Can Sectoral Reallocations of Labour Explain Canada's Absymal Productivity Performance?

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ABSTRACT

This report presents a framework for decomposing aggregate productivity growth into within-sector effects and sectoral reallocation effects. This framework is used to analyze productivity growth in 12 Canadian industries for the 1961-2007 period and for several sub-periods. The results do not support the common view that Canada's weak post-2000 productivity performance is attributable to a reallocation of labour toward mining, oil and gas, a sector with low productivity growth. Rather, it was the fall in labour productivity growth in manufacturing that accounted for all of the slowdown in business sector productivity growth after 2000.

PRODUCTIVITY GROWTH HAS BEEN slow in Canada since 2000, both from an historical perspective and relative to that in the United States. Growth of business sector output per hour has averaged 0.8 per cent per year between 2000 and 2009, compared to 1.5 per cent in the 1973-2000 period (and 3.3 per cent in the 1945-1973 period) and 2.3 per cent in the United States.

Aggregate labour productivity growth is determined by both productivity growth within a sector and the reallocation of the share of hours worked between sectors. An understanding of the dynamics of this growth requires insight into the contributions of these two effects. This article develops an analytical framework to estimate these effects at the aggregate and sectoral levels and applies it to the

Canadian economy for the 1961-2007 period and a number of sub-periods.

One hypothesis that has been put forward to explain Canada's poor productivity performance has been the reallocation of labour to less productive activities, with downward effects on aggregate productivity. Based on the analytical framework developed in this article, I investigate this hypothesis and find no evidence to support it.

The article is divided into three parts. The first part develops the analytical framework to decompose aggregate productivity growth into within-sector effects and reallocation effects for the business sector and 12 industries or sectors. The second section presents and discusses the results of the decomposition. The third and final section discusses whether the results shed light

on the reasons for the slower aggregate productivity growth the Canadian economy has been experiencing since 2000.

The Analytical Framework

To begin we note that at any given point in time,

$$P \equiv \frac{Q}{H} = \frac{\Sigma Q_i}{H} = \frac{\Sigma H_i P_i}{H} = \Sigma P_i h_i \qquad (1)$$

where

P = Aggregate labour productivity level

P_i = Labour productivity level in sector i

H = Aggregate hours worked

H_i = Hours worked in sector i

h_i = Share of hours worked in sector i

Q = Aggregate real output

Q_i = Real output of sector i

Equation (1) says that aggregate labour productivity P is equal to the weighted average of labour productivity in each of the sectors that make up the economy. The weight for each sector is its share of the total number of hours worked in the economy.

Because we are interested in how shifts in hours worked across sectors affect aggregate labour productivity growth, we must move beyond a single point in time. Equation (2) expresses the absolute change in aggregate labour productivity from period 0 to period 1, $\Delta P = P^1 - P^0$, where superscripts denote the period.

$$\Delta P = \Sigma h_i^0 \Delta P_i + \Sigma P_i^0 \Delta h_i + \Sigma \Delta h_i \Delta P_i \qquad (2)$$

In equation (2) h_i^0 and P_i^0 are respectively the share of total hours worked in sector i and the level of labour productivity in sector i (expressed in dollars) in period 0.

In order to obtain economically meaningful sectoral contributions to aggregate productivity growth, we adjust the second term of equation (2) by subtracting the average level of labour productivity $\bar{P}^0$ from the level of labour productivity in each sector in period 0, P_i^0. In the third term, we subtract the average change in labour productivity $\Delta \bar{P}$ from the change in labour productivity in each sector, ΔP_i. The first adjustment ensures that an increase in the hours share in a sector with a below-average labour productivity level makes a negative contribution to aggregate labour productivity growth.[2] The second adjustment also ensures that an increase in the hours share in a sector with below-average absolute growth in labour productivity makes a negative contribution to aggregate labour productivity growth. The result of these adjustments is equation (3):

$$\Delta P = \Sigma h_i^0 \Delta P_i + \Sigma (P_i^0 - \bar{P}^0) \Delta h_i + \Sigma \Delta h_i (\Delta P_i - \Delta \bar{P})$$
(3)

We are able to subtract $\bar{P}^0$ and $\Delta \bar{P}$ from equation (2) because the terms $\Delta \bar{P} \Delta h_i$ and $\bar{P}^0 \Delta h_i$ each sum to zero across all sectors, since $\bar{P}^0$ and $\Delta \bar{P}$ are constant and all changes in hours share Δh_i sum to zero across sectors.

The three terms in equation (3) represent respectively the within-sector, reallocation level and reallocation growth effects. The within-sector effect captures the change in labour productivity within a sector. The reallocation level effect indicates whether changes in hours share have favoured sectors with above- or below-average labour productivity levels. The reallocation growth effect is the sum of the product of the absolute change in the share of hours worked and the absolute change in the labour productivity level for each of the i sectors relative to the

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2   It is this adjustment for the average productivity level that differentiates our decomposition formula from that of Tang and Wang (2004).

average change across all sectors. It measures whether an economy is subject to a phenomenon akin to Baumol's cost disease, *i.e.* the tendency of labour to move towards sectors with relatively small absolute increases in labour productivity. A negative reallocation growth effect at the aggregate level means that labour is moving to sectors with relatively smaller absolute labour productivity increases.

There are some limitations to this analysis. First, the analysis assumes that differences in technological, institutional, and market structures across sectors lead to differences in average levels of labour productivity, even if marginal products are the same. It also assumes that when a sector loses or gains labour, the changes in output per hour are equal to the sector's average output per hour worked. Second, these results are sensitive to the level of disaggregation. For instance, we use 12 sectors. If within a sector, resources shift from one subsector to another, and these subsectors have different levels of labour productivity, then the measured impact of the reallocation effect on aggregate labour productivity growth would be different.

The Results

The within-sector effect, the reallocation level effect, the reallocation growth effect (also known as the Baumol effect or the interaction effect), the total reallocation effect (the sum of the productivity level and growth effects) and the total sector contribution related to aggregate (business sector) labour productivity growth for 12 sectors are presented for the 1961-2007 period and six cyclically neutral (peak-to-peak) sub-periods (1961-1973, 1973-2000, 1973-1981, 1981-1989, 1989-2000 and 2000-2007). Table 1 provides estimates of the total contributions to aggregate labour productivity growth from these effects in both absolute and relative terms for the seven periods. Table 2 provides a sectoral decomposition of these

effects for the 2000-2007 period. Appendix Tables 1-3 provide more detailed estimates of the sectoral contributions to aggregate labour productivity growth from the different effects for the 1961-2007, 1961-1973, and 1973-2000 sub-periods. The focus of the discussion in this section will be on Table 1 and Table 2.

For the business sector as a whole, the average annual rate of labour productivity growth in the 2000-2007 period was 1.10 per cent per year (Table 1). This is below the growth rate experienced in all earlier periods under analysis. Of this growth rate, 1.13 percentage points or 102.3 per cent was due to the within-sector effect, that is, productivity growth within the 12 sectors; 0.12 percentage points or 10.6 per cent was due to the reallocation level effect, and -0.14 percentage points or 12.8 per cent was due to the reallocation growth effect. The total reallocation effect is the sum of the reallocation level and growth effects and was -0.03 percentage points or -2.3 per cent.

The total reallocation effect can be positive, that is a boost or fillip to aggregate productivity growth (1961-1973 and 1973-1981) or negative, that is a drag on productivity growth (1961-1973, 1973-2000, 1981-1989, 1989-2000, and 2000-2007). Its importance relative to the aggregate labour productivity growth depends on the absolute size of the effect (in percentage points) as well as the absolute level of aggregate labour productivity growth (the greater the productivity growth, the smaller the relative importance and vice versa, ceteris paribus). The positive contribution of the total reallocation effect, in both absolute and relative terms, was greatest in positive terms in 1961-73 and 1973-1981 and the negative contribution was largest in 1981-1989 and 1989-2000.

Table 2 provides the sectoral decomposition of the contributions of the reallocation effects to aggregate labour productivity growth in the 2000-2007 period. There were offsetting devel-

Table 1

Decomposition of Aggregate Labour Productivity Growth into Within-Sector and Reallocation Effects, 1961-2007

| | Average Annual Growth Rate | Contribution to Labour Productivity Growth | | | | | | | | Churn Measure | | | |
| | | Within-Sector Effect[1] | | Reallocation Level Effect[2] | | Reallocation Growth Effect[3] | | Total Reallocation Effect | | Share of Hours Worked | | Reallocation Level Effect | |
	per cent	points	per cent	points	per cent	points	per cent	points	per cent	total	average annual	total	average annual
1961-2007	2.01	2.13	105.9	0.28	13.9	-0.40	-19.76	-0.12	-5.91	51.7	1.1	0.31	0.01
1961-1973	3.44	3.08	89.7	0.48	14.1	-0.13	-3.80	0.35	10.30	17.6	1.5	0.66	0.05
1973-2000	1.62	1.83	113.0	0.06	3.8	-0.27	-16.74	-0.21	-12.97	32.0	1.2	0.21	0.01
1973-1981	1.71	1.37	80.3	0.56	32.5	-0.22	-12.82	0.34	19.73	14.4	1.8	0.74	0.09
1981-1989	1.31	1.53	117.1	-0.13	-10.0	-0.09	-7.12	-0.22	-17.15	7.8	1.0	0.25	0.03
1989-2000	1.79	2.03	113.3	-0.10	-5.6	-0.14	-7.69	-0.24	-13.32	13.2	1.2	0.31	0.03
2000-2007	1.10	1.13	102.3	0.12	10.6	-0.14	-12.82	-0.03	-2.27	9.6	1.4	0.71	0.10

Source: Tables 4-4f. CSLS calculations based on Statistics Canada's Canadian Productivity Accounts KLEMS database.

Notes: The aggregate is the business sector. The business sector covers the whole economy less public administration, non-profit institutions and the rental value of owner-occupied dwellings. GDP for the business sector is calculated as the sum of the GDP of the constituent sectors.
Labour productivity is real GDP per hour worked. Real GDP is calculated from Statistics Canada, Canadian Productivity Accounts KLEMS Database, CANSIM Table 383-0021. Current-dollar GDP estimates for 2002 were extended forward to 2007 and backward to 1961 using the growth rates of the corresponding real GDP series from the same table.
The churn measure is the sum of the absolute values changes in share of total hours worked or the sum of the absolute values of the reallocation effect. The average annual churn is the total churn measure divided by the number of years in the period.

1. The contribution of labour productivity growth within the sector to aggregate labour productivity growth.

2. The contribution of changes in the share of hours worked between sectors to aggregate labour productivity growth.

3. The reallocation growth effect is the sum of the product of the absolute change in the share of hours worked and the absolute change in the labour productivity level for each of the i sectors. It measures whether an economy is subject to Baumol's cost disease, i.e. the tendency of factors of production to move into sectors with relatively small absolute increases in productivity.

opments within this period. In terms of the productivity level reallocation effect, there were significant positive effects experienced by the mining and oil and gas extraction sector (0.26 percentage points per year) and finance, insurance, real estate and renting and leasing (0.08 points) because of the above average labour productivity level and increasing hours share of these sectors. Significant negative level reallocation effects occurred in manufacturing (-0.15 points) because of the sector's above average productivity level and falling hours share and in other services (except public administration) (-0.09 points) because of this sector's below average productivity level and increasing hours share.

In terms of the productivity growth reallocation effect, all sectors had minimal effects except mining and oil and gas extraction (-0.09 points), due to the very large fall in labour productivity in this sector and the increase in the hours share.

Because of the small size of the sectoral productivity growth reallocation effects, the total reallocation effect was close to the productivity level reallocation effect for all sectors, except for mining and oil and gas extraction.

It is interesting to note that gross reallocation effects (sum of the absolute values of the sectoral productivity level effect), which we also call the churn measure, has been greater on an average

Table 2: Decomposition of Aggregate Labour Productivity Growth by Sector and Within-Sector and Reallocation Effects, 2000-2007

	Within-Sector Effect	Reallocation Effect			Total Effect	Within-Sector Effect	Reallocation Effect			Total Effect
		Level	Growth	Total			Level	Growth	Total	
	(percentage points)					(per cent)				
Business Sector	1.10	-	-	-	1.10	100.0	-	-	-	100.0
Agricult., Forest., Fish. and Hunt.	0.12	0.04	-0.02	0.02	0.14	10.5	3.66	-1.52	2.14	12.6
Mining and Oil and Gas Extract.	-0.24	0.26	-0.09	0.17	-0.06	-21.4	24.03	-8.50	15.53	-5.9
Utilities	-0.01	0.02	0.00	0.02	0.01	-1.2	2.24	-0.14	2.10	0.9
Construction	0.11	-0.03	0.00	-0.03	0.08	9.8	-2.83	0.40	-2.44	7.4
Manufacturing	0.27	-0.15	-0.01	-0.16	0.11	24.4	-13.37	-1.12	-14.49	9.9
Wholesale Trade	0.26	0.00	0.00	0.00	0.26	23.4	0.21	-0.37	-0.16	23.3
Retail Trade	0.23	-0.01	0.00	-0.01	0.23	21.2	-0.73	0.08	-0.65	20.6
Transportation and Warehousing	0.03	0.00	0.00	0.00	0.03	2.8	0.02	0.01	0.03	2.8
Information and Cultural Ind.	0.14	-0.01	-0.01	-0.02	0.13	12.9	-0.89	-0.57	-1.46	11.4
FIRE	0.11	0.08	0.00	0.08	0.19	9.6	7.36	0.19	7.54	17.1
Prof., Scient. and Tech. Services	0.03	-0.01	0.00	-0.02	0.01	2.3	-1.27	-0.38	-1.65	0.6
Other Services (exc. Pub. Admin.)	0.09	-0.09	-0.01	-0.10	-0.01	8.1	-7.87	-0.90	-8.77	-0.7

Source: CSLS calculation based on data from Statistics Canada. See Table 4f for more details.

annual basis in the most recent period (0.10) than in the six earlier periods (Table 1).

Table 2 provides estimates of the absolute and relative importance by sector of the within-sector effect and the total effect for the 2000-2007 period. Given the 4.17 per cent average annual fall in output per hour in the mining and oil and gas extraction sector between 2000 and 2007 (Appendix Table 3), this sector's within sector effect contributed -0.24 percentage points per year to aggregate labour productivity growth. The above average productivity level of the sector combined with the increased hours share resulted in a 0.26 point productivity level effect. The below average productivity growth of the sector, again combined with the rising hours share, resulted in a -0.09 point productivity growth reallocation effect for a total reallocation effect of 0.17 points. This offset much of the sector's large negative within sector effect to result in a -0.06 point net contribution to aggregate productivity growth.

Three sectors made large within-sector contributions to aggregate labour productivity growth in the 2000-2007 period: manufacturing (0.27 points), wholesale trade (0.26 points), and retail trade (0.23 points). The absolute increases in constant dollar output per hour were the same for the three sectors, but those of the retail and wholesale trade sectors were due to the rapid productivity growth of these two sectors (3.30 per cent and 3.64 per cent per year respectively), while that of manufacturing reflected mainly its high productivity level (productivity growth in this sector was only 1.11 per cent). The overall contribution of the two trade sectors to aggregate productivity growth, in both absolute and relative terms, was close to the within sector contribution due to small reallocation effects. In contrast, the overall contribution of manufacturing to aggregate productivity growth was only 0.09 points because of this sector's negative reallocation effect (-0.16), primarily due to a large negative productivity level effect arising

Table 3

A Comparison of Sectoral Contribution in 1973-2000 and 2000-2007 period Divided into Within-Sector and Reallocation Effects

	Labour Productivity		Contribution to Aggregate Labour Productivity Growth								
	1973-2000	2000-2007	1973-2000			2000-2007			Difference Between 1973-2000 and 2000-2007		
			Within-Sector Effect	Real-location Effect	Total Effect	Within-Sector Effect	Real-location Effect	Total Effect	Within-Sector Effect	Real-location Effect	Total Effect
	(compound annual growth rate)		(percentage points)								
	A	B	C	D	E	F	G	H	I = F - C	J = G - D	K = H - E
Business Sector[1]	1.62	1.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Agriculture, Forestry, Fishing and Hunting	2.68	3.28	0.16	0.06	0.21	0.12	0.02	0.14	-0.04	-0.03	-0.07
Mining and Oil and Gas Extraction	-0.29	-4.17	-0.03	-0.02	-0.04	-0.24	0.17	-0.06	-0.21	0.19	-0.02
Utilities	0.93	-0.43	0.03	0.00	0.04	-0.01	0.02	0.01	-0.05	0.02	-0.03
Construction	1.43	1.61	0.12	0.01	0.14	0.11	-0.03	0.08	-0.01	-0.04	-0.06
Manufacturing	2.89	1.11	0.89	-0.13	0.76	0.27	-0.16	0.11	-0.62	-0.02	-0.65
Wholesale Trade	2.94	3.64	0.15	0.00	0.15	0.26	0.00	0.26	0.11	0.00	0.11
Retail Trade	2.08	3.30	0.13	0.00	0.13	0.23	-0.01	0.23	0.10	-0.01	0.09
Transportation and Warehousing	1.55	0.52	0.09	0.00	0.09	0.03	0.00	0.03	-0.06	0.00	-0.06
Information and Cultural Industries	3.42	3.21	0.08	0.01	0.10	0.14	-0.02	0.13	0.06	-0.03	0.03
Finance, Insurance, Real Estate and Renting and Leasing1	1.52	0.75	0.17	0.07	0.24	0.11	0.08	0.19	-0.07	0.02	-0.05
Professional, Scientific and Technical Services	0.82	0.43	0.02	-0.04	-0.01	0.03	-0.02	0.01	0.00	0.02	0.02
Other Services (except Public Administration)2	0.07	0.71	0.01	-0.18	-0.17	0.09	-0.10	-0.01	0.08	0.08	0.16
Sum Total	-	-	1.83	-0.21	1.62	1.13	-0.03	1.10	-0.71	0.19	-0.52

from the very large fall in the sector's hours share (3.32 points). It is interesting to note that the two trade sectors accounted for 0.49 points or 44 per cent of aggregate labour productivity growth in 2000-2007, but accounted for only 19.9 per cent of total hours worked.

Perspectives on the post-2000 productivity slowdown

It is also very insightful to examine the changes in the contributions by sector to aggregate productivity growth between 1973-2000 and 2000-2007 (Table 3). Between these two periods, labour productivity growth decreased 0.52 percentage points, from 1.62 per cent per year in 1973-2000 to 1.10 per cent in 2000-2007 (Table 1). All the post-2000 slowdown can be accounted for by the manufacturing sector, which made a -0.65 percentage points contribution to the -0.52 points falloff in aggregate productivity growth between periods. This situation arose from the 1.8 percentage-point fall in annual labour productivity growth in

manufacturing between 1973-2000 and 2000-2007 (from 2.9 per cent to 1.1 per cent).

Across all sectors, the slowdown for within-sector productivity growth between 1973-2000 and 2000-2007 (-0.71 points) was larger than the total slowdown including both within-sector and reallocation effects (-0.52 points). In other words, sectoral shifts were not directly responsible for the falloff in labour productivity growth. Indeed, these sectoral reallocations boosted productivity between periods. This is because the negative impact of the sector reallocations (both productivity level and growth effects) was smaller in 2000-2007 (-0.03 points) than in 1973-2000 (-0.21 points), making a 0.19 point positive contribution to the difference in productivity growth between the two periods (Appendix Table 2).

The reason for this can be largely found in the mining and oil and gas extraction sector. In 1973-2000, this magnitude of the reallocation level effect in this sector was very small (-0.02 points). In 2000-2007, the size of this effect rose to 0.17 points because of the movement of workers to this high productivity level sector, resulting in a 0.19 point change between period.

Conclusion

It was the fall in labour productivity growth in manufacturing that accounted for all of the slowdown in business sector productivity growth in 2000-2007 in Canada relative to the 1973-2000 period. Despite the large decline in labour productivity in the mining and oil and gas extraction sector, this sector contributed little to the slowdown because of positive reallocation level effects. The rising employment share in a very high labour productivity level sector offset the falling productivity level in the sector. It is the falling productivity growth rate in manufacturing, not sectoral reallocations, that largely explains why labour productivity growth in Canada has been so weak after 2000 relative to the last quarter of the 20th century.

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Appendix Tables

Appendix Table 1
Decomposition of Aggregate Labour Productivity Growth by Sector into Within-Sector and Reallocation Effects, 1961-2007

	Labour Productivity				Sector Minus Business Sector Productivity		Share of Total Hours Worked		
	1961 Level	2007 Level	Compound Annual Growth Rate	Absolute Change	1961 Level	1961-2007 Absolute Change	1961	2007	Absolute Change
	(constant 2002 dollars per hour worked)		(per cent)	(constant 2002 dollars per hour worked)			(per cent)		(percentage points)
	A	B	C	D = B-A	E = A - 15.32	F = D - 23.01	G	H	I = H-G
Business Sector[1]	15.32	38.33	2.01	23.01	N/A	N/A	100.0	100.0	N/A
Agriculture, Forestry, Fishing and Hunting	6.73	32.95	3.51	26.22	-8.59	3.20	16.86	3.31	-13.55
Mining and Oil and Gas Extraction	95.76	119.20	0.48	23.44	80.44	0.42	1.58	2.01	0.42
Utilities	56.90	145.96	2.07	89.06	41.58	66.04	0.69	0.83	0.14
Construction	19.29	33.77	1.22	14.48	3.97	-8.54	9.49	9.28	-0.21
Manufacturing	13.42	50.69	2.93	37.27	-1.90	14.25	26.28	14.96	-11.33
Wholesale Trade	11.43	41.05	2.82	29.62	-3.89	6.61	4.82	7.12	2.31
Retail Trade	6.89	23.28	2.68	16.38	-8.43	-6.63	11.88	12.80	0.92
Transportation and Warehousing	12.14	34.57	2.30	22.44	-3.18	-0.58	7.12	6.34	-0.78
Information and Cultural Industries	11.92	63.24	3.70	51.32	-3.41	28.31	1.94	2.73	0.79
Finance, Insurance, Real Estate and Renting and Leasing1	44.78	71.82	1.03	27.04	29.46	4.03	4.28	8.03	3.74
Professional, Scientific and Technical Services	21.69	30.00	0.71	8.31	6.37	-14.71	1.72	7.76	6.04
Other Services (except Public Administration)2	16.22	20.19	0.48	3.97	0.90	-19.04	13.33	24.83	11.50
Sum Total							100.0	100.0	0.00
								Total Churn Measure:	51.7
								Average Annual Churn:	1.12

Source: Calculated by CSLS from Statistics Canada, Canadian Productivity Accounts KLEMS Database, CANSIM Table 383-0021.

Notes: The churn measure is the sum of the absolute values changes in share of total hours worked or the sum of the absolute values of the real-location effect. The average annual churn is the total churn measure divided by the number of years in the period.

In column [E] the business sector average labour productivity over the period is subtracted from the sector's period average labour productivity in order to obtain reallocation effects that can be interpreted inuititvely. In the absence of this adjustment, a sector that experiences an increase in labour share always experiences a positive reallocation effect. This is misleading, because the reallocation effect should be negative if, for example, a below-average productivity sector experiences an increase in labour share.

Appendix Table 2

Decomposition of Aggregate Labour Productivity Growth by Sector into Within-Sector and Reallocation Effects, 1973-2000

	Labour Productivity				Sector Minus Business Sector Productivity		Share of Total Hours Worked		
	1973 Level	2000 Level	Compound Annual Growth Rate	Absolute Change	1973 Level	1973-2000 Absolute Change	1973	2000	Absolute Change
	(constant 2002 dollars per hour worked)		(per cent)	(constant 2002 dollars per hour worked)			(per cent)		(percentage points)
	A	B	C	D = B-A	E = A - 22.98	F = D - 12.52	G	H	I = H-G
Business Sector[1]	22.98	35.51	1.62	12.52	N/A	N/A	100.0	100.0	N/A
Agriculture, Forestry, Fishing and Hunting	12.88	26.28	2.68	13.40	-10.10	0.87	9.08	4.43	-4.65
Mining and Oil and Gas Extraction	173.66	160.66	-0.29	-13.00	150.68	-25.52	1.55	1.46	-0.09
Utilities	117.17	150.40	0.93	33.23	94.19	20.71	0.74	0.77	0.03
Construction	20.61	30.20	1.43	9.59	-2.37	-2.94	9.84	7.78	-2.06
Manufacturing	21.75	46.91	2.89	25.15	-1.23	12.63	27.40	18.28	-9.12
Wholesale Trade	14.60	31.96	2.94	17.35	-8.38	4.83	6.62	7.29	0.67
Retail Trade	10.64	18.54	2.08	7.90	-12.34	-4.62	12.74	12.68	-0.05
Transportation and Warehousing	21.99	33.34	1.55	11.35	-0.99	-1.17	6.15	6.36	0.22
Information and Cultural Industries	20.42	50.67	3.42	30.25	-2.56	17.73	2.16	2.90	0.74
Finance, Insurance, Real Estate and Renting and Leasing1	45.33	68.16	1.52	22.83	22.35	10.31	5.81	7.39	1.58
Professional, Scientific and Technical Services	23.37	29.10	0.82	5.73	0.39	-6.80	2.94	7.20	4.26
Other Services (except Public Administration)2	18.86	19.22	0.07	0.36	-4.12	-12.17	14.98	23.46	8.48
Sum Total							100.0	100.0	0.00
							Total Churn Measure:		32.0
							Average Annual Churn:		1.18

Source: Calculated by CSLS from Statistics Canada, Canadian Productivity Accounts KLEMS Database, CANSIM Table 383-0021.

Notes: The churn measure is the sum of the absolute values changes in share of total hours worked or the sum of the absolute values of the reallocation effect. The average annual churn is the total churn measure divided by the number of years in the period.

In column [E] the business sector average labour productivity over the period is subtracted from the sector's period average labour productivity in order to obtain reallocation effects that can be interpreted inuititvely. In the absence of this adjustment, a sector that experiences an increase in labour share always experiences a positive reallocation effect. This is misleading, because the reallocation effect should be negative if, for example, a below-average productivity sector experiences an increase in labour share.

Appendix Table 3

Decomposition of Aggregate Labour Productivity Growth by Sector into Within-Sector and Reallocation Effects, 2000-2007

	Labour Productivity				Sector Minus Business Sector Productivity		Share of Total Hours Worked		
	2000 Level	2007 Level	Compound Annual Growth Rate	Absolute Change	2000 Level	2000-2007 Absolute Change	2000	2007	Absolute Change
	(constant 2002 dollars per hour worked)		(per cent)		(constant 2002 dollars per hour worked)		(per cent)		(percentage points)
	A	B	C	D = B-A	E = A - 35.51	F = D - 2.83	G	H	I = H-G
Business Sector[1]	35.51	38.33	1.10	2.83	N/A	N/A	100.0	100.0	N/A
Agriculture, Forestry, Fishing and Hunting	26.28	32.95	3.28	6.67	-9.23	3.84	4.43	3.31	-1.12
Mining and Oil and Gas Extraction	160.66	119.20	-4.17	-41.46	125.16	-44.29	1.46	2.01	0.54
Utilities	150.40	145.96	-0.43	-4.44	114.90	-7.27	0.77	0.83	0.06
Construction	30.20	33.77	1.61	3.57	-5.31	0.74	7.78	9.28	1.51
Manufacturing	46.91	50.69	1.11	3.78	11.40	0.95	18.28	14.96	-3.32
Wholesale Trade	31.96	41.05	3.64	9.09	-3.55	6.26	7.29	7.12	-0.17
Retail Trade	18.54	23.28	3.30	4.73	-16.96	1.90	12.68	12.80	0.12
Transportation and Warehousing	33.34	34.57	0.52	1.24	-2.17	-1.59	6.36	6.34	-0.02
Information and Cultural Industries	50.67	63.24	3.21	12.56	15.17	9.74	2.90	2.73	-0.17
Finance, Insurance, Real Estate and Renting and Leasing1	68.16	71.82	0.75	3.66	32.66	0.83	7.39	8.03	0.64
Professional, Scientific and Technical Services	29.10	30.00	0.43	0.89	-6.40	-1.93	7.20	7.76	0.56
Other Services (except Public Administration)2	19.22	20.19	0.71	0.97	-16.29	-1.85	23.46	24.83	1.37
Sum Total							100.0	100.0	0.00
								Total Churn Measure:	9.6
								Average Annual Churn:	1.37

Source: Calculated by CSLS from Statistics Canada, Canadian Productivity Accounts KLEMS Database, CANSIM Table 383-0021.

Notes: The churn measure is the sum of the absolute values changes in share of total hours worked or the sum of the absolute values of the reallocation effect. The average annual churn is the total churn measure divided by the number of years in the period.

In column [E] the business sector average labour productivity over the period is subtracted from the sector's period average labour productivity in order to obtain reallocation effects that can be interpreted inuititvely. In the absence of this adjustment, a sector that experiences an increase in labour share always experiences a positive reallocation effect. This is misleading, because the reallocation effect should be negative if, for example, a below-average productivity sector experiences an increase in labour share.