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LABOUR PRODUCTIVITY AND THE DISTRIBUTION OF
REAL EARNINGS IN CANADA, 1976-2014

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Abstract

Canadian labour is more productive than ever before, but there is a pervasive sense among Canadians that the living standards of the 'middle class' have been stagnating. Indeed, between 1976 and 2014, median real hourly earnings grew by only 0.09 per cent per year, compared to labour productivity growth of 1.12 per cent per year. We decompose this 1.03 percentage-point growth gap into four components: rising earnings inequality; changes in employer contributions to social insurance programs; rising relative prices for consumer goods, which reduces workers' purchasing power; and a decline in labour's share of aggregate income.

Our main result is that rising earnings inequality accounts for half the 1.03 percentage-point gap, with a decline in labour's income share and a deterioration of labour's purchasing power accounting for the remaining half. Employer social contributions played no role. Further analysis of the inequality component reveals that real wage growth in recent decades has been fastest at the top and at the bottom of the earnings distribution, with relative stagnation in the middle. Our findings are consistent with a 'hollowing out of the middle' story, rather than a 'super-rich pulling away from everyone else' story.

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Labour Productivity and the Distribution of Real Earnings in Canada, 1976 to 2014

Executive Summary

Canadian labour is more productive than ever before, but there is a pervasive sense among Canadians that the living standards of the 'middle class' have been stagnating. Over the 1976-2014 period, labour productivity in Canada grew by 1.12 per cent per year while median real hourly earnings grew by only 0.09 per cent per year. This disconnect between rising labour productivity and stagnant earnings for the median worker likely explains the prevailing sense of middle class malaise.

Economic history and economic theory suggest that labour productivity growth should generate rising living standards for workers over time, so the gap between annual labour productivity growth and annual median wage growth is puzzling. What factors account for it? In this report, we decompose the 1.03 percentage-point gap between labour productivity growth and median real hourly earnings growth into four components:

1. rising earnings inequality;
2. changes in employer contributions to social insurance programs;
3. rising relative prices for consumer goods, which reduces workers' purchasing power; and
4. a decline in labour's share of aggregate income.

The main result of this exercise is that rising earnings inequality accounts for half the 1.03 percentage-point gap, with a decline in labour's income share and a deterioration of labour's purchasing power accounting for the remaining half. Employer social contributions played no role.

Empirical Strategy

We develop an accounting method that decomposes the overall 1.03 percentage-point growth gap between labour productivity and median real hourly earnings into the four components listed above.

- **Earnings inequality:** The inequality component is the gap between the growth rates of average and median real hourly earnings. If the gains from labour productivity growth flow disproportionately to workers who were already high earners, then average earnings rise relative to the median. This contributes positively to the growth gap between labour productivity and median real hourly earnings.

- **Employer social contributions:** Total labour compensation includes both earnings and supplementary labour income, defined as employer contributions to social insurance programs (e.g. the Canada Pension Plan or the Employment Insurance system). The exclusion of this form of compensation from the earnings data may explain part of the measured gap between labour productivity growth and median real hourly earnings growth.
- **Labour's terms of trade:** Workers produce and sell output at one price (the "output price"), then use the proceeds (i.e. their labour compensation) to buy consumer goods at another price (the "consumption goods price"). The two prices differ because, in general, the bundle of goods consumed by consumers in Canada is not the same as the bundle of goods produced in the domestic economy. If consumer prices rise relative to output prices, workers' purchasing power decreases. We refer to this as a deterioration in labour's terms of trade. Since labour productivity is measured in output units while real earnings are measured in units of consumer goods, a deterioration in labour's terms of trade decreases workers' real earnings relative to labour productivity, and hence increases the productivity-earnings gap.
- **Labour's share of income:** In any given year, the total income generated in the economy is paid either to factors of production (labour and capital). Over the long term, these aggregate shares are determined by technological and institutional factors. Technological or institutional changes that reduce the importance of labour in production or reduce the bargaining power of labour against other factors of production can reduce labour's share of aggregate income.

We show that the total productivity-earnings gap is an additive combination of these four components:

$$\Delta\% \text{ Gap} = \Delta\% \text{ Inequality} + \Delta\% \text{ Employer Social Contributions} \\ - \Delta\% \text{ Labour Terms of Trade} - \Delta\% \text{ Labour Share}$$

where the notation $\Delta\% X$ denotes the per cent change of any variable X .

Empirical Findings

The main findings of the report are as follows:

- Rising earnings inequality accounts for 51 per cent of the 1.03 percentage-point gap over the 1976-2014 period, with a decline in labour's income share and a deterioration of labour's terms of trade accounting for 30 per cent and 19 per cent, respectively. Employer social contributions played no role.
- If the increased income generated by labour productivity growth has not flowed to the median worker in the form of higher earnings, where has it gone? Our analysis suggests a two-part answer to this question:

1. **Higher earnings at the top and bottom of the earnings distribution:** Much of the increase in labour productivity over the 1976-2014 period did flow to Canadian workers -- just not to the *median* worker. Since 1997 (the first year for which we have detailed data on the distribution of wages), the fastest real wage growth has occurred at the top and at the bottom of the earnings distribution. Earnings in the middle of the distribution have been relatively stagnant. Thus, the story is a 'hollowing out of the middle' rather than 'the super-rich taking all the gains.'
 2. **Higher incomes for capital owners:** Between 1976 and 2014, labour's share of aggregate income declined from 59.9 per cent to 53.3 per cent. This decline was accompanied by a corresponding increase in capital's share of income.
- Our accounting strategy does not reveal the causes of these changes, but we relate our findings to existing research that, we suspect, provides an explanation. The most plausible explanations for both the 'hollowing out of the middle' of the earnings distribution and the decline of labour's share of income are globalization, technological change, and institutional change:
 1. **Globalization** has allowed capital to seek the highest returns globally and, at the same time, has brought workers in Canada's traded goods sector into competition with the workers of low-wage countries.
 2. **Technological change** in robotics and computer software have increased the scope for capital-labour substitution in the performance of routine production tasks. Such tasks -- production-line work, computation-intensive white-collar work, and so on -- formerly provided jobs with wages in the middle of the earnings distribution.
 3. **Institutional changes**, such as the decline of unionization among workers, may have been an additional contributing factor.

Our findings do not imply that labour productivity growth has not been beneficial for Canadian workers, nor does it imply that policy efforts to raise productivity growth would be misplaced. Labour productivity growth has increased the compensation of Canadian workers, just not in the 'middle class.' To the extent that Canadians are unhappy with the way in which income growth has been distributed in recent decades, policy can be used to adjust that distribution. Productivity growth makes this easier, not harder; it is easier to ensure that everyone receives a larger slice of the pie when the pie itself is growing.

That being said, the forces that are likely causing the stagnation of middle-class earnings are unlikely to disappear in the near future. If anything, the possibilities for further substitution of capital for labour are likely to expand with the advent of self-

driving vehicles, self-service technology in retail, automated fast food preparation, and so on. At some point, policymakers will have to grapple with the implications of these changes for the living standards of the middle class.

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Labour Productivity and the Distribution of Real Earnings in Canada, 1976 to 2014¹

I. Motivation and Background

Canada's workers are more productive than ever. Between 1976 and 2014, Canada's labour productivity -- the volume of goods and services produced in the average hour of work in Canada -- increased by 52.5 per cent, or 1.12 per cent per year.²

At the same time, a common view holds that Canada's 'middle class' is experiencing economic stagnation. In its 2016 budget, the Government of Canada expressed this view as follows:

[Even] though there has been economic growth over the past three decades, it hasn't much benefitted the middle class. Too often, the benefits have been felt only by already wealthy Canadians, while the middle class and those working hard to join it have struggled to make ends meet. (Government of Canada, 2016)

Survey evidence confirms that this sentiment is pervasive among Canadians. Graves (2014) refers to an "almost universal public consensus that the middle class is in crisis." The share of Canadians who self-identify as 'middle class' fell from 67 per cent in the early 2000s to 47 percent at the end of 2014 (EKOS Research, 2014). Canadian workers do not feel that their improved productivity has raised their standard of living.

Evidence on wage growth in recent decades suggests that these workers may have a point. While cumulative growth in labour productivity over the period was 52.5 per cent, the hourly earnings of the median worker grew by only 3.3 per cent after adjusting for the rising cost of living. This disconnect between growing labour productivity and stagnant earnings for the median worker likely goes a long way toward explaining the prevailing sense of middle class malaise.³

¹The report was written by James Ugucconi and Alexander Murray, both economists at the Centre for the Study of Living Standards (CSLS) and Andrew Sharpe, CSLS Executive Director. The authors would like to thank CSLS Chair Don Drummond for extensive comments that improved the flow and readability of the paper. Email: james.ugucconi@gmail.com; alexander.murray@csls.ca, and andrew.sharpe@csls.ca.

²See Appendix Tables 1-3 at the end of this report for data for all years for the 1976-2014 for all variables discussed in the report.

³This stagnation of middle class earnings in Canada at first glance appears inconsistent with the view that Canada's middle class is the most affluent in the world as recently reported in the *New York Times* (Austen and Leonhard, 2014 and Leonhardt and Quealy, 2014). The explanation for this apparent paradox may lie in three factors. First, this report focuses on growth rates, while the *New York Times* articles are on income levels. A country can have a high level of income but experience a slow growth rate. Second, this study reports on hourly earnings while the *New York Times* articles report on household income, which includes transfers payments and investment income. Third, household income is determined by the incomes of all members in the household that work, so increased employment rates can boost household income relative to average earnings.

Economic history and economic theory suggest that labour productivity growth should generate rising living standards for workers over time, so the apparent disconnect between labour productivity growth and wage growth is puzzling. What factors account for it? In this report, we show that the gap between labour productivity growth and median hourly earnings growth can be decomposed into contributions from the following four sources:

1. rising earnings inequality;
2. changes in the importance of employer contributions to social insurance programs as a form of labour compensation;
3. rising relative prices for consumer goods; and
4. a decline in labour's share of aggregate income.

Each of these components has its own implications for the welfare of workers. To the extent that the productivity-earnings gap simply reflects a rising share of labour compensation being paid in the form of employer contributions to social insurance plans, for example, it is not obvious that workers are any worse off. On the other hand, rising earnings inequality or a decline in labour's share of income might represent more serious obstacles to broad-based prosperity.

As we will show, it turns out that rising earnings inequality has been the greatest single contributor to the productivity-earnings gap. Over the 1976-2014 period, 51 per cent of the gap was accounted for by rising earnings inequality. A declining labour share and a rising relative price of consumer goods (which reduces workers' purchasing power) also made substantial contributions to the gap, while changes in employers' social contributions were a negligible factor.

If rising inequality is the leading driver of the productivity-earnings gap, is the story simply that super high-earning individuals are leaving everyone else behind? When we examine the wage data more closely, we uncover a subtler story. Wage growth in recent decades has been highest at the top *and* at the bottom of the wage distribution, with relative stagnation in the middle. These findings are consistent with a 'hollowing out of the middle' narrative, as one finds in the recent literature on the phenomenon of 'labour market polarization'.⁴

In the rest of the present section, we provide evidence on recent trends in labour productivity and in several measures of labour remuneration. Most of our results are evident in these trends, though our technical analysis later in the report will make the results quantitatively precise. We then discuss related literature. This material provides motivation and context for the more detailed analysis that follows.

⁴ The literature on labour market polarization finds that technological change and globalization have led to a decline in middle-wage jobs in advanced economies, so that employment and wage growth occur only in high-wage and low-wage occupations. This occurs because traditional middle-wage jobs are the ones most susceptible to automation or outsourcing. See Autor and Dorn (2013), Autor *et al.* (2006) and Jaimovich and Siu (2012), among others.

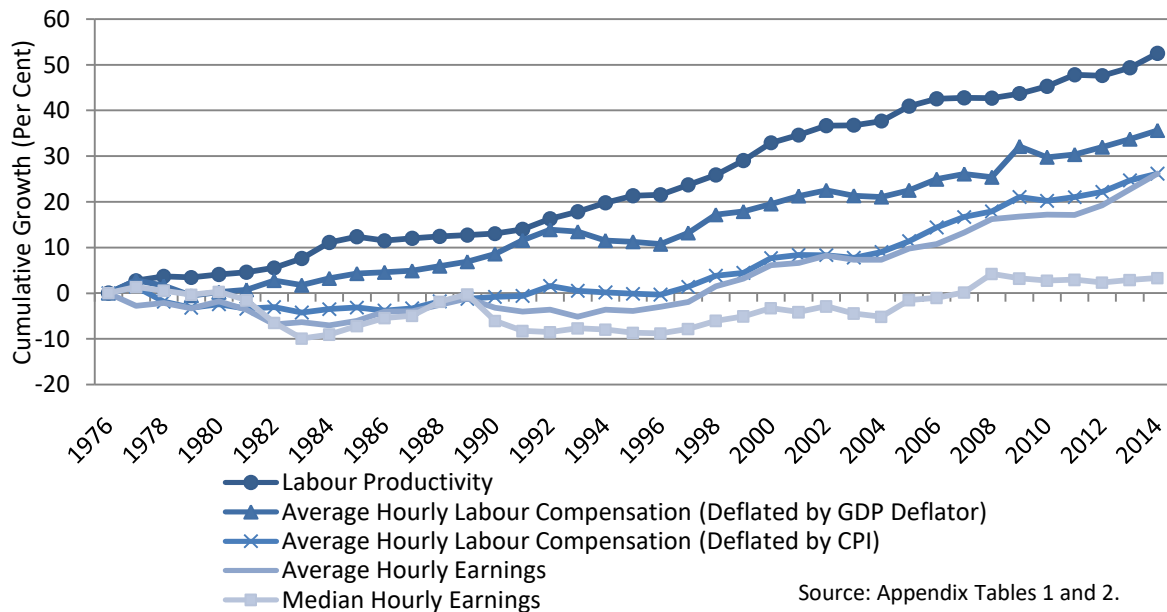
The remainder of the report is structured as follows. In Section II, we describe our framework for decomposing the gap between labour productivity growth and median annual earnings growth into the components listed above. In Section III, we present the results of the decomposition. Results are presented for the full 1976-2014 period and for five sub-periods chosen based on the timing of business cycle peaks. Section IV contains a concluding discussion.

Preliminary Evidence

Chart 1 depicts the *prima facie* evidence for the view that middle class living standards have been stagnant in recent decades in spite of considerable growth in labour productivity. The chart indicates that growth of labour remuneration has not kept pace with labour productivity over the 1976-2014 period. Most strikingly, while growth in labour productivity over the period was 52.5 per cent (or 1.12 per cent per year), the hourly earnings of the median worker grew by only 3.3 per cent (or 0.09 per cent per year).⁵ The 1.03 percentage-point gap between these annual growth rates is what we seek to explain.

How can we understand the disconnect between labour productivity growth and median earnings growth? The three remaining lines in Chart 1 provide a starting point. While median hourly earnings were stagnant, *average* hourly earnings grew by 26.2 per cent (or 0.61 per cent per year) over the 1976-2014 period. The difference between these

Chart 1: Cumulative Growth in Labour Productivity and in Four Measures of Real Labour Remuneration, Canada, Per Cent, 1976-2014



⁵ Following Statistics Canada (1997), earnings are defined as “the sum of wages and salaries, and net self-employment income.”

two data series is that the *median* wage reflects the experience of workers in the middle of the wage distribution while the *average* wage is dragged upward by super high-earning individuals. Thus, it appears that rising earnings inequality has played a significant role in the stagnation of median earnings; the gains from labour productivity growth are largely accruing to *some* workers, but not much is going to the *median* worker.

The next line in Chart 1 depicts average hourly labour compensation deflated by the consumer price index (CPI). This data series differs from average hourly earnings in that it includes employer contributions to social insurance programs on workers' behalf, in addition to the wage and salary earnings counted in the average hourly earnings data.

Average hourly labour compensation (deflated by the CPI), sometimes referred to as the consumer wage, increased by 26.2 per cent (or 0.61 per cent per year) over the 1976-2014 period, exactly the same cumulative growth as was exhibited by average hourly earnings. This implies that employer contributions to social insurance programs appears to have played a negligible role in the productivity-earnings gap over the 1976-2014 period.

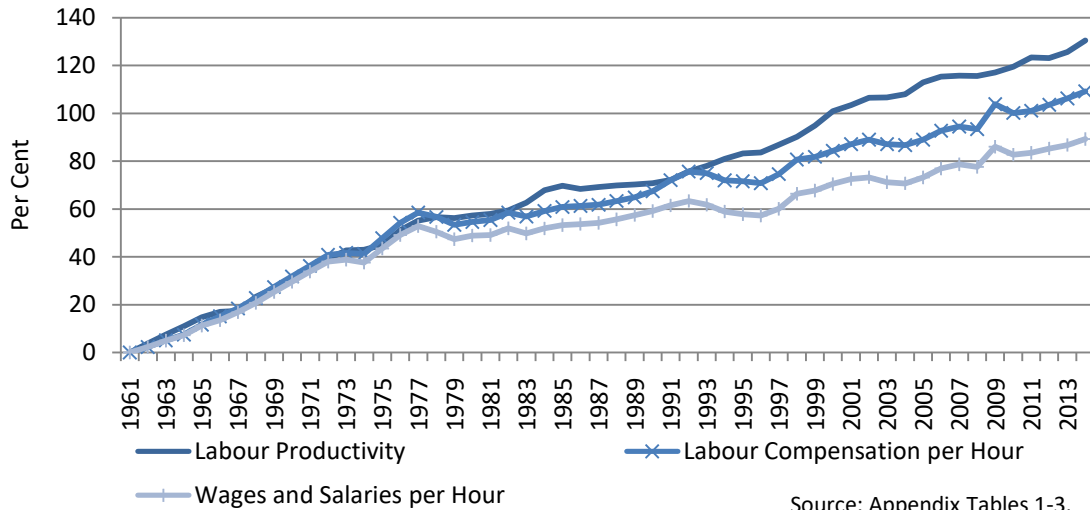
The final line in Chart 1 depicts average hourly labour compensation deflated by the GDP deflator, a measure of the growth of output prices. This measure is often called the producer wage. The gap between the two average hourly labour compensation measures reflects the difference between the growth rates of the output price and the consumption goods price; that is, changes in labour's terms of trade.⁶

Average hourly labour compensation (deflated by the GDP deflator) increased by 35.6 per cent (or 0.81 per cent per year) over the 1976-2014 period, 0.2 percentage-points per year faster than CPI-deflated average hourly labour compensation or average hourly earnings. Consumer prices grew faster than output prices over the period, which ate into workers' purchasing power.

Thus, two factors -- rising earnings inequality and the rising relative price of consumer goods -- appear to explain much of the gap between labour productivity growth and median earnings growth. But they do not explain all of the gap; there remains a substantial discrepancy between labour productivity growth and average hourly labour compensation growth (deflated by the GDP deflator). In our formal analysis in Sections II and III, we attribute this remaining gap to a decline in labour's share of aggregate income; a greater share of all the income generated in Canada is being paid either as compensation to other factors of production (primarily capital) or as rents to the holders of market power, with less left for compensation to labour.

⁶ The output price index (formally called the GDP deflator) is an average price for all goods and services produced in Canada, while the consumer price index is an average price for all the goods and services consumed in Canada. The two price indexes can differ because the bundle of goods produced in Canada is not the same as the bundle of goods consumed in Canada. For example, Canada produces products for export to other countries. The prices of those goods show up in the output price index but not in the consumer price index.

Chart 2: Cumulative Growth in Labour Productivity and in Two Measures of Real Labour Remuneration, Canada, Per Cent, 1961-2014



Thus, the four factors listed above provide a complete account of the sources of the productivity-earnings gap depicted in Chart 1. Our formal analysis in Sections II and III brings quantitative precision to this accounting.

The fact that median earnings have not kept pace with labour productivity may be a matter of concern for workers, but should we be surprised by it? Some economists might answer this question in the negative. They would point out that, under standard assumptions, economic theory implies that labour productivity should grow at roughly the same rate as *average* hourly labour compensation over the long run. The standard theory is silent about the distribution of earnings. A stagnant median wage in the presence of rising labour productivity presents no inconsistency with basic economic theory; it simply implies that the wage distribution is becoming more unequal, and standard theory has never precluded that possibility.

This defense of the basic theory is partly correct, but it ignores the fact that, as noted above, even *average* hourly labour compensation has not kept pace with labour productivity since 1976. This discrepancy is strongly at odds with standard economic theory. Moreover, it represents a change relative to Canada's earlier economic history. Average hourly labour compensation grew at the same rate as labour productivity between 1961 and the mid-1970s (Chart 2).⁷ It was only after 1976 that the two series

⁷ 'Median Hourly Earnings' could not be included in Chart 2 because that data series begins in 1976. 'Average Hourly Earnings' also starts in 1976, so in Chart 2 we have used an analogous series called 'Wages and Salaries per Hour' that can be estimated back to 1961. We do not use 'Wages and Salaries per Hour' in our main analysis because, unlike our preferred 'Average Hourly Earnings' series, Statistics Canada's 'Wages and Salaries' series does not include the earnings of the self-employed. To construct the series in Chart 2, we computed wages and salaries as a share of the total compensation of employees and multiplied that share by our total labour compensation series (which includes both employees and the self-employed). The underlying assumption is that employer social contributions account for the same share of total compensation among the self-employed as among employees -- an assumption that is unlikely to hold in reality. (For example, the self-employed do not pay EI contributions on their own behalf, but pay both employer and employee CPP premiums) Nevertheless, this 'Wages and Salaries per Hour' series is useful for illustrative

became decoupled (although average labour compensation did briefly catch up to labour productivity in the early 1990s before falling behind again). Average hourly wages and salaries also grew at the same rate as labour productivity until the mid-1970s, which indicates that employer contributions to social insurance programs as a share of total labour compensation did not change much until then.

Thus, recent trends in labour productivity and in labour compensation are puzzling from the perspectives of both economic theory and economic history. The stagnation of real earnings for the median worker while labour productivity has continued to grow appears to have generated a pervasive sense that Canada's middle class is in crisis. These facts provide the context for the analysis in this report.

Literature Review

The stagnation of real median earnings in Canada is not a new observation. Fisher and Hostland (2002) observe that labour productivity outpaced real wage growth from 1994 to 2001. Bartlett and Tapp (2012) noticed that labour productivity growth largely outpaced compensation growth from the mid-1990s through to 2012 in Canada. The gap, however, is not limited to Canada – the International Labour Organization (2015) observed that real wages grew much slower than labour productivity from 1999 through to 2013 in developed countries across the board.

Fisher and Hostland (2002), however, conclude that policy makers ought not to be worried about the gap. They argue that though the growth of real wages can and does deviate from labour productivity growth for several years, ultimately the two can be expected to revert to growing together as history has shown because labour's share of income tends to revert to its mean. They argue that policy makers ought to be most concerned about sustaining labour productivity in the face of changing demographics.

Sharpe *et al.* (2008b) decompose the divergence between real median wages and labour productivity into four overarching factors: rising inequality, changing terms of trade for labour, a decrease in labour's share of income, and measurement inconsistencies.⁸ They find that from 1980 to 2005, labour productivity grew 1.26 percentage points per year faster than median real earnings. They decompose the gap into their four factors, attributing 0.35 percentage points per year to inequality, 0.42 percentage points per year to terms of trade for labour, 0.25 percentage points per year to labour's share of income, and 0.25 percentage points per year to measurement issues.⁹ Unfortunately, because they employ census data on median real earnings, they are unable to decompose the 1980 to 2005 period into peak-to-peak sub-periods. Our paper largely

purposes in Chart 2. A final technical note: all the series in Chart 2 are inflation-adjusted using the output price index to facilitate direct comparison in light of economic theory.

⁸ The term "labour's terms of trade" refers to the ratio of consumption goods prices to producer prices, while the term "measurement inconsistencies" refers to the combined effect of employer social contributions and changes in hours of work per worker.

⁹ Our estimates for the 1980 to 2005 period are broadly similar to those obtained by Sharpe *et al.* (2008b). For 1980 to 2005 we estimate the gap to be 1.41 percentage points per year, of which: inequality made up 0.52 percentage points; terms of trade accounted for 0.28 percentage points; labour's share of income contributed 0.41 percentage points per year; and measurement inconsistencies made up the remaining 0.20 percentage points.

follows the method of Sharpe *et al.* but improves upon it in two respects. First, we present a more comprehensive analysis by expanding the time period from 1980-2005 to 1976-2014. Second, we analyze peak-to-peak sub-periods to discuss how the gap evolved over time.

Pessoa and Van Reenen (2012) perform a decomposition of median wage growth and productivity growth similar to the one presented in Sharpe *et al.* (2008b) for the United Kingdom and the United States. They propose that there are two different types of measurements for the divergence – “gross decoupling” and “net decoupling”. The former measures differences in growth between labour productivity and median hourly real earnings, while the latter measures differences in growth between labour productivity and average labour compensation per hour (deflated with the same deflator). Gross decoupling accounts for changes to labour’s share of income, labour’s terms of trade, changes median and mean hourly earnings, and the wedge between labour compensation and earnings, while net decoupling accounts on for changes to labour’s share of income. Ultimately, Pessoa and Van Reenen (2012) find little evidence of net decoupling in the UK, but significant gross decoupling in the United States and the UK. In the UK, gross decoupling was driven by differences between mean and median earnings and the wedge between earnings and labour compensation.

Pessoa and Van Reenen (2012) recognize that both gross decoupling and net decoupling are important policy indicators. As gross decoupling relates the “true middle” of the earnings distribution to labour productivity, it avoids issues of a skewed average and uses a more tangible income concept from the point of view of the worker (e.g. EI contributions made by the employer may not be considered income by a given worker). As gross decoupling also deflates earnings with the CPI and labour productivity with the GDP deflator, it also captures any difference in the prices faced by firms and workers. This is an important distinction to make because firms and consumers can at times face very different prices. Changes in capital equipment prices affect firms' costs more than consumers' costs, for example. Net decoupling, on the other hand, is important because it challenges one of the main stylized facts cited by economists – labour’s stable share of income. Pessoa and Van Reenen observe that net decoupling could occur for a whole host of reasons, including shocks which disturb the long run equilibrium, technological biased against labour, changes to the level of competition in the market (in the product market it results in setting higher prices, while in the labour market it results in setting lower wages), and finally changes to labour supply due to structural phenomena like globalization.

Mishel and Gee (2012) also employ Sharpe *et al.* (2008b)’s methodology. Much like us, they perform an analysis comparing median real wages in the United States with labour productivity. Like most of the literature, they also find that a significant gap between labour productivity and median real wages. Mishel and Gee show that rising wage inequality accounted for 0.61 percentage points of the 1.56 per cent per year gap from 1973 to 2011, while labour’s terms of trade accounted for another 0.44 percentage points. They specifically point to the erosion of labour standards, globalization, high trade deficits, and the rising share of capital depreciation in GDP to explain both growing

inequality and the changes in the distribution of income towards capital.

Dufour and Russell (2015) argue that the distribution of the gains from productivity growth is governed by the relative bargaining power of employers and workers, and that a decline in workers' bargaining power can explain part of the productivity-earnings gap. They show that average real wages tracked labour productivity growth fairly well in Canada until the late 1970s, but thereafter the two diverged as average real wage growth slowed. Ultimately, Dufour and Russell argue that public policies led to the gap between productivity and wage growth by diminishing labour's bargaining power.

II. Empirical Framework

Our decomposition of the gap between labour productivity growth and median real hourly earnings growth follows the approach developed in Sharpe *et al.* (2008a). In this section, we formally describe this approach. The first subsection presents the technical details of the decomposition without much commentary. In the second subsection, we provide a conceptual discussion of each of the components of the decomposition and explain how they should be interpreted. In the final subsection, we describe the data sources we will use.

A. Decomposition Method

The starting point for the decomposition is the following accounting identity:

$$\frac{Y_L}{P_C \times L} = \frac{Y}{P_Y \times L} \times \frac{Y_L}{Y} \times \frac{P_Y}{P_C} \quad (1)$$

Here, Y_L is total nominal labour compensation, P_C is the price of consumption goods, and L is total hours worked. Y is total nominal output (or income) in the economy and P_Y is the price of output.

Thus, the ratio $\frac{Y_L}{P_C \times L}$ denotes average real hourly labour compensation in units of consumption goods (i.e. the "consumer wage"). On the right-hand side, the ratio $\frac{Y}{P_Y \times L}$ denotes real output per hour in units of output goods; that is, labour productivity. $\frac{Y_L}{Y}$ is labour's share of total income in the economy. The remaining term $\frac{P_Y}{P_C}$ is the relative price of output goods in terms of consumption goods; following the literature, we will refer to this as "labour's terms of trade." More will be said about this in subsection B below.

For any variable X , let the notation $\Delta\% X$ denote the per cent growth rate of X . Then expressing equation (1) in growth rates, we obtain

$$\begin{aligned} \Delta\% \text{ Average Real Hourly Compensation} \\ &= \Delta\% \text{ Labour Productivity} + \Delta\% \text{ Labour Share} \\ &+ \Delta\% \text{ Labour Terms of Trade} \end{aligned} \quad (2)$$

Our goal is to explain changes in the gap between labour productivity and median real hourly earnings. Let $\Delta\% \text{ Gap}$ denote the productivity-earnings growth gap. Formally, it is defined by

$$\Delta\% \text{ Gap} = \Delta\% \text{ Labour Productivity} - \Delta\% \text{ Median Real Hourly Earnings} \quad (3)$$

Rearranging (2) and using (3) to eliminate labour productivity growth, we obtain

$$\begin{aligned} \Delta\% \text{ Gap} = & \Delta\% \text{ Average Real Hourly Compensation} \\ & - \Delta\% \text{ Median Real Hourly Earnings} - \Delta\% \text{ Labour Share} \\ & - \Delta\% \text{ Labour Terms of Trade} \end{aligned} \quad (4)$$

Now, the change in average real hourly earnings relative to median real hourly earnings is an indicator of the change in earnings inequality over time. Thus, we define the change in inequality as

$$\begin{aligned} \Delta\% \text{ Inequality} = & \Delta\% \text{ Average Real Hourly Earnings} \\ & - \Delta\% \text{ Median Real Hourly Earnings} \end{aligned} \quad (5)$$

Finally, we need to relate average real hourly compensation to average real hourly earnings. As we discuss in more detail below, the difference between these two measures reflects the impact of changes in employer contributions to social insurance programs:

$$\begin{aligned} \Delta\% \text{ Average Real Hourly Compensation} - \Delta\% \text{ Average Real Hourly Earnings} \\ = \Delta\% \text{ Employer Social Contributions} \end{aligned} \quad (6)$$

Substituting (5) and (6) into (4) yields the overall decomposition:

$$\begin{aligned} \Delta\% \text{ Gap} = & \Delta\% \text{ Inequality} + \Delta\% \text{ Employer Social Contributions} \\ & - \Delta\% \text{ Labour Terms of Trade} - \Delta\% \text{ Labour Share} \end{aligned} \quad (7)$$

Equation (7) is the final decomposition formula. Having presented the technical details of its derivation, we now proceed to discuss its interpretation.

B. Interpreting the Decomposition

The object of interest to us is $\Delta\% \text{ Gap}$, the discrepancy between labour productivity growth and median real hourly earnings growth. Equation (7) expresses this gap in terms of four components, each of which has a precise economic interpretation. In this subsection, we provide a brief explanation of each of the four components. We then conclude with general comments about the decomposition.

Inequality

The inequality component is the gap between the growth rates of average and median real hourly earnings. Empirically, the Canadian distribution of earnings is positively skewed; its mean is greater than its median because the mean is dragged

upward by very high earners. When earnings at the top of the distribution grow more quickly than those in the middle of the distribution, the mean rises relative to the median and earnings inequality rises. This would imply that the gains from labour productivity are flowing disproportionately to workers who were already high earners relative to the median worker, so $\Delta\% \text{ Inequality}$ contributes positively to $\Delta\% \text{ Gap}$.

Employer Social Contributions

Total real compensation includes employer contributions to social insurance programs (e.g. the Canada Pension Plan or the Employment Insurance system) while real earnings do not. It is possible that part of the gap between labour productivity growth and median hourly earnings growth is accounted for by workers receiving a growing amount of their compensation in the form of employer contributions to social insurance programs rather than cash or in-kind earnings. Whether this makes workers worse off depends on how much they value the social programs.

Labour's Terms of Trade

The accounting identity in equation (1) includes two prices: the consumption goods price P_C and the output goods price P_Y . These average prices differ because, in general, the bundle of goods consumed by consumers is not the same as the bundle of goods produced in the domestic economy.¹⁰

Labour productivity is defined as the volume of output goods produced per hour of work, so the relevant price is P_Y . Workers ultimately want to use their compensation to buy consumption goods, so the relevant price for measuring real labour compensation is P_C . The discrepancy between labour productivity and real labour compensation is therefore influenced by the ratio $\frac{P_Y}{P_C}$. Following the literature, we refer to this ratio as "labour's terms of trade."¹¹

When $\Delta\% \text{ Labour Terms of Trade} > 0$, consumer prices are falling relative to output prices. Everything else being equal, this increases workers' purchasing power relative to labour productivity, and hence reduces the gap between labour productivity growth and real earnings growth. That is why labour's terms of trade enter equation (7) with a negative sign.

¹⁰ For example, Canada produces goods that are exported to other countries rather than purchased by Canadian consumers. The prices of those exports are included in the output price P_Y but not in the consumption price P_C .

¹¹ Clearly, an analogy is being drawn between $\frac{P_Y}{P_C}$ and the more common notion of "terms of trade," which is the ratio of a country's export prices to its import prices. Intuitively, P_C is the price of the goods workers buy and P_Y is the price of the goods workers produce and sell. It is to workers' advantage when the price of what they sell increases relative to the price of what they buy, just as it is to a country's advantage when the price of what it sells (its exports) increases relative to the price of what it buys (its imports).

Labour Share

The final term in equation(7) accounts for changes in total labour compensation as a share of aggregate income in the economy. Labour productivity measures the economy's average output per hour of labour supplied by workers, but part of that output is paid to other factors of production (primarily capital). The remaining share accrues to labour. These aggregate shares are determined by technological and institutional factors in the long run, though they can be influenced by supply and demand conditions in the short run.

When labour's share rises, the gap between labour productivity growth and labour compensation growth falls. This is why labour's share enters equation(7) with a negative sign.

General Comments

The decomposition in equation (7) represents an accounting exercise and does not, on its own, justify any statements about cause and effect. Did the gap between labour productivity and median real annual earnings increase *because* earnings inequality increased for some reason? Or did measured earnings inequality increase *because* the productivity-earnings gap increased for some reason? An accounting decomposition cannot answer such a question.¹² To address such questions would require a structural model that explains why each of the components changed the way it did.

Nevertheless, we think the accounting approach is useful. It draws our attention to the relationships between the productivity/earnings gap and several other economic phenomena -- rising earnings inequality and the changing impact of laws governing employer contributions to social insurance programs, and so on. It lends a disciplined, quantitative characterization to those relationships. It suggests areas for future research that might clarify the causal mechanisms at play.

C. Data

We had several different options available for the labour compensation data (be it compensation, wages, salaries, or earnings) we could employ in this report. As noted by Sharpe *et al.* (2008a), neither the Survey of Employment, Payroll and Hours series nor the Major Wage Settlements series cover all works or all types of labour compensation. The earnings series reported by the Survey of Labour and Income Dynamics (SLID) and the wage series reported by the Labour Force Survey (LFS) exclude employer social contributions. System of National Accounts (SNA) data includes labour compensation for all jobs in the economy, and includes employer social contributions. Income and Expenditure Accounts data includes employer social contributions, but it does not include

¹² Similar questions can be asked about the other components as well. Did earnings grow more slowly than productivity because labour's share of income declined? Or did labour's share of income decline because earnings grew more slowly than labour productivity?

Exhibit 1: Comprehensiveness of Labour Compensation Data from Various Sources

	Includes self-employed	Includes supplementary labour income	Covers total economy
Survey of Employment, Payroll, and Hours	X	X	X
Major Wage Settlements	X	X	X
Survey of Labour and Income Dynamics	✓	X	✓
Labour Force Survey	✓	X	✓
System of National Accounts	✓	✓	✓
Income and Expenditure Accounts	X	✓	✓
Productivity Accounts	✓	✓	X

compensation for all workers as it excludes the self-employed.¹³ Finally, the Productivity Accounts data includes all workers and both forms of compensation, but only the business sector. Exhibit 1 summarizes these considerations.

The bulk of our analysis employs the SLID and SNA data, though we do supplement the SLID data with the LFS microdata. The SNA data allows us to relate average hourly real compensation growth with labour productivity growth for all workers in the economy from 1961 to 2014. The SLID data allow us to investigate the distribution of earnings growth and compare it with our estimates of labour productivity growth. The SLID data cover 1993 to 2011 and were extended back to 1976 using the Survey of Consumer Finance data.

Starting in 2012, the Canadian Income Survey replaced the SLID. While the Canadian Income Survey still presents information on the distribution of incomes by reporting averages and medians, the dataset has two major drawbacks: it reports incomes by census family and unattached individuals rather than by earner; and it does not

¹³The treatment of self-employed workers in the literature on the productivity/wage relationship varies depending on data availability and the researchers' stance on trading off precision for accuracy. The generally agreed upon best practice is to include the self-employed rather than exclude them. The major issue with self-employed individuals is that income from self-employment reflects both a return to labour and to capital. Because dividends and labour income receive different tax treatments, tax data on labour income likely may not reflect the economic realities of labour's marginal revenue product. As such, most national statistics agencies adjust the market income of the self-employed (earnings from both labour and capital) to impute their labour earnings. Our earnings data from SLID includes net self-employment income. Our compensation data from the SNA on the other hand takes net mixed income (self-employment income less capital consumption) and apportions half of it to self-employed labour income.

differentiate between labour income and income from other sources. Consequently, we use the rate of change from the hourly wage variable from 2012 to 2014 from the LFS microdata deflated with the CPI to extend the SLID data to 2014.¹⁴

Although the LFS in its current form has existed since 1976, it only began asking respondents about their wages in 1997. When these data are available, the LFS allows us to investigate the distribution of wage growth at far more depth than simply looking at the relative growth of medians and averages. For example, using the LFS we can investigate how specific percentiles grow relative to average wage growth, and thereby better understand who specifically benefits from growth a given period. We opted for the SLID data over the LFS in this case because the link between labour productivity and real wages is a long run phenomenon, and the LFS time series is simply too short. The LFS will be more useful in the future, as the trade-off between depth of investigation and scope of study becomes less acute.

One important definitional difference we would like to stress is earnings versus labour compensation. We use total labour compensation to construct our real wage estimates. Compensation includes all wages and salaries paid to the workers for their work *as well as* social contributions made by the employer on behalf of the employee. These social contributions include both mandatory contributions to programs such as EI or the CPP and other social insurance schemes such as a registered pension fund, health insurance from an insurance company, or programs operated by the employers themselves. Earnings only include the labour market income of the worker.

Finally, median and average real earnings from the SLID is available only on an annual basis. In order to make an apples-to-apples comparison between earnings and labour productivity, we require earnings on an hourly basis. In our analysis, we approximate median hourly earnings by dividing the annual series by the average number of hours worked per worker in that year. This approximation is imperfect to the extent that the change in annual hours worked has differed across workers.¹⁵

III. Decomposition Results

This section presents and discusses the decomposition results. We begin with an overall summary of the results. We then devote one subsection to detailed analysis of each of the four components: earnings inequality, employer social contributions, labour's terms of trade, and labour's share of income.

¹⁴ Data for 2012-2014 are obtained by extrapolating the SLID series using the growth rate of median and average hourly earnings from the LFS. The SLID and LFS series overlap for the period 1997-2011. Over that period, median real annual earnings grew by 0.44 per cent per year in the SLID and by 0.53 per cent per year in the LFS.

¹⁵ Hours per worker declined by 0.22 per cent per year over the 1976-2014 period. If we did not adjust median annual earnings for this decline in per-worker hours worked (that is, if we measured the gap between labour productivity growth and median annual earnings rather than median hourly earnings), the annual growth gap would be 0.22 percentage points larger and hours per worker would show up as a fifth component of our decomposition.

A. Summary of Results

The decomposition results are summarized in Table 1. Over the 1976-2014 period, the growth gap between labour productivity and median real hourly earnings was 1.03 per cent per year. Of that gap, rising earnings inequality accounted for 0.53 percentage points, or 51 per cent of the total gap. A declining labour share of aggregate income accounted for the next largest component: 0.31 percentage points, or 30 per cent of the gap. A deterioration of labour's terms of trade -- that is, an increase in consumer prices relative to output prices, which reduces workers' purchasing power -- accounted for the remaining 0.20 percentage points, or 19 per cent of the total gap. Employer social contributions were a non-factor; their percentage-point contribution to the gap was zero up to two decimal places.

In addition to the results for the full 1976-2014 period, Table 1 contains results for six sub-periods. The cut-off dates are business cycle peaks (except for the first and last years, which are determined by data availability). The analysis reveals that the proximate sources of the productivity-earnings gap differ from sub-period to sub-period. In 1976-1981, the productivity-earnings gap was large (1.21 per cent per year) in spite of declining inequality. The gap in that period was driven by a large deterioration in labour's terms of trade and a large decline in the labour share of income. The contribution of inequality has tended to increase over time (except for the 2000-2008 period, which was

Table 1: Decomposition of the Growth Gap between Labour Productivity and Median Real Hourly Earnings into Four Components, Canada, 1976-2014

	Labour Productivity	Median Real Hourly Earnings	Gap	Inequality	Employer Social Contributions	Labour's Terms of Trade	Labour Share
	<u>Growth (per cent per year)</u>			<u>Percentage Point Contributions to the Gap</u>			
1976-2014	1.12	0.09	1.03	0.53	0.00	0.20	0.31
1976-1981	0.90	-0.32	1.21	-0.41	0.03	0.92	0.76
1981-1989	0.94	0.16	0.78	0.15	-0.03	0.48	0.19
1989-2000	1.51	-0.28	1.79	0.92	0.14	0.24	0.48
2000-2008	0.89	0.94	-0.05	0.20	0.01	-0.55	0.29
2008-2014	1.12	-0.14	1.26	1.52	-0.24	0.18	-0.20
				<u>Per Cent Contributions to the Gap</u>			
1976-2014	--	--	--	51.0	0.17	19.1	29.7
1976-1981	--	--	--	-33.9	2.5	75.8	62.3
1981-1989	--	--	--	19.5	-4.0	61.9	24.0
1989-2000	--	--	--	51.7	7.8	13.3	26.6
2000-2008	--	--	--	--	--	--	--
2008-2014	--	--	--	120.5	-19.0	14.4	-15.9

Note: Per cent contributions to the gap are not computed for the 2000-2008 period because the total gap was close to zero over that period.

an unusual period in that the overall productivity-earnings gap was essentially zero). The contribution of labour's terms of trade has tended to decline as consumer price inflation and output price inflation have both stabilized at a similar level (around the Bank of Canada's two per cent annual inflation target). The contribution of labour's share has varied from period to period, while that of employer social contributions has in general been small.

In the most recent period, 2008-2014, the 1.52 percentage-point contribution of rising inequality accounts for more than 100 per cent of the 1.26 percentage-point productivity-earnings growth gap.

B. Earnings Inequality

Thomas and Ugucconi (2016) show that economic inequality has risen considerably in Canada in recent decades, particularly in the 1990s. Our data also show growing inequality in Canada as mean and median hourly real earnings have diverged. Between 1976 and 2014, median hourly earnings increased 0.09 per cent per year (from \$17.1 to \$17.7) while mean hourly earnings increased 0.61 per cent per year (from \$20.3 to \$25.7) (Chart 3, Panel A). Thus, average earnings exceeded median earnings by 19 per cent in 1976 and by 45 per cent in 2014 (Chart 3, Panel B). Average earnings began to pull away from median earnings in the late 1980s, and earnings inequality grew quickly throughout the 1990s. Inequality stabilized in the early 2000s, but appears to have begun another steep increase after 2010. Table 2 summarizes the inequality component and its determinants -- the growth rates of median and average real hourly earnings -- for the 1976-2014 period and for the six peak-to-peak sub-periods.

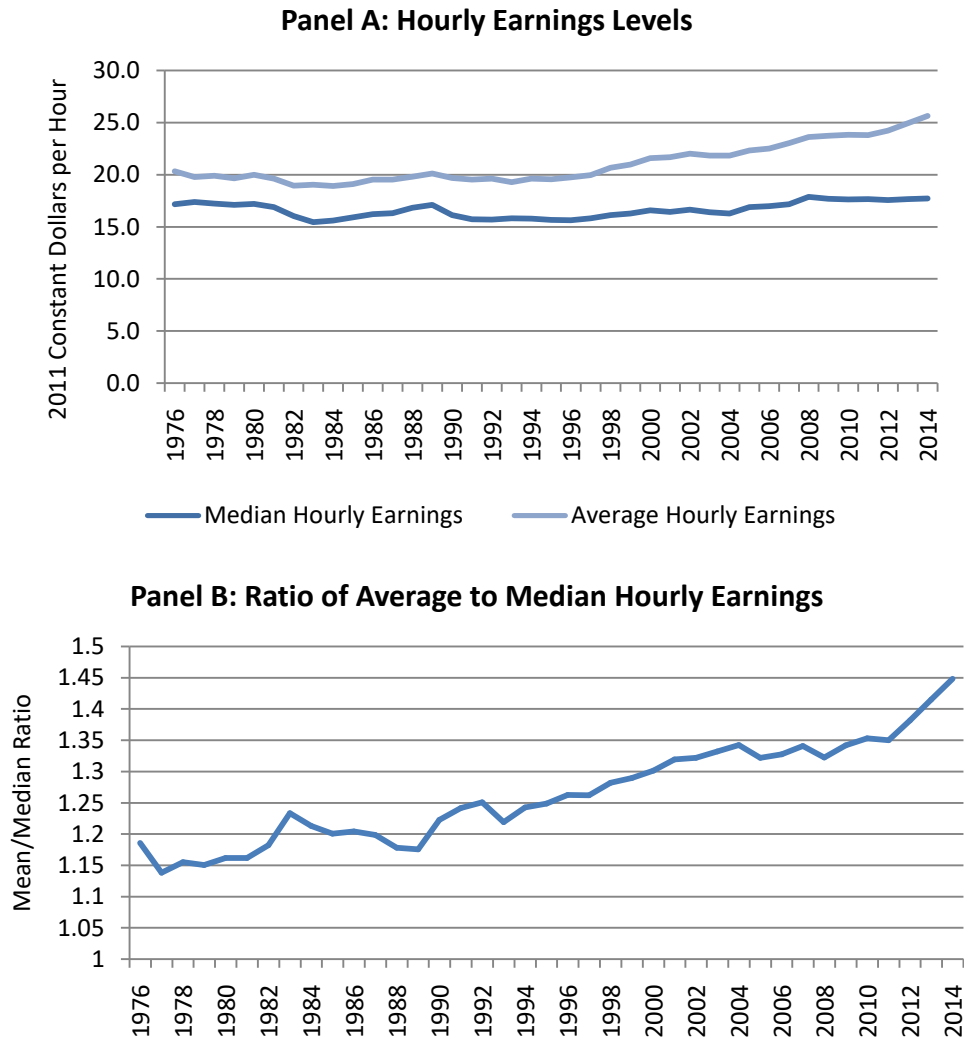
Growing inequality is not simply a matter of comparing mean and median workers, but rather a matter of widening the distribution of earnings on the whole. Using

Table 2: Wage Inequality Component and its Determinants, Canada, 1976-2014

	Average Real Hourly Earnings	Median Real Hourly Earnings	Inequality Component
	A	B	C = A - B
1976-2014	0.61	0.09	0.53
1976-1981	-0.73	-0.32	-0.41
1981-1989	0.31	0.16	0.15
1989-2000	0.65	-0.28	0.93
2000-2008	1.14	0.94	0.20
2008-2014	1.38	-0.14	1.53

Growth rates are in per cent per year.

Chart 3: Average and Median Real Hourly Earnings, Canada, 2011 Constant Dollars per Hour, 1976-2014



Source: Appendix Table 2.

Labour Force Survey microdata obtained from Statistics Canada, we construct hourly real earnings for all workers by deflating nominal hourly earnings with the CPI. Our data only cover 1997 to 2014, but still allow us to important insights into the evolution of inequality in the 2000 to 2008 and 2008 to 2014 periods. The results are presented in Table 3 and in Chart 4.¹⁶

¹⁶ Although the annual growth rates of median hourly earnings in the SLID and the LFS are similar for the 1997-2011 period (at 0.44 per cent and 0.53 per cent, respectively), Table 2 and Table 3 reveal substantial differences between the growth rates implied by the two data series for sub-periods. This reflects a combination of sampling error and definitional differences (e.g. the LFS "earnings" data exclude bonuses and stock options). It may also reflect error arising from our assumption that the change in annual hours worked has been the same for all workers. Nevertheless, we think the analysis of differences in wage growth across the wage distribution -- which the LFS makes possible -- remains informative in spite of the existence of some discrepancies between the two data sources.

Table 3: Distribution of Real Hourly Wage Growth, Canada, Per Cent per Year, 1997-2014

Real hourly earnings	1997-2014	2000-2008	2008-2014
Mean	0.75	0.82	0.81
Percentile			
1 st	1.73	1.26	2.37
10 th	0.75	0.74	1.44
20 th	0.60	0.72	0.64
30 th	0.85	0.78	0.68
40 th	0.63	0.39	0.83
50 th	0.47	0.55	0.34
60 th	0.61	0.59	0.75
70 th	0.66	0.58	0.84
80 th	0.82	0.97	0.86
90 th	0.94	1.19	0.73
99 th	1.02	1.18	0.75

Percentiles constructed using Labour Force Survey microdata.

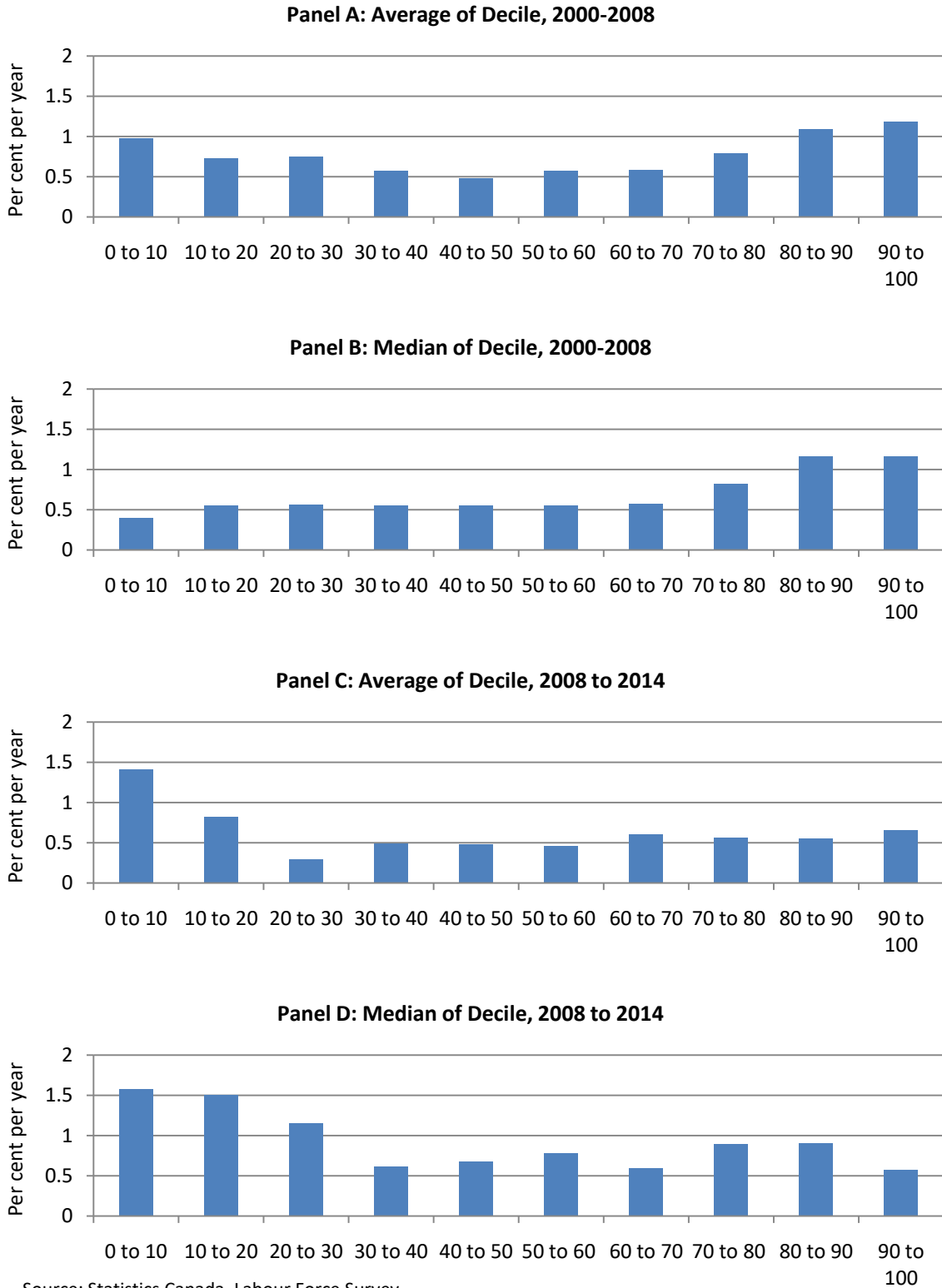
First and foremost, in Table 3 we see the divergence between median (50th percentile) and average hourly real earnings which our inequality component of the gap measures in all three periods. Average hourly real earnings grew much quicker than median hourly real earnings from 2000 to 2008 and from 2008 to 2014.

Earners in the 99th percentile (the "top one per cent") experienced stronger hourly real earnings growth than any of the deciles from 1997 to 2014 and in the 2000 to 2008 peak to peak period, though the 1st percentile's hourly real earnings grew faster than the 99th percentile's from 1997 to 2014 and in both sub-periods. From 2008 to 2014, real earnings growth for the 99th percentile was in line with growth throughout the middle of the distribution, defined as the middle three deciles. The highest growth rates were actually experienced by earners in the bottom decile of the distribution during the 2008-2014 period.

Real earnings growth across the deciles is not uniform. Given that average earnings have grown more rapidly than median earnings in recent decades, it is not surprising that the deciles above the median exhibited faster real earnings growth relative to the median itself. What is perhaps more surprising, however, is the U-shaped distribution of real earnings growth depicted in Chart 4. Workers in the middle range of the wage distribution during the 2000-2008 period experienced the slowest growth for the period. In fact, the real earnings of the 10th percentile grew almost as quickly as the real earnings of the 80th percentile from 2000 to 2008.

For the purposes of our decomposition, we focus on mean real earnings compared to the median. We acknowledge that this does not necessarily capture the "big picture" of inequality changes in Canada. Inequality measures like the Gini coefficient better represent overall inequality in Canada by relying on information from the whole distribution rather than particular points. Chart 5 plots the Gini coefficient for real hourly earnings from 1997 to 2014. It shows a slight rise in earnings inequality from 1998 to

Chart 4: Distribution of Real Hourly Earnings Growth, Canada, Per Cent per Year, 2000-2014



Source: Statistics Canada, Labour Force Survey.

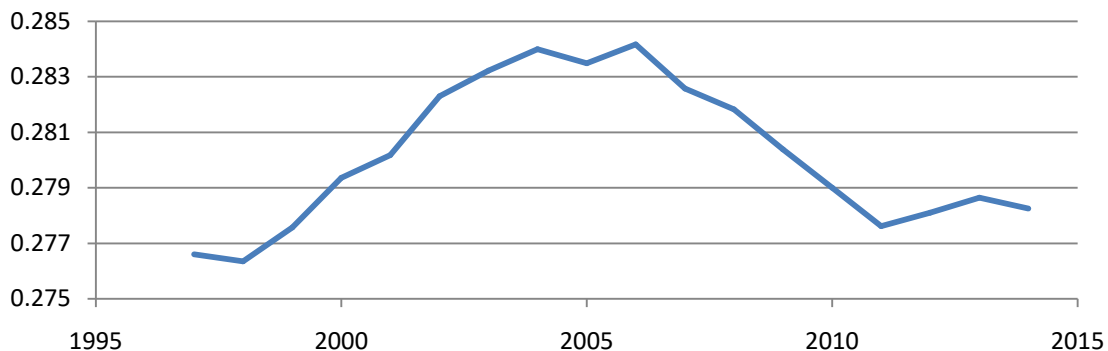
2004 (around 2.8 per cent), and falling earnings inequality from 2006 onwards. Thus, what we call the 'inequality' component of the gap might more accurately be thought of as a 'middle class stagnation' component, where we identify the 'middle class' with the median of the earnings distribution.

Overall, the inequality component contributed 0.53 percentage points per year to the gap between productivity growth and median hourly earnings growth over the 1976-2014 period, making it the largest contributor of any of the components. What explains the stagnation of earnings in the middle of the wage distribution in recent decades? The two forces that have received the most attention in the literature are globalization and technological change.

The world's increased openness to international flows of goods and capital has created opportunities for capital in advanced economies to seek high returns around the world and, at the same time, has brought workers in these economies into competition with the workers of relatively low-wage countries. Recent research suggests that the effect on employment levels and wages in advanced economies resulting from trade with low-wage countries may be larger and more persistent than economists once thought.¹⁷ We would expect these effects to be largest in industries with the greatest direct trade exposure, such as manufacturing -- industries that traditionally accounted for many jobs in the middle part of the wage distribution.

Technological change also affects the distribution of earnings. Traditionally, economists have focused on the notion of skill-biased technological change; that is, the idea that advanced technologies tend to raise the wages of highly skilled workers relative to the wages of comparatively unskilled workers. More recently, some economists have pointed out that computer technology is increasingly able to automate the kinds of routine tasks once performed by middle-wage workers in clerical or middle-management

Chart 5: Gini Coefficient for Real Hourly Earnings, Canada, 1997-2014



Source: Statistics Canada, Labour Force Survey.

¹⁷See Acemoglu *et al.* (2016), Autor *et al.* (2013a), Autor *et al.* (2016) and Autor *et al.* (2014), among others.

occupations. This is on top of the continuing automation of factory jobs, which also used to comprise part of the middle of the wage distribution. The result of these technological forces is 'labour market polarization,' a phenomenon whereby the middle of the wage distribution is 'hollowed out' and workers' labour market outcomes are increasingly bifurcated between highly skilled, high-wage 'winners' and low-wage 'losers.'¹⁸ Our findings on the U-shaped distribution of real earnings growth are consistent with a story like this.

As noted in the introduction to this report, economic theory implies that labour productivity and *average* real hourly labour compensation should grow at roughly the same rate over the long term. In terms of how middle class people feel about their economic situation, however, median hourly earnings is arguably a more important measure than average hourly compensation. The fact that earnings inequality accounts for 51 per cent of the gap between labour productivity growth and median real hourly earnings growth implies that the theoretical link between labour productivity and labour compensation may not have broken down as much as it might seem at first glance. Labour productivity is still leading to earnings growth for workers, but that earnings growth is benefitting workers at the top and at the bottom of the earnings distribution while the median worker -- the representative of the 'middle class' -- has benefitted hardly at all.

That being said, economic theory has not been vindicated yet. After accounting for earnings inequality, 49 per cent of the productivity-earnings gap remains to be explained. We now proceed to the next step in our decomposition.

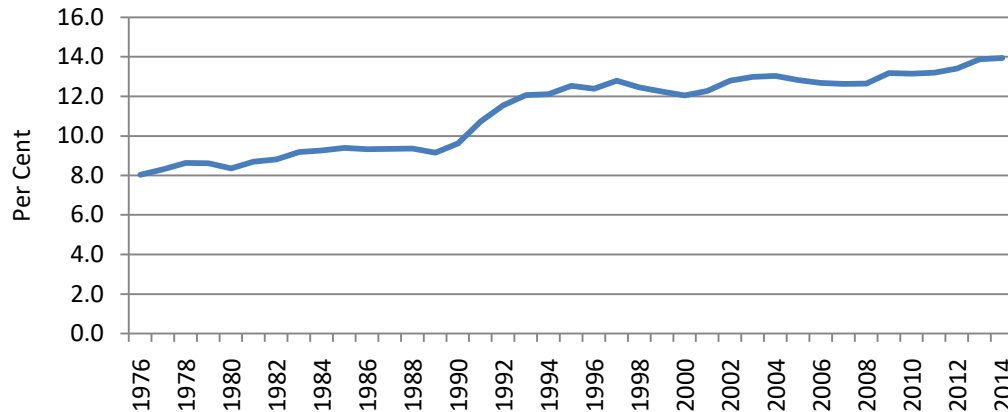
C. Employers' Social Contributions

In addition to wages and salaries and taxable in-kind benefits captured on T4 tax forms, workers take part of their compensation in the form of government-mandated employer contributions to social insurance programs (e.g. the Canada Pension Plan and Employment Insurance). These contributions are included in real hourly labour compensation, but not in real hourly earnings. Thus, part of the gap between labour productivity growth and median hourly earnings growth should in principle be accounted for by growth of employers' social contributions. In practice, Chart 1 and Table 1 show that over the 1976-2014 period the growth rate for average hourly earnings and average hourly labour compensation was the same, which implies that employer social contributions made a negligible contribution to the productivity-earnings growth gap.

This result is somewhat surprising because employer social contributions as a share of employees' compensation increased from 8.0 per cent in 1976 to 13.9 per cent in 2014 (Chart 6). If employer social contributions grew over the period (and, indeed, grew faster than earnings), we might have expected that growth to show up as a contribution to the productivity-earnings growth gap. It is noteworthy that the fastest growth of employer social contributions occurred in the 1990s, and the sub-period decompositions in Table 1

¹⁸ See Autor *et al.* (2006), Autor and Dorn (2013), Autor *et al.* (2013b), Autor *et al.* (2015), and Jaimovich and Siu (2012), among others.

Chart 6: Employer Social Contributions as a Share of Labour Compensation, Employees Only, Canada, 1976-2014



Source: Appendix Table 3.

do show that the employer social contributions component made a non-negligible contribution to the gap during the 1989-2000 sub-period. On the other hand, employer social contributions made a substantial negative contribution to the gap in the 2008-2014 period even though the value of employer social contributions continued to grow in the data underlying Chart 6.

A possible explanation for these findings is that they reflect the influence of the self-employed. While in principle the SLID includes net self-employment income in earnings, due to self-reporting it may not capture it as comprehensively as the productivity statistics, which are based on tax data. Slower growth in self-employment income than in wages and salaries would hence reduce labour compensation growth relative to earnings growth and offset the upward effect on labour compensation growth from the more rapid growth in employer social contributions. This was the actual situation over the 1976-2014 period when nominal self-employment income grew at a 4.3 per cent average annual rate, compare to 5.9 per cent for labour compensation (Appendix Table 3).

In addition, measurement error in SLID may mean that the average hourly earnings are systematically overstated. This would reduce the gap between labour compensation growth and earnings growth -- which is supposedly due to the faster growth in employer social contributions.

D. Labour Terms of Trade

As we explained in Section II, the term "labour's terms of trade" refers to the ratio of the output price P_Y to the consumer price P_C . These average prices differ because, in general, the bundle of goods consumed by consumers is not the same as the bundle of goods produced in the domestic economy. Workers produce output and receive compensation for their labour services, which is used to buy consumer goods. If consumer prices rise relative to output prices, workers' purchasing power falls compared

to what it would have been if both consumer prices rose at the same rate as output prices. We would refer to such a situation as a deterioration in labour's terms of trade. Since labour productivity is measured in output units while real earnings are measured in units of consumer goods, a deterioration in labour's terms of trade decreases workers' real earnings relative to labour productivity, and hence increases the productivity-earnings gap.

Over the 1976-2014 period, worsening terms of trade for labour accounted for 0.20 percentage points (or 19 per cent) of the gap between labour productivity growth and median real hourly earnings growth (Table 1). For the 1976-2014 period and for the six peak-to-peak sub-periods, Table 4 shows how changes in output prices (measured by the GDP deflator) and consumption prices (measured by the consumer price index, or CPI) led to the changes in labour's terms of trade shown in Table 1.¹⁹

In every sub-period except 2000-2008, consumer price inflation exceeded output price inflation and, hence, labour's terms of trade deteriorated. Labour's terms of trade made its largest contributions the gap in the 1976-1981 and 1981-1989 sub-periods, adding 0.92 percentage points per year and 0.48 percentage points per year in each period respectively. CPI growth slowed relative to GDP deflator growth as time went on, so much so that from 2000 to 2008 it actually decreased the gap by 0.55 per cent per year. This in part reflected the impact of cheap imports from countries such as China. From 2008 to 2014 CPI growth picked up relative to the GDP deflator, but terms of trade only contributed 0.18 percentage points per year to the gap.

Table 4: Labour Terms of Trade and Its Determinants, Canada, 1976-2014

	Output Price (GDP Deflator)	Consumption Price (CPI)	Change in Labour's Terms of Trade
	A	B	C = A - B
1976-2014	3.54	3.73	-0.20
1976-1981	8.82	9.74	-0.92
1981-1989	4.81	5.30	-0.48
1989-2000	2.00	2.24	-0.24
2000-2008	2.81	2.26	0.55
2008-2014	1.38	1.56	-0.18

Growth rates are in per cent per year.

¹⁹ The labour terms of trade numbers in Table 4 and in Table 1 have opposite signs because labour's terms of trade enters the decomposition (equation (7)) with a negative sign. Thus, the negative terms of trade values in Table 4 show up in Table 1 as positive contributions to the productivity-earnings gap.

Table 5: Growth of the Implicit Price Indexes for Expenditure Components of GDP, Canada, Per Cent per Year, 1981-2014

	Final Consumption Expenditure	Household Final Consumption Expenditure	General Governments Final Consumption Expenditure	Gross Fixed Capital Formation	Exports of Goods and Services	Imports of Goods and Services
1981-2014	2.83	2.61	3.41	2.10	1.48	1.09
1981-1989	5.33	5.20	5.56	3.43	1.50	1.35
1989-2000	2.27	2.16	2.74	1.02	1.91	2.14
2000-2008	2.02	1.63	2.98	2.53	1.75	-0.52
2008-2014	1.66	1.36	2.41	1.75	0.31	0.98

Growth rates in terms of per cent per year.

Table 5 shows the implicit price indexes of the various components of GDP from 1981 to 2014. The CPI roughly tracks the implicit price index of household final consumption expenditure, and comparison of Table 4 and Table 5 confirms that the two price indexes grew at similar rates in each sub-period. The GDP deflator, however, is affected by the implicit prices indexes of the other constituent parts of GDP. Implicit price indexes of imports and exports are driven by changes in the exchange rate of the Canadian dollar against foreign currencies, as well as commodity prices and the differences in inflation rates between Canada and its trade partners. While the growth rates of export and import prices were well below the growth rate of household final consumption expenditure prices, overall their weight in GDP is small, so their effect on the GDP deflator's growth is likely minimal.

A second explanation for the deterioration of labour's terms of trade lies in capital equipment prices. The price index for gross fixed capital formation grew at a much lower rate than that of household final consumption expenditure throughout the 1980s and 1990s. This likely explains most of the difference in growth between the CPI and GDP deflator in that time period. The major difference between the consumption and investment prices over these two period was the falling price of investment in information and communication technology (ICT) equipment. As ICT investment prices fell, they pulled down the implicit price index of gross fixed capital formation and, with it, the overall GDP deflator.

E. Labour Share of Income

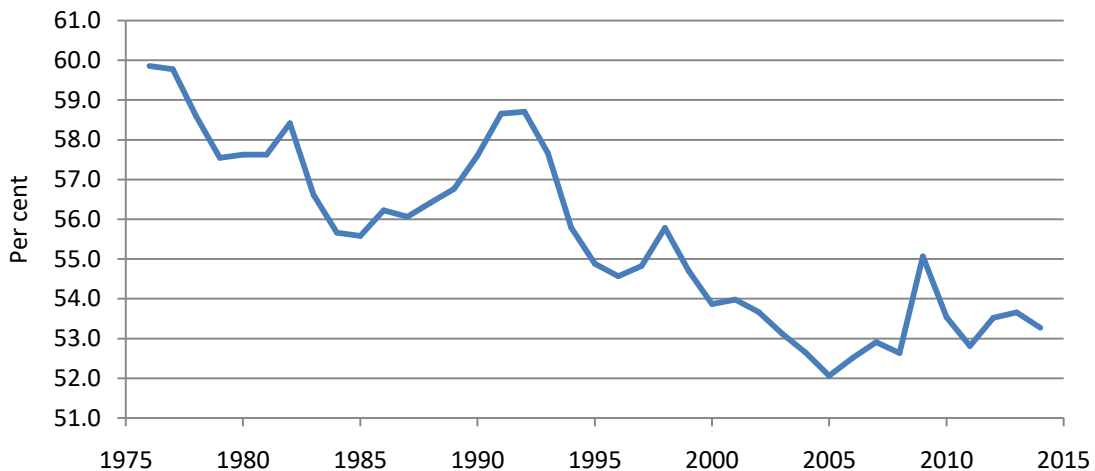
We began with the growth gap between labour productivity and median real hourly earnings. After adjusting for earnings inequality, employer social contributions, and labour's terms of trade, we are left with the growth gap between labour productivity and average real hourly labour compensation, both inflation-adjusted using the output price index. Standard economic theory suggests that this gap should be zero over the long term because labour market competition should force firms to raise wages in line with productivity growth.

Our empirical decomposition shows that earnings inequality, employer social contributions and labour's terms of trade together account for 70.3 per cent of the productivity-earnings gap. That part of the gap may have substantial implications for middle class Canadians' subjective sense of their own economic welfare, but it poses no challenge to economic theory. The remaining 29.7 per cent of the gap, however, does represent a breakdown of the traditional view that labour productivity and average labour compensation should grow together.

That traditional view is based on the assumption that labour's share of aggregate income remains approximately constant over time.²⁰ If instead the structure of the economy changes in a way that reduces labour's aggregate income share, then such a change would show up in the data as a wedge between labour productivity growth and average real hourly labour compensation growth. That is precisely what we observe in the Canadian data. Thus, we attribute the remaining 29.7 per cent of the productivity-earnings gap to a decline in labour's share.

Labour income's share of total income has decreased from 59.9 per cent in 1976 to 53.3 per cent in 2014. Broadly speaking the decline of labour's share of income was steady, with reversals from 1986 to 1993 and 2005 to 2009. Those temporary improvements reflect the fact that returns to capital are more volatile than wages over the business cycle, so that labour's share of income tends to rise during recessions and fall during the early parts of booms. The effects of recessions are transitory, however; the long-term trend in labour's share is downward.

Chart 7: Labour Compensation as a Share of GDP, Canada, Per Cent, 1976-2014



Source: Appendix Table 1.

²⁰ This assumption was initially based on historical observation, and it led to the development of theories in which the income shares of factors of production remain constant over time because of the nature of production technology in the economy.

Overall, labour's share of income fell 0.31 per cent per year from 1976 to 2014. As shown in equation (7), changes in labour's share of income contribute inversely to the gap, meaning a fall in the former contributes growth to the latter and vice versa. Consequently, labour's share of income added 0.31 percentage points per year to the gap from 1976 to 2014 – the second-largest contribution of any component. Labour's share of income fell the most during the 1976 to 1981 period, adding 0.76 percentage points per year to the gap.

Labour's lost share of income is largely accounted for by an increase in the income share of gross operating surplus.²¹ From 1981 to 2014, the net operating surplus of corporations as a share of aggregate income in Canada increased from around 23.7 per cent to 27.5 per cent. Over the same period, labour's share of income fell by almost 4 percentage points (Chart 7). As net operating surplus reflects payments to capital net of depreciation, an increase in net operating surplus reflects increased profit margins. The gap can therefore be somewhat explained by the diminished importance of labour to production, and the increased importance of capital. This explanation also fits with the bargaining power explanation of the gap proposed by Dufour and Russell (2015), as labour's diminished importance to production deprives it of some clout at the bargaining table.

In a recent report, the OECD (2012) offers an explanation of the falling income share of labour from 1990 to 2007 in OECD countries. In theory, this development could simply be a matter of labour movement from labour-intensive sectors to relatively capital-intensive sectors. However, the OECD argues that developments *within* sectors have been more important than changes between sectors. They find that total factor productivity growth and capital deepening explain up to 80 per cent of the falling share of labour. Traditionally, total factor productivity growth has worked as a complement to employment, but the OECD posits that the technological developments of recent decades are entirely different than the technological developments which relied on workers in the past. Specifically, investment in information and communication technologies in the last two decades have boosted productivity across the board, but have also led to the automation of repetitive jobs. This is closely related to the literature on labour market polarization, which we mentioned in our discussion of earnings inequality above.

The OECD (2012) also finds that globalization accounted for at least 10 per cent of the fall of labour's share of income in advanced economies. Consistent with Dufour and Russell, they argue that the effects of globalization operate on labour's share through bargaining power both because of increased domestic competition (reduced transportation costs allow for delocalized supply chains) and increased international competition (the threat of offshoring and import competition).

²¹ Gross operating surplus is the income of corporations, governments, households, and non-profit institutions serving households accruing to the capital factor of production from the production of goods and services. Its increased share was driven by increased net operating surplus of corporations (i.e. capital remuneration) and a slight uptick in capital consumption by corporations (likely due to the increased importance of ICT capital investments, which depreciate quicker than conventional capital equipment due to obsolescence).

Finally, the OECD (2012) proposes other more minor sources of labour's share of income worth considering. They argue that the privatization of state major owned firms in many advanced economies in the early 1990s led to significant productivity gains, in part from shedding unproductive labour. Indeed, in the Canadian case Ugucioni (2016) found that the privatization of Canadian National Railway in 1995 was followed by significant cuts to labour at the firm. The OECD also argue that the coverage and structure of bargaining institutions also affect the extent of the fall of labour's share of income by affecting bargaining power. Minimum wages could also affect labour's share, although the direction of the effect is ambiguous; a minimum wage increase raises some workers' wages directly but may also incite employers to exploit opportunities for automation (especially because minimum wage workers are predominantly low skilled).

IV. Conclusion

Over the 1976-2014 period, labour productivity in Canada grew by 1.12 per cent per year. Over the same period, median real hourly earnings were stagnant; they grew only 0.09 per cent per year. This means that while Canadian labour was growing more productive over time, middle-class workers did not feel that their living standards were rising.

In this report, we have decomposed the 1.03 percentage-point gap between labour productivity growth and median real hourly earnings growth into four components: earnings inequality, employer social contributions, labour's terms of trade, and labour's share of aggregate income. Our main accounting result is that rising earnings inequality accounts for half the 1.03 percentage-point gap, with a decline in labour's income share and a deterioration of labour's terms of trade accounting for the remaining half. Employer social contributions played no role.

If the increased income generated by labour productivity growth has not flowed to the median worker in the form of higher earnings, where has it gone? Our analysis suggests a two-part answer to this question:

1. **Higher earnings at the top and bottom of the earnings distribution:** Much of the increase in labour productivity over the 1976-2014 period did flow to Canadian workers -- just not to the *median* worker. In recent decades, the fastest real wage growth has occurred at the top and at the bottom of the earnings distribution. Earnings in the middle of the distribution have been relatively stagnant.
2. **Higher incomes for capital owners:** Between 1976 and 2014, labour's share of aggregate income declined and capital's share increased.

Our accounting decomposition does not reveal the reasons for these developments, but in our discussion we related our findings to existing research that, we suspect, provides part of the explanation. Globalization has allowed capital to seek the highest returns globally and, at the same time, has brought workers in Canada's traded

goods sector into competition with the workers of low-wage countries such as China and India. At the same time, technological developments in robotics and computer software have increased the scope for capital-labour substitution in the performance of routine production tasks. Such tasks -- production-line work, computation-intensive white-collar work, and so on -- formerly provided jobs with wages in the middle of the earnings distribution. Institutional factors, such as the decline of unionization, may have been an additional contributing factor.²²

As these forces play out, labour market outcomes for Canadian workers are increasingly bifurcated. Highly skilled workers (e.g. people who can design new computer software) enjoy high earnings growth. Their increased demand for services may deliver spillover benefits in the form of higher wage growth in low-wage occupations. But in the middle, earnings do not grow.

Our findings do not imply that labour productivity growth has not been beneficial for Canadian workers, nor does it imply that policy efforts to raise productivity growth would be misplaced. Labour productivity growth has increased the compensation of Canadian workers, just not in the 'middle class.' To the extent that Canadians are unhappy with the way in which income growth has been distributed in recent decades, policy can be used to adjust that distribution. Productivity growth makes this easier, not harder; it is easier to ensure that everyone gets a larger slice of the pie when the pie itself is growing over time.

That being said, the forces that are likely causing the stagnation of middle-class earnings are unlikely to disappear in the near future. If anything, the possibilities for further substitution of capital for labour are likely to expand with the advent of self-driving vehicles, self-service technology in retail, automated fast food preparation, and so on. At some point, policymakers will have to grapple with the implications of these changes for the living standards of the middle class.

²² In recent decades, these phenomena have been exhibited not only in Canada but also in other advanced economies. In a study of eleven OECD countries, Ugucioni and Sharpe (2016) show that productivity growth has exceeded real wage growth in eight of the eleven countries since the mid-1980s.

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Appendix Table 1: Labour Input, Labour Compensation, Output, and Prices Indexes, Canada, Total Economy, 1976-2014

	Total number of Jobs (jobs x1000)	Hours worked for all jobs (hours x1,000,000)	Total compensation for all jobs (current dollars x1,000,000)	Median annual earnings (2011 constant dollars)	Average annual earnings (2011 constant dollars)	GDP (current dollars x1,000,000)	Consumer Price Index (2007 = 100)	GDP Deflator (2007 = 100)	Total compensation as a share of GDP (per cent)
	A	B	C	D	E	F	G	H	I
1976	9,829	18,175	121,912	31,700	37,600	203,684	27.9	30.1	59.9
1977	10,002	18,309	134,519	31,800	36,200	225,050	30.1	32.1	59.8
1978	10,286	18,862	146,122	31,600	36,500	249,395	32.8	34.3	58.6
1979	10,742	19,620	163,845	31,200	35,900	284,735	35.9	37.7	57.5
1980	11,086	19,922	184,505	30,900	35,900	320,190	39.5	41.5	57.6
1981	11,426	20,518	211,542	30,300	35,200	367,121	44.4	46.0	57.6
1982	11,067	19,685	225,937	28,500	33,700	386,773	49.2	50.2	58.4
1983	11,156	19,804	237,589	27,400	33,800	419,691	52.1	53.0	56.6
1984	11,430	20,315	256,171	27,700	33,600	460,243	54.3	54.9	55.7
1985	11,787	21,042	276,841	28,400	34,100	498,075	56.5	56.7	55.6
1986	12,147	21,665	294,860	28,900	34,800	524,450	58.8	58.5	56.2
1987	12,526	22,450	320,650	29,200	35,000	571,926	61.4	61.2	56.1
1988	12,962	23,357	352,267	30,300	35,700	624,401	63.9	64.0	56.4
1989	13,270	23,833	379,775	30,700	36,100	669,026	67.1	67.0	56.8
1990	13,352	23,806	399,168	28,700	35,100	692,997	70.3	69.4	57.6
1991	13,114	23,111	410,135	27,700	34,400	699,253	74.3	71.5	58.7
1992	13,022	22,843	420,302	27,500	34,400	716,019	75.3	72.6	58.7
1993	13,166	23,142	429,395	27,800	33,900	744,608	76.8	73.5	57.7
1994	13,405	23,794	440,461	28,000	34,800	789,507	76.9	74.6	55.8
1995	13,627	24,117	454,950	27,700	34,600	828,973	78.6	76.2	54.9
1996	13,750	24,464	467,640	27,800	35,100	857,023	79.7	77.6	54.6
1997	14,039	25,063	495,532	28,200	35,600	903,902	81.1	78.5	54.8
1998	14,354	25,580	522,856	28,700	36,800	937,295	81.9	78.4	55.8
1999	14,731	26,250	549,416	29,000	37,400	1,004,456	83.3	79.8	54.7
2000	15,067	26,799	593,757	29,500	38,400	1,102,380	85.6	83.3	53.9
2001	15,206	26,931	615,597	29,100	38,400	1,140,505	87.7	84.7	54.0
2002	15,581	27,322	638,346	29,200	38,600	1,189,452	89.7	85.7	53.7

Appendix Table 1: Labour Input, Labour Compensation, Output, and Prices Indexes, Canada, Total Economy, 1976-2014

	Total number of Jobs	Hours worked for all jobs (hours x1000)	Total compensation for all jobs (current dollars x1000)	Median annual earnings (2011 constant dollars)	Average annual earnings (2011 constant dollars)	GDP (current dollars x1,000,000)	Consumer Price Index (2007 = 100)	GDP Deflator (2007 = 100)	Total compensation as a share of GDP (per cent)
	A	B	C	D	E	F	G	H	I
2003	15,919	27,795	664,123	28,600	38,100	1,250,315	92.2	88.5	53.1
2004	16,181	28,465	700,748	28,600	38,400	1,331,178	93.9	91.4	52.6
2005	16,428	28,692	737,673	29,500	39,000	1,417,028	96.0	94.3	52.1
2006	16,685	29,114	783,579	29,600	39,300	1,492,207	97.8	96.8	52.5
2007	17,038	29,668	832,480	29,900	40,100	1,573,532	100.0	100.0	52.9
2008	17,285	29,987	870,048	31,000	41,000	1,652,923	102.3	104.0	52.6
2009	16,986	28,894	863,094	30,100	40,400	1,567,365	102.6	101.6	55.1
2010	17,298	29,459	889,807	30,000	40,600	1,662,130	104.5	104.6	53.5
2011	17,572	29,866	934,765	30,000	40,500	1,769,921	107.5	107.9	52.8
2012	17,764	30,422	975,587	30,055	41,539	1,822,808	109.1	109.2	53.5
2013	18,003	30,739	1,015,312	30,111	42,605	1,892,193	110.1	111.0	53.7
2014	18,109	30,847	1,051,082	30,167	43,698	1,973,043	112.3	112.9	53.3
Growth rates:									
1976-2014	1.62	1.40	5.83	-0.13	0.40	6.16	3.73	3.54	--
1976-1981	3.06	2.45	11.65	-0.90	-1.31	12.50	9.74	8.82	--
1981-1989	1.89	1.89	7.59	0.16	0.32	7.79	5.30	4.81	--
1989-2000	1.16	1.07	4.15	-0.36	0.56	4.64	2.24	2.00	--
2000-2008	1.73	1.41	4.89	0.62	0.82	5.19	2.26	2.81	--
2008-2014	0.78	0.47	3.20	-0.45	1.07	2.99	1.56	1.38	--

Appendix Table 1: Labour Input, Labour Compensation, Output, and Prices Indexes, Canada, Total Economy, 1976-2014

Sources and Notes:

A: From 1997 to 2014, series from CANSIM Table 383-0030 (System of National Accounts Data). 1976-1997 obtained by applying growth rates from CANSIM table 383-0003 to the series. Note that these two series overlap for the period of 1997-2001, and over that time frame 383-0030 grew at a CAGR of 2.04 per cent per year and 380-0003 grew at a CAGR of 2.11 per cent per year.

B: From 1997 to 2014, series from CANSIM Table 383-0030 (System of National Accounts Data). 1976-1997 obtained by applying growth rates from CANSIM table 383-0003 to the series. Note that these two series overlap for the period of 1997-2001, and over that time frame 383-0030 grew at a CAGR of 1.84 per cent per year and 380-0003 grew at a CAGR of 1.95 per cent per year.

C: From 1997 to 2014, series from CANSIM Table 383-0030 (System of National Accounts Data). 1976-1997 obtained by applying growth rates from CANSIM table 383-0003 to the series. Note that these two series overlap for the period of 1997-2001, and over that time frame 383-0030 grew at a CAGR of 5.57 per cent per year and 380-0003 grew at a CAGR of 5.75 per cent per year.

D: From 1976 to 2011, data from CANSIM table 202-0407 (SLID data). 2012-2014 obtained by applying the growth rate of median hourly earnings from our LFS microdata for that period. The two series overlap for the period of 1997 to 2011, and over that time CANSIM table 202-0407 grew at a CAGR of 0.44 per cent per year while the LFS median grew at a rate of 0.53 per cent per year.

E: From 1976 to 2011, data from CANSIM table 202-0407 (SLID data). 2012-2014 obtained by applying the growth rate of average hourly earnings from our LFS microdata for that period. The two series overlap for the period of 1997 to 2011, and over that time CANSIM table 202-0407 grew at a CAGR of 0.93 per cent per year while the LFS average grew at a rate of 0.73 per cent per year.

F: From 1981 to 2014, series from CANSIM Table 384-0038 (Income Expenditure Accounts Data). 1976-1980 obtained by applying growth rates from CANSIM table 380-0017 to the series. Note that these two series overlap for the period of 1981-2011, and over that time frame 384-0038 grew at a CAGR of 5.38 per cent per year and 380-0016 grew at a CAGR of 5.34 per cent per year.

G: Series from CANSIM Table 326-0021.

H: From 1981 to 2014, series from CANSIM Table 380-0066. 1976-1980 obtained by applying growth rates from CANSIM table 380-0056 to the series. Note that these two series overlap for the period of 1981-2011, and over that time frame 380-0056 grew at a CAGR of 2.78 per cent per year and 380-0066 grew at a CAGR of 2.88 per cent per year.

I: Series is the ratio of column C to column F, multiplied by 100.

Appendix Table 2: Earnings, Hourly Labour Compensation, and Labour Productivity, Canada, Total Economy, 1976-2014

	Average Hours worked per year in all jobs	Median hourly earnings (2011 constant dollars)	Average hourly earnings (2011 constant dollars)	Average hourly compensation (2007 dollars; deflated with CPI)	Average hourly compensation (2007 dollars; deflated with GDP deflator)	Labour productivity (2007 dollars per hour)
	A	B	C	D	E	F
1976	1,849	17.14	20.33	24.05	22.25	37.18
1977	1,830	17.37	19.78	24.38	22.87	38.26
1978	1,834	17.23	19.91	23.60	22.60	38.58
1979	1,827	17.08	19.65	23.28	22.13	38.45
1980	1,797	17.20	19.98	23.47	22.30	38.69
1981	1,796	16.87	19.60	23.22	22.41	38.90
1982	1,779	16.02	18.95	23.31	22.86	39.14
1983	1,775	15.44	19.04	23.02	22.64	39.99
1984	1,777	15.59	18.90	23.20	22.97	41.27
1985	1,785	15.91	19.10	23.29	23.20	41.75
1986	1,784	16.20	19.51	23.13	23.26	41.38
1987	1,792	16.29	19.53	23.25	23.34	41.63
1988	1,802	16.82	19.81	23.62	23.57	41.77
1989	1,796	17.09	20.10	23.75	23.78	41.90
1990	1,783	16.10	19.69	23.85	24.16	41.95
1991	1,762	15.72	19.52	23.90	24.82	42.32
1992	1,754	15.68	19.61	24.42	25.34	43.17
1993	1,758	15.82	19.29	24.17	25.24	43.78
1994	1,775	15.78	19.61	24.08	24.81	44.48
1995	1,770	15.65	19.55	24.01	24.76	45.11
1996	1,779	15.62	19.73	23.98	24.63	45.15
1997	1,785	15.80	19.94	24.39	25.19	45.94
1998	1,782	16.10	20.65	24.96	26.07	46.74
1999	1,782	16.27	20.99	25.12	26.23	47.95
2000	1,779	16.59	21.59	25.89	26.60	49.38
2001	1,771	16.43	21.68	26.06	26.99	50.00
2002	1,754	16.65	22.01	26.05	27.26	50.80
2003	1,746	16.38	21.82	25.92	27.00	50.83

Appendix Table 2: Earnings, Hourly Labour Compensation, and Labour Productivity, Canada, Total Economy, 1976-2014

	Average Hours worked per year in all jobs	Median hourly earnings (2011 constant dollars)	Average hourly earnings (2011 constant dollars)	Average hourly compensation (2007 dollars; deflated with CPI)	Average hourly compensation (2007 dollars; deflated with GDP deflator)	Labour productivity (2007 dollars per hour)
	A	B	C	D	E	F
2004	1,759	16.26	21.83	26.22	26.93	51.17
2005	1,747	16.89	22.33	26.79	27.26	52.37
2006	1,745	16.96	22.52	27.51	27.80	52.95
2007	1,741	17.17	23.03	28.06	28.06	53.04
2008	1,735	17.87	23.63	28.35	27.90	53.00
2009	1,701	17.69	23.75	29.11	29.40	53.39
2010	1,703	17.62	23.84	28.91	28.88	53.94
2011	1,700	17.65	23.83	29.11	29.01	54.92
2012	1,713	17.55	24.26	29.38	29.37	54.87
2013	1,707	17.63	24.95	29.99	29.76	55.46
2014	1,703	17.71	25.65	30.35	30.18	56.65
Growth rates:						
1976-2014	-0.22	0.09	0.61	0.61	0.81	1.11
1976-1981	-0.58	-0.32	-0.73	-0.69	0.14	0.91
1981-1989	0.00	0.16	0.31	0.28	0.74	0.93
1989-2000	-0.09	-0.27	0.65	0.79	1.02	1.51
2000-2008	-0.31	0.94	1.14	1.14	0.60	0.89
2008-2014	-0.30	-0.15	1.38	1.14	1.32	1.12

Sources and notes:

A: Series is the ratio of total hours to total jobs (columns B and A in Appendix Table 1).

B: Series is median real annual earnings (column D in Appendix Table 1) divided by average hours per worker (column A). This method of approximating median hourly earnings may introduce some bias. See the discussion in the main text of the report accompanying these Appendix Tables.

C: Series is average real annual earnings (column E in Appendix Table 1) divided by average hours per worker (column A).

D: Series is total labour compensation divided by total hours and deflated by the CPI. (This concept is called the consumer wage.) All three underlying series are in Appendix Table 1 (columns C, B and G).

E: Series is total labour compensation divided by total hours and deflated by the GDP deflator. (This concept is called the producer wage.) All three underlying series are in Appendix Table 1 (columns C, B and H).

F: Series is GDP divided by total hours worked and deflated by the GDP deflator. All three underlying series are in Appendix Table 1 (columns B, F and H).

Appendix Table 3: Alternative Measures of Labour Compensation and its Components, Canada, 1976-2014

	Total compensation for all jobs (current dollars x1,000,000)	Compensation of Employees (current dollars x1,000,000)	Wages and salaries (current dollars x1,000,000)	Employers' social contributions (current dollars x1,000,000)	Imputed labour compensation of the self-employed (current dollars x1,000,000)	Employers' social contributions as a share of employee compensation (per cent)	Imputed self-employment income as a share of total labour compensation (per cent)
	A	B	C	D	E = A - B	F = D/B	G = E/A
1976	121,912	111,413	102,476	8,937	10,499	8.0	8.6
1977	134,519	123,390	113,156	10,234	11,129	8.3	8.3
1978	146,122	134,216	122,640	11,576	11,906	8.6	8.1
1979	163,845	150,946	137,961	12,986	12,898	8.6	7.9
1980	184,505	170,643	156,402	14,241	13,862	8.3	7.5
1981	211,542	196,716	179,634	17,082	14,827	8.7	7.0
1982	225,937	210,084	191,607	18,477	15,853	8.8	7.0
1983	237,589	220,283	200,078	20,204	17,307	9.2	7.3
1984	256,171	237,248	215,286	21,963	18,923	9.3	7.4
1985	276,841	255,825	231,829	23,996	21,016	9.4	7.6
1986	294,860	272,755	247,343	25,412	22,105	9.3	7.5
1987	320,650	296,442	268,756	27,686	24,209	9.3	7.5
1988	352,267	325,250	294,840	30,409	27,018	9.3	7.7
1989	379,775	350,743	318,716	32,026	29,032	9.1	7.6
1990	399,168	368,891	333,460	35,431	30,276	9.6	7.6
1991	410,135	379,092	338,525	40,567	31,043	10.7	7.6
1992	420,302	387,788	343,069	44,720	32,514	11.5	7.7
1993	429,395	394,816	347,236	47,580	34,579	12.1	8.1
1994	440,461	404,918	355,927	48,992	35,543	12.1	8.1
1995	454,950	418,825	366,391	52,434	36,125	12.5	7.9
1996	467,640	428,792	375,721	53,071	38,848	12.4	8.3
1997	495,532	456,323	398,006	58,317	39,208	12.8	7.9
1998	522,856	480,971	421,165	59,806	41,886	12.4	8.0
1999	549,416	507,125	445,097	62,029	42,290	12.2	7.7
2000	593,757	552,023	485,578	66,445	41,734	12.0	7.0
2001	615,597	574,796	504,327	70,470	40,800	12.3	6.6
2002	638,346	597,153	520,815	76,338	41,194	12.8	6.5
2003	664,123	621,207	540,597	80,611	42,915	13.0	6.5

Appendix Table 3: Alternative Measures of Labour Compensation and its Components, Canada, 1976-2014

	Total compensation for all jobs (current dollars x1,000,000)	Compensation of Employees (current dollars x1,000,000)	Wages and salaries (current dollars x1,000,000)	Employers' social contributions (current dollars x1,000,000)	Imputed labour compensation of the self-employed (current dollars x1,000,000)	Employers' social contributions as a share of employee compensation (per cent)	Imputed self-employment income as a share of total labour compensation (per cent)
	A	B	C	D	E = A - B	F = D/B	G = E/A
2004	700,748	656,758	571,239	85,519	43,990	13.0	6.3
2005	737,673	693,438	604,621	88,816	44,235	12.8	6.0
2006	783,579	738,263	644,759	93,503	45,316	12.7	5.8
2007	832,480	783,930	684,981	98,949	48,549	12.6	5.8
2008	870,048	819,726	716,168	103,558	50,322	12.6	5.8
2009	863,094	812,073	705,172	106,901	51,021	13.2	5.9
2010	889,807	837,683	727,616	110,067	52,124	13.1	5.9
2011	934,765	883,046	766,671	116,375	51,719	13.2	5.5
2012	975,587	923,412	799,647	123,765	52,175	13.4	5.3
2013	1,015,312	962,100	828,737	133,363	53,213	13.9	5.2
2014	1,051,082	998,586	859,485	139,101	52,496	13.9	5.0

Growth rates:

1976-2014	5.83	5.94	5.76	7.49	4.33	5.9	-3.6
1976-1981	11.65	12.04	11.88	13.83	7.15	0.7	-8.3
1981-1989	7.59	7.50	7.43	8.17	8.76	0.4	-8.1
1989-2000	4.15	4.21	3.90	6.86	3.35	2.9	-11.5
2000-2008	4.89	5.07	4.98	5.70	2.37	0.6	-15.8
2008-2014	3.20	3.34	3.09	5.04	0.71	1.3	-15.2

Percentage-point change:

Sources and notes:

A: See note for column C of Appendix Table 1.

B-D: For 1997-2014, series are from CANSIM Table 382-0006. For 1976-1996, series are from CANSIM Table 382-0001. There is no period of overlap between the two underlying series. This may introduce a discontinuity between 1996 and 1997.

E: Series is the difference between column A and column B.

F: Series is the ratio of column D and column B.

G: Series is the ratio of column E and column A.