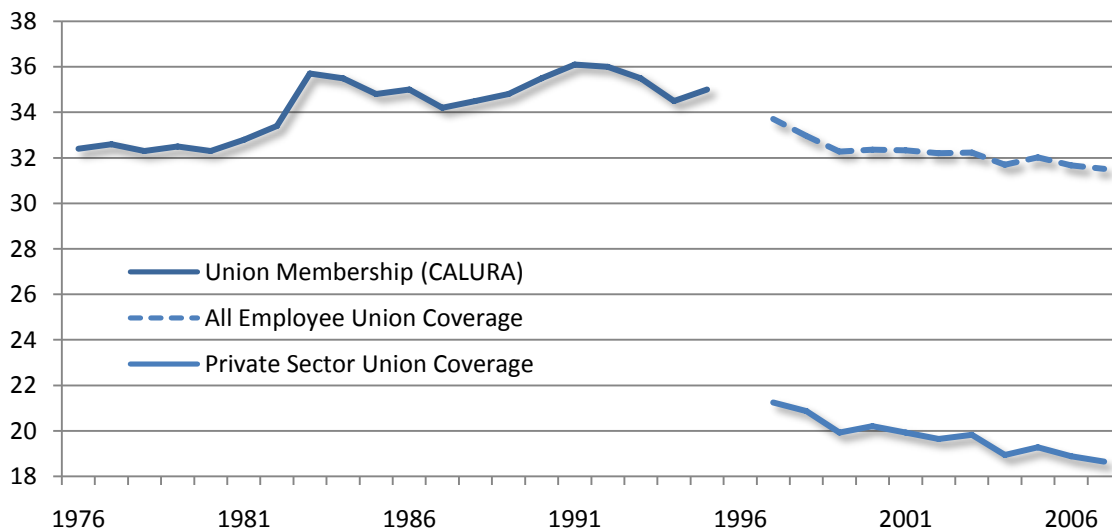
⁵ In the labour compensation series from the Productivity Accounts, Statistics Canada imputes a value for the labour income of self-employed workers by assuming that the hourly earnings of self-employed workers are proportional to the hourly earnings of paid workers with the same level of education and experience. The relationship between the hourly earnings of paid and self-employed workers is derived from the Census of Population (Baldwin, *et al.*, 2007: 26).

which contributed to a recession and a prolonged period of stagnation. The unemployment rate reached 11.4 per cent in 1993 and remained above nine per cent until 1998. Since the mid-1990s, real wages failed to make up for the shortfall that occurred during the period of weak economic growth and high unemployment in the first half of the 1990s. The inability of the labour share to return to pre-1991 levels reflects in part the falling bargaining power of workers.⁶

In Canada, the following factors have eroded the wage bargaining power of workers in recent years:

- Globalization has affected the bargaining power of Canadian workers through reductions in trade barriers and increased competition from low-wage countries (e.g. China) and countries with high productivity industries (e.g. Japan). The threat of off-shoring has tempered wage demands and driven down the economic rents over which workers had previously been able to bargain.
- In Canada, the unionization rates have exhibited a downward trend since the late 1990s (Chart 2). This trend suggests that workers may be losing some power to bargain for higher wages, resulting in a decline in the labour share.

Chart 2: Unionization Rate*, Canada, 1976-1995 and 1997-2007



Source: Statistics Canada, Cansim Table 379-0025 and 282-0078. Corporations and Labour Unions Returns Act (CALURA) and Labour Force Survey (LFS).

*From 1976 to 1995, the series is derived from CALURA and refers to union membership. For the 1997-2007 period, data are from LFS and refers to employees who are members of a union and employees who are covered by a collective agreement or a union contract.

⁶ In a world of perfect competition and constant returns to scale, wage bargaining has no effect on the labour share. Indeed, there is no excess profit (only normal profits) to be shared and labour demands for increases in real wages that exceed average labour productivity gains will remain either unanswered, or will drive the targeted business out of the market. In reality, however, few firms operate in a perfectly competitive market, opening the door to excess profits. This excess profit can be shared between the owners of the firm and labour. This is where wage bargaining can play an important role in affecting the labour share.

- Conway, Janod and Nicoletti (2005) find that Canada moved to a less restrictive product regulatory environment between 1998 and 2003. Deregulation of product markets can lead to increasing competition that reduces excess profits and the ability of workers to obtain higher wages.
- Labour market deregulation also has similar negative effects for the labour share in the short term. In Canada, reduced Employment Insurance benefits, for example, have diminished the capacity of workers to negotiate higher wages as their threat of leaving is less credible.

Commodity Prices

In recent years, commodity prices, and particularly oil prices have risen significantly, a trend which abated and then reversed in the second half of 2008. The direct impact of a demand-induced increase in commodity prices is an increase in economic rent and profits in resource-related industries. For example, in the mining, and oil and gas sector, profits doubled between 2000 and 2006 (Arsenault and Sharpe, 2008).

Higher commodity prices may lead to employment shifts across industries. Between 2000 and 2007, employment in the manufacturing sector fell almost 10 per cent while employment in the mining and oil and gas industry increased about 60 per cent. Because commodity-based industries tend to have larger profit shares and lower labour shares, employment shifts towards these industries lead to a decreasing labour share.

In the long term, the main effect of a permanent increase in commodity prices on labour's share results from changes in industrial structure. While firms, including manufacturers and commodity producers, will eventually adjust to the new set of relative prices at home and abroad, employment shifts towards industries with lower labour share have the potential to translate into a permanently lower labour share at the aggregate economy level.

Capital Consumption Allowances

Sharpe, Arsenault, and Harrison (2008) noted that between 1980 and 2005, as the labour share had declined the shares of several non-wage components of GDP have increased. As was just noted, changing market and institutional conditions have favored an increase in the profit share, which increased as a share of GDP by 1.5 percentage points from 1980 to 2005. A less obvious but still important development has been the increase in the share of GDP accounted for by capital consumption allowances, also called depreciation. This issue was not explored in depth at that time, but is now explored below in the context of broader conceptual and measurement issues associated with the labour share.

New Findings

This part of the paper expands upon the findings of Share, Arsenault, and Harrison (2008) in three directions. First, the accounting decomposition of the relationship between median real wages and labour productivity is carried out for the United States. Second, we discuss in more detail issues around income inequality and its drivers in Canada and the United States. Finally, we discuss conceptual and definitional issues associated with the measurement of the labour share.

An Accounting Perspective on the Relationship between Labour Productivity and Real Wages in the United States

We can undertake a similar analysis of the relationship between labour productivity and real wages in the United States (Summary Table 5).⁷ In the United States, median hourly wages rose at an average annual rate of 0.33 per cent, while labour productivity increased at an average annual rate of 1.73 per cent between 1980 and 2005. The gap was therefore 1.40 percentage points. Rising inequality, captured by the difference between median and average real hourly compensation, was the most important explanation for the gap, explaining 45 per cent. Supplementary labour income becoming an increasing share of compensation accounted for 12 per cent of the gap between the growth rates of median wages and labour productivity. Labour's terms of trade contributed 23 per cent of the gap, as the GDP deflator registered inflation of 2.99 per cent per year, while the CPI showed price inflation of 3.31 per cent. Finally, the decline in labour share of GDP from 65.0 per cent in 1980 to 61.3 per cent in 2005 accounted for 17 per cent of the gap between the growth rates of median real wages and labour productivity.

While this decomposition is not entirely comparable to that conducted above for Canada, there are several points of interest to note. First, the increase in earnings inequality in the United States has been much more important than in Canada, in both absolute and relative terms. Whereas in Canada, the difference between the average annual growth rates of median and average real earnings was 0.35 percentage points, accounting for 27.6 per cent of the gap between the growth rate of real median wages and labour productivity, in the United States, the difference in the average annual growth rates of median real hourly compensation and average real hourly compensation was 0.63 percentage points, accounting for 45.1 per cent of the gap between the growth rates of real wages and labour productivity. This finding is consistent with evidence (for example, Saez and Veall, 2005) that the rise in inequality has been more pronounced in the United States than in Canada.

⁷ We are unable to reproduce for the United States the exact same decomposition that was presented for Canada in Summary Table 2. No series on the median earnings of full-time full-year workers was available for the United States, so the decomposition in Summary Table 5 begins with median real hourly wages. Since the change in average hours worked per full-time full-year worker is relatively unimportant for the purposes of this analysis, this omission is not a major concern. That said, readers should exercise caution in making direct comparison between Summary Table 2 and Summary Table 5, because the US analysis reflects the non-farm business sector, while the Canadian analysis reflect the total economy. Moreover, the definition and coverage of labour compensation may be somewhat different.

Summary Table 5: Reconciling Growth in Median Real Earnings and Labour Productivity Growth in the United States, 1980-2005

Earnings and productivity growth gap	Compound Annual Growth Rates (per cent)	
	Median real hourly wage	0.33
Labour productivity (Real output per hour)	1.73	
Total gap	1.40	
Contribution to median real earnings and productivity gap ^{1,3}	Absolute (points)	Relative (per cent)
From median real hourly wage to median real hourly compensation	0.16	11.7
From median real hourly compensation to average real hourly compensation	0.63	45.1
Labour's Terms of Trade: from CPI to GDP deflator ²	0.31	22.5
Labour share of nominal GDP	0.23	16.7
Total – All Factors	1.34	95.9

Source: CSLS calculations based on data from the Economic Policy Institute, the Bureau of Economic Analysis, and the Bureau of Labor Statistics.

Notes:

- Contributions do not add up to 100 per cent because of small difference between data sources used to estimate real hourly compensation and the labour share of nominal GDP. As well, estimates of median hourly real wage are for 1979-2005, while estimates of median hourly compensation are for the period 1980-2004. All other series were available in both 1980 and 2005.
- The CPI used here is the CPI-U-RS, instead of the more commonly used CPI-U (CPI for all urban consumers). CPI-U-RS is a CPI developed by the BLS by applying methods that are currently used to produce the CPI-U to generate a CPI back to 1978. It should be noted that the widest differences between the two series (CPI-U and CPI-U-RS) occur prior to 1983, when the current treatment of homeowner cost measurement was introduced into the CPI-U.
- All figures are for the non-farm business sector, to the exception of the labour share which is for the total economy.

Labour's terms of trade deteriorated less in the United States than in Canada over the period from 1980 to 2005, at an average rate of 0.30 per cent per year (Summary Table 6) in comparison to 0.41 per cent per year in Canada. As was the case in Canada, most (85 per cent) of the deterioration in labour's terms of trade in the United States stemmed from the quality-adjusted prices of private investment rising much less quickly than the CPI. Put another way, the prices of investment goods and services being produced by Americans were failing to keep pace with the cost of living. The slow growth in the quality-adjusted prices of investment goods resulted from very slow growth in the prices of non-residential structures and real declines in the prices of equipment and software.

Summary Table 6: Decomposition of Labour's Terms of Trade, United States, 1980-2005

Labour's Terms of Trade	CPI	Domestic Economy Deflators				International Trade Deflators		
		GDP	Private Consumption	Government Consumption and Investment	Private Investment	Total	Exports	Imports
Compound Annual Growth Rate (per cent)								
-0.30	3.31	2.99	3.09	3.55	1.63	..	0.91	0.65
Absolute Contribution (percentage points)								
-0.30	..	..	-0.14	0.05	-0.26	0.09	-0.24	-0.33
Relative Contribution (per cent)								
100.0	..	..	45.5	-15.2	84.5	-29.7	75.6	105.3
Source: Bureau of Labor Statistics CPI-U-RS. Bureau of Economic Analysis GDP.								
Note: Some figures may not add due to rounding and to small exclusions from GDP								

Income Inequality in Canada and the United States

Sharpe, Arsenault, and Harrison (2008) noted that increased earnings inequality had contributed to the divergence between the growth rates of real wages and labour productivity in 1980-2005, but that report did not explore the drivers in earnings inequality. This section surveys some recent literature on income (not earnings⁸) inequality in Canada and the United States in order to provide some additional explanation for the significant rise in earnings inequality in both countries.

In Canada the reasons for the growing income inequality are poorly understood, but two key findings are broadly accepted. First, a number of researchers have noted that total income since the late 1970s is increasingly concentrated among the top one per cent of earners.⁹ The share of income going to the top one per cent in Canada increased from 8.5 per cent in 1982 to 12.2 per cent in 2004 (Summary Table 7). Income gains among the top 0.1 per cent were even more significant; income share rose from 2.7 per cent in 1982 to 4.7 per cent in 2004. The other important point is that every other group in the income distribution, except for the bottom 25 per cent have lost share of income.

Data limitations also hinder our ability to assess the reasons for the increase in the income share of the top one per cent. Osberg (2008) notes that most of the information we gather on education and unemployment, which is most relevant in explaining trends in inequality covers the middle of the income distribution and not the tails. In this vacuum of reliable data, researchers have put forward a number of theories to explain the rise of the top one per cent. In Canada, far less analysis has been completed than in the United States. As a result, we must draw heavily on US literature in this discussion.

⁸ In practice, total income inequality data is more readily available than data on earnings inequality. Income differs from earnings because it includes transfer payments and non-labour income such as interest, dividends, and capital gains, collectively capital income. Nonetheless, earnings are the largest component of total income and have driven the trend in recent years.

⁹ Saez and Veall (2005) is a particularly well-known paper in this literature, and its findings have been confirmed in many subsequent studies (Murphy, Michaud and Wolfson (2008) and Heisz (2007) for example).

Using tax data on adjusted gross income from the US Internal Revenue Service, Kaplan and Rauh (2007) examined of who makes up the top income earners in the United States.¹⁰ They looked at four groups: top executives in non-financial firms; financial service sector employees from investment banks, hedge funds, private equity funds, and mutual funds; lawyers; and professional athletes and celebrities. They conclude that their evidence supports theories to explain the rising share of top income earners which rely on skill-biased technological change, greater scale, and superstars.

Summary Table 7: Shares of Total Individual Income in Canada, by Level of Income, Per Cent, 1982-2004

	1982	1992	2004	Change 1982 to 2004
Bottom 5%	-1.0	-0.1	0.0	1.0
5% to 10%	0.1	0.6	0.4	0.3
10% to 15%	0.6	1.0	0.9	0.3
15% to 20%	1.1	1.4	1.2	0.1
20% to 25%	1.5	1.7	1.5	0.0
25% to 30%	1.9	2.0	1.8	-0.1
30% to 35%	2.3	2.3	2.1	-0.2
35% to 40%	2.8	2.7	2.5	-0.3
40% to 45%	3.2	3.2	2.8	-0.4
45% to 50%	3.7	3.5	3.2	-0.5
50% to 55%	4.2	3.9	3.7	-0.5
55% to 60%	4.7	4.5	4.2	-0.5
60% to 65%	5.2	5.0	4.7	-0.5
65% to 70%	5.9	5.6	5.3	-0.6
70% to 75%	6.6	6.3	5.9	-0.7
75% to 80%	7.3	7.1	6.7	-0.6
80% to 85%	8.2	8.0	7.7	-0.5
85% to 90%	9.4	9.3	9.0	-0.4
90% to 95%	11.2	11.2	11.0	-0.2
95% to 100%	21.0	20.9	25.3	4.3
95% to 99%	12.5	12.3	13.1	0.6
99% to 99.9%	5.8	6.0	7.5	1.7
99.9% to 99.99%	1.8	1.8	3.0	1.2
Top 1% (99% to 100%)	8.5	8.6	12.2	3.7
Top 0.1% (99.9% to 100%)	2.7	2.6	4.7	2.0
Top 0.01% (99.99% to 100%)	0.9	0.8	1.7	0.8

Source: Murphy et al (2007)

Theories of skill-biased technological change predict that changing technology, particularly information and communications technology (ICT), have increased the earnings of some, like professional athletes who can now reach wider markets both as athletes and as promoters of products they endorse. On the other hand, the ability to more

¹⁰ The analysis by Kaplan and Rauh goes beyond labour income.

efficiently manage global supply chains, largely thanks to ICT has significantly increased the ability of firms to locate production in lower cost regions. This trend has put downward pressure on the wages of competing workers in firms still located in relatively high-cost countries like Canada.

Some argue that rising pay for the top one per cent reflects the growing demand for very highly skilled labour coupled with higher returns resulting from instantaneous communications. This “superstar” theory, often attributed to Rosen (1981), can reflect the efficient functioning of the market economy. An extreme example is J.K. Rowling, the author of the Harry Potter series. She was the first person to become a billionaire by writing books, a reality made possible by the new market forces which among other things facilitate the distribution of products across markets.¹¹

The idea that CEOs and other persons in positions of power within corporations may abuse the trust of shareholders is an idea as old as the corporation itself. Posner (2009) notes that CEO compensation has increased significantly in recent years, from an average of \$2.33 million in 1992 to an average of \$5.47 million in 2005. Over the same period, the average earnings per production worker in the U.S. private sector increased from \$19,149 in 1992 to \$28,305 in 2005 (Bureau of Labor Statistics, weekly earnings from the Current Employment Survey). The CEO compensation to average earnings ratio thus increased from about 120 in 1992 to over 190 in 2005.

There is an extensive literature on the market failure that can result from the principal-agent problem, much of it referenced by Posner (2009). The argument is that corporate managers (agents) will not always act in the best interests of the corporation’s shareholders (principals), because they have competing objectives including personal enrichment and empire-building. The problem is made worse by the dispersion of ownership in many public companies. Owners and the directors they elect to govern corporations have little incentive to expend resources monitoring top managers. Much literature also exists on the often elaborate mechanisms developed to overcome the principal-agent problem by aligning management incentives with shareholder interests—stock options among the most well-known. The extent to which such mechanisms have been successful remains hotly debated, and several high profile failures illustrate the risks of poorly designed incentive compensation.

What makes the corporate principal-agent problem an attractive explanation of increasing income inequality is increasing scale of firms in recent years. Posner (2009) argues that larger firms are more easily able to hide the compensation of top managers. For example, if a firm doubles in revenue, then an increase in managerial compensation of 50 per cent is less likely to be noticed by shareholders, because managerial compensation has declined as a share of total expenses. To the extent that stock options have not been treated as expenses this problem is exacerbated. Massive increases in managerial compensation would be far more difficult to justify in the absence of fast-growing revenues. Gabaix and Landier (2008) estimate that the 100 largest firms in the United States, measured in terms of earnings before interest and taxes, increased 2.7

¹¹ Other examples include professional athletes, musicians and performers in general.

times in real terms (using the GDP deflator) between 1980 and 2003. In contrast, US real GDP increased by only 100 per cent. They argue the growth of CEO compensation is closely related to this increase in firm size.

All three factors may interact in many instances to increase the share of income going to the top of the income distribution. For instance, hedge fund managers may be benefiting from higher earnings resulting from changes in technology that allow them to effectively manage more money, which allows them to obtain higher pay, whether the result of a market failure or not, and which allows them to reach more customers.

Much less is known about the top of the income distribution in Canada. We can certainly argue that trends in the United States are having an impact on Canada. Saez and Veall (2005) suggest that the threat of migration to the United States, where the surge in top income share started earlier (1970), might have spurred the surge in Canada. They support their case with evidence from Quebec where residents have a lower propensity to migrate because of language and cultural differences and where the top income share increase has been much more modest. While all of the factors identified as explanations for the increase in the share of income going to the top of the distribution in the United States are also likely at play in Canada, surging top incomes in Canada may have much to do with forces at play in the United States.

Conceptual and Measurement Issues Associated with the Labour Share

Conceptual and measurement issues make the interpretation of a falling labour share difficult.¹² First, it is not clear that taking labour compensation as a share of GDP is appropriate, since GDP includes a number of categories that do not represent income from production, including capital cost allowance (CCA), taxes less subsidies, inventory valuation adjustment, and statistical discrepancy. These elements are the difference between GDP and net domestic income (NDI). Quantitatively, CCA and taxes less subsidies are the most important such elements of GDP.

Capital cost allowance is a significant component of GDP, 11.8 per cent of GDP in 1980 and 12.8 per cent of GDP in 2005. CCA represents the depreciation of fixed assets (not inventory). Removing CCA from GDP provides a measure of the volume of production that can be used for consumption and new investment once the existing stock of capital has been maintained. Part of the price consumers pay for goods and services reflects CCA, and so when GDP is calculated by summing up the value of all transactions, CCA is included. Since resources that are being used to recapitalize existing assets are not available to either labour or capital as income, a more meaningful definition of labour share can be calculated by removing CCA from GDP.

One explanation for the increasing importance of CCA is that newer technologies (particularly computers and software) depreciate at a faster rate than older technologies,

¹² We are grateful to Pierre Fortin for his lucid exposition of these issues.

the share of CCA in GDP increases and it pushes the labour share downwards. Increases in CCA decrease the share of income going to labour, because CCA is a component of the non-labour share of output. The brunt of the shift in the relationship between labour productivity and real wages occurred between 1992 and 1996. This coincided with a rise in the share of income going to CCA. Yet, the increase in the share of CCA can hardly explain more than one-third of the fall in the labour share between 1980 and 2005.

The other adjustments to GDP to reach NDI are to remove taxes less subsidies both on products and factors of production,¹³ and to add in inventory valuation adjustment.¹⁴ Taxes are not income for labour or capital, while subsidies are and profits from inventory are. Taxes less subsidies contributed significantly to the difference in trend between GDP and NDI - particularly due to the introduction of the GST in 1991 – with the ‘taxes less subsidies’ / NDI ratio increasing 4.2 percentage points between 1980 and 2005 (more than the equivalent measure for CCA, at 2.4 percentage points). Inventory valuation, a very volatile component of GDP, also increased its ratio to NDI by 2.8 percentage points.

Summary Table 8: Labour Share: Conceptual and Measurement Issues

	Level (Billions of Current Dollars)		As a Share of GDP (per cent)		As a Share of NDI (per cent)	
	1980	2005	1980	2005	1980	2005
Labour Compensation*	180,191	742,466	57.3	54.0	70.0	71.1
Capital Income*	77,175	301,537	24.5	21.9	30.0	28.9
Net Domestic Income (NDI)*	257,366	1,044,003	81.9	75.9	100.0	100.0
Inventory Valuation Adjustment	-7,336	-933	-2.3	-0.1	-2.9	-0.1
Capital Consumption Allowance	37,212	176,338	11.8	12.8	14.5	16.9
Taxes less subsidies	27,892	156,181	8.9	11.4	10.8	15.0
Statistical Discrepancy	-744	-509	-0.2	0.0	-0.3	0.0
GDP at Market Prices	314,390	1,375,080	100.0	100.0	122.2	131.7

Source: Authors' calculations based on Statistics Canada data and methodology from Fisher and Hostland (2002). This methodology estimates the labour share of self-employment income to be 57 per cent. This approach is different from the way in which the labour share is calculated elsewhere in this article, however, this difference is necessary in order to estimate the labour share of NDI consistently. Analysis in this section is based on a lucid exposition by Pierre Fortin.

It may be more appropriate to view the labour share as labour compensation divided by NDI, which is GDP less CCA, taxes less subsidies, inventory valuation

¹³ “Taxes less subsidies, on factors of production refer to taxes received and subsidies paid by government. These taxes and subsidies are payable or paid regardless of the quantity or value of the goods and services produced or sold. Capital taxes, licences and permits, property taxes and payroll taxes are examples of taxes included in this aggregate... Taxes less subsidies on products, refer to taxes received and subsidies paid by government. These taxes and subsidies are payable or paid, based on the quantity or value of goods and services produced or sold. This aggregate includes sales taxes, fuel taxes, import duties and taxes, and excise taxes on tobacco and alcoholic products.” (Statistics Canada, 2008a)

¹⁴ “The inventory valuation adjustment represents the net holding gain or loss incurred by businesses as a result of price changes. This is an adjustment to profits, since gains or losses on inventories are included in the corporation profits before taxes.” (Statistics Canada, 2008a)

adjustment, and statistical discrepancy. By this measure, the labour share rose between 1980 and 2005 from 70.0 per cent of NDI to 71.1 per cent, while capital share fell from 30.0 per cent to 28.9 per cent of NDI. Difficulties in measuring and interpreting changes in the labour share mean that we feel it is more appropriate to focus on inequality and labour's terms of trade as key drivers of the relationship between real wages and labour productivity.

Conclusion

In 2008, Sharpe, Arsenault and Harrison found that the median real earnings of Canadians barely increased between 1980 and 2005 and that over the same period, labour productivity had risen by 37.4 per cent. They explained this divergence by four factors: measurement issues, an increase in earnings inequality, a decline in labour's terms of trade, and a decline in labour's share of national income. Building on these findings, this made three new contributions:

- It undertook the accounting decomposition of the relationship between the growth rates of real wages and labour productivity for the United States. Despite an average increase of 0.33 per cent in median real hourly wage in the United States, the gap between real wages and labour productivity annual growth was larger in the United States (1.40 percentage points) than in Canada (1.26 percentage points) between 1980 and 2005. The rise inequality was a much more important factor for the divergence between the growth rates of labour productivity and real wages in the United States, where it accounted for almost half of the difference, than in Canada, where it accounted for around one-quarter of the gap. Changes in supplementary labour income were more important in Canada (28 per cent) than in the United States (12 per cent), and so were falling labour's terms of trade (33 per cent versus 23 per cent). The fall in labour share was similarly important in both countries (20 per cent in Canada versus 17 per cent in the United States).
- This paper also explored in more detail the causes of rising inequality in Canada and the United States. The rise in inequality is attributable to the increasing income share of the top one per cent of the income distribution, and stagnant or falling income shares elsewhere. Market failures related to principal-agent problems around the compensation of corporate managers appear to be a key driver of rising inequality in the United States and are likely important in Canada as well, but to a lesser extent.
- Finally, this paper explored in more detail whether GDP is the correct basis on which to compute the labour share. It concluded that the use of net domestic income (NDI) to compute labour share may provide a more meaningful interpretation. However, unlike labour share of GDP, the share of NDI going to labour actually rose in Canada over the period 1980-2005. Ambiguity in the interpretation of labour share suggests the attention should be more appropriately focused on rising inequality as a key driver of the divergence between the growth rates of real wages and labour productivity in Canada and the United States.

A number of factors can explain why Canada and the United States have experienced stagnant median real wages, but the transformation of the North American economy, which is being driven by globalization and technological change is at the heart of any explanation. The precise nature and relative importance of the channels through which these forces are impacting the relationship between real wages remain contentious, but, as Osberg (2008) points out in reference to inequality, there will likely be implications for political economy to the extent that these trends persist.

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