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by Shutao Cao and Danny Leung

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Abstract

This paper documents the rate at which labour flows between industries and between firms within industries using the most recent data available. It examines the determinants of these flows and their relationship with the productivity growth. It is found that the dispersion of industry employment growth rates has been elevated since 2005, and that this increase is not likely to be related to the business cycle. It is also found that changes in real exchange rates and commodity prices can account for a significant part of the employment dispersion across industries, especially since 2005. However, shifts of employment labour between industries have generally not contributed positively to aggregate labour productivity growth. With respect to movements of labour between firms within industries, it is found that the job reallocation rates have fallen steadily over the past decade and a half. Finally, unlike labour flows between industries, excess job reallocation rates within industries are found to be strongly related to multifactor productivity and labour productivity growth at the industry level.

JEL classification: D23, J6, E32
Bank classification: Productivity; Inflation and prices; Labour markets

Résumé

Les auteurs étudient les plus récentes données disponibles sur le rythme de redistribution du travail entre les secteurs et entre les entreprises d'un même secteur. Ils analysent les déterminants des flux de main-d'œuvre et leur relation avec la progression de la productivité. Ils notent que la dispersion des taux de croissance sectorielle de l'emploi a augmenté depuis 2005 et que cette hausse n'est vraisemblablement pas liée au cycle économique. Ils constatent également que la dispersion de l'emploi entre les secteurs pourrait tenir en grande partie aux variations des taux de change réels et des prix des matières premières, surtout depuis 2005. En général, toutefois, les déplacements de main-d'œuvre intersectoriels n'ont pas contribué positivement à la progression de la productivité globale du travail. En ce qui concerne les mouvements de main-d'œuvre intrasectoriels, les taux de redistribution des emplois ont diminué de façon constante au cours de la dernière décennie et demie. Enfin, contrairement aux flux de main-d'œuvre intersectoriels, les taux de redistribution excédentaire des emplois à l'intérieur des secteurs se révèlent être en relation étroite avec la croissance de la productivité multifactorielle et de la productivité du travail à l'échelle sectorielle.

Classification JEL : D23, J6, E32
Classification de la Banque : Productivité; Inflation et prix; Marchés du travail

1. INTRODUCTION

Labour reallocation between industries and between firms has garnered increasing interest in both Canada and the United States recently. In the United States, interest in sectoral reallocation centers around whether the recent increase in the unemployment rate is related to structural imbalances that require large movements of labour across sectors.[1] In Canada, large movements in commodity prices and the real exchange rate are thought to have caused major changes in the relative output prices of various industries, which in turn should have led to large movements of labour between industries.[2]. Furthermore, Balakrishnan (2008) carries out a Canada-U.S. comparison of the magnitude of labour reallocation across firms in the interest of identifying a structural difference in the two economies that may be contributing to the differential in productivity growth.

This paper focuses on labour reallocation in Canada. It addresses the following questions: whether the pace of labour reallocation across industries has changed recently in Canada, whether these sectoral shifts can generally be accounted for by movements in the real exchange rate and commodity prices, have shifts in labour across sectors led to gains in productivity, how has the pace of labour reallocation between firms in Canada evolved, what determines the pace of reallocation across firms, and to what extent does reallocation at the firm level contribute to productivity growth?

In documenting the pace of labour reallocation across industries, this paper follows the work of Kavcic and Yuen (2005), who use the Lilien (1982) measure of employment growth dispersion to assess the speed of reallocation. In addition to extending the work of Kavcic and Yuen (2005) up to 2008, this paper makes a distinction between labour flows related to the business cycle and ones due to structural changes. It follows the work of Rissman (1997) and Aaronson et al. (2004) on the United States in the use of a state-space model to simultaneously estimate the business cycle and the sensitivity of industry labour flows to the cycle. Regression analysis is then performed to determine to what extent these cyclically-adjusted employment flows can be accounted for by changes in the real exchange rate and commodity prices. Finally, shift-share analysis is used to ascertain the effects of shifts in labour across sectors on productivity growth.

Using the conventions outlined in Davis et al. (1996) and Davis and Haltiwanger

[1] See Valletta and Cleary (2008).
[2] See Macdonald (2007).

(1999), this paper also documents the pace of labour reallocation between firms over time in Canada. Regression analysis is performed to see what factors might explain variation in these flows across industries and time. Unlike Balakrishnan (2008), who does not present any evidence on whether these flows between firms lead to improvements in productivity, this paper offers evidence that shows a strong link between the rate of reallocation and both multifactor productivity (MFP) and labour productivity growth. Baldwin and Gu (2004, 2006) have shown that output reallocation across plants has contributed importantly to labour productivity growth in Canada manufacturing, but their results are produced using an accounting approach that needs firm-level data on output and labour input. The econometric evidence presented in this paper is based on industry-level measures of labour reallocation between firms and industry-level measures of productivity growth. This allows the relationship between job reallocation and productivity growth outside of manufacturing to be examined.

It is found that although the pace of net labour reallocation across industries has increased since 2005, it is still slower than in some previous episodes. The fact that two procyclical industries are currently moving in opposite directions in terms of employment - manufacturing employment growth is negative and construction employment growth is positive - suggests that the pickup in reallocation since 2005 is likely to be structural. It is also found that the dispersion of employment growth across industries predicted by industry-level regressions of cyclically-adjusted changes in employment shares on growth in the real exchange rate and commodity prices is 75 per cent that of the actual dispersion. Moreover, for the 2004-2008 period, the amount accounted for by the regression model rises to 83 per cent. Shifts in employment across industries had a negative effect on aggregate labour productivity growth over the 1987-2008 period, and a small positive effect in the 2004-2008 period. Although manufacturing employment declined during 2004-2008, employment expanded in industries like FIRE and mining, oil and gas that had higher levels of productivity. In contrast, a strong positive relationship is found between gross flows of employment across firms and MFP and labour productivity growth at the industry level. Finally, the rate of job reallocation is found to be declining steadily since 1992. Changes in the job reallocation at the industry level are found to be related to firm size and commodity prices, but neither can account for the decline in job

reallocation. Possible explanations are increased hiring and firing costs and increased job search frictions since early 1990s. The decline in job reallocation may also be attributed to more persistent productivity shocks or policy distortions.

The next section of the paper gives the various definitions used in the paper. The data sets used in the paper are introduced in section 3. The results are presented in section 4. Section 4 first looks at the evolution of net flows of labour between industries in Canada, then at whether these employment flows can be explained by changes in relative prices, and finally at whether these flows have had an impact on productivity growth. A similar examination of gross flows between firms then follows. Concluding remarks are given in section 5.

2. METHODOLOGY

2.1. *Net labour flows across industries*

In his seminal paper, Lilien (1982) introduced a measure that captures the degree to which labour is reallocated across industries as follows:

$$\sigma_t = \left(\sum_{i=1}^{N} s_{it}(g_{it} - g_t)^2 \right)^{0.5}, \tag{1}$$

where s_{it} is industry i's share of labour (employment or hours) at time t, g_{it} is the growth rate of labour for industry i, and g_t is the growth rate of aggregate employment. This measure is the weighted squared deviations of industry employment growth rates from the aggregate employment growth rate. The measure is zero when all industries grow at the same rate. The measure increases when some industries are rapidly expanding and others shrinking. It is tempting to interpret movements in this measure as changes in the pace of structural change. Lilien attributes the positive correlation between unemployment rate and σ_t to the secular shocks. However, Abraham and Katz (1986) pointed out that Lilien's measure cannot be strictly interpreted this way because industry labour growth rates diverge in a predictable way over the business cycle. Aggregate shocks can also produce the positive correlation. For example, they noted that the labour of goods-producing industries declined faster during a recession than service-producing sectors. Employment growth dispersion would peak during a recession, even though there are no

structural factors, such as changes in relative prices, at work.

This paper uses the methodology advanced by Rissman (1997) to remove the effects of the normal labour flows that occur over the cycle. Rissman (1997) decomposes the difference in industry and aggregate labour growth rates, $\Delta \ln s_{it} = g_{it} - g_t$, into three components:

$$\Delta \ln s_{it} = a_i + b_i(L)B_t + u_{it}, \tag{2}$$

where a_i is an industry-specific constant, $b_i(L)B_t$ is the cyclical component, and u_{it} is an industry-specific idiosyncratic shock. The variable B_t is a measure of the business cycle that is assumed to follow an autoregressive process, and $b_i(L)$ is an industry-specific polynomial lag operator that allows the cycle to have a differential impact across industries. Since B_t is not directly observable, it is estimated together with other unknown parameters using the Kalman filter. Specifically, (2) is the measurement equation and the autoregressive process of B_t is the state equation in an unobserved components model. After the estimation a measure of dispersion without the cyclical component can be computed:

$$\sigma_t^* = \left(\sum_{i=1}^{N} s_{it}^* (\hat{a}_i + \hat{u}_{it})^2 \right)^{0.5}, \tag{3}$$

where $\hat{a}_i + \hat{u}_{it}$ is the estimated industry-specific constant plus the estimated industry-specific shock, and s_{it}^* is industry i's share of labour that is constructed using the industry growth rates independent of the cycle.

2.2. *Gross labour flows among firms*

This paper follows the definitions of creation, destruction and reallocation used in Davis and Haltiwanger (1999). Let E_{fit} be the number of workers in firm f, industry i and time t, and $Z_{it} = 0.5 \left(\sum_f E_{fit} + \sum_f E_{fit-1} \right)$ be the average of industry i's employment in t and $t-1$. The gross job creation rate for industry i and time t is:

$$C_{it} = \frac{\sum_{f \in \Delta E_{fit} > 0} \Delta E_{fit}}{Z_{it}}, \tag{4}$$

where the numerator is the sum of the change in employment in firms that increases employment in industry i. Similarly, the gross rate of job destruction is:

$$D_{it} = \frac{\sum_{f \in \Delta E_{fit} < 0} \Delta E_{fit}}{Z_{it}}, \tag{5}$$

and the gross rate of job reallocation is:

$$R_{it} = \frac{\sum_f \Delta \left| E_{fit} \right|}{Z_{it}} = C_{it} + D_{it}. \tag{6}$$

Aggregate job reallocation is calculated in a similar way. Instead of summing over all firms in a particular industry, a sum over all firms in all industries is taken. Another interesting concept in this literature is the notion of excess job reallocation, $R_t - \left| \frac{\Delta E_t}{Z_t} \right|$, gross reallocation in excess of the amount needed to facilitate the net change in employment. This aggregate excess reallocation rate itself can be decomposed into:

$$R_t - \left| \frac{\Delta E_t}{Z_t} \right| = \sum_i \frac{Z_{it}}{Z_t} \left(\left| \frac{\Delta E_{it}}{Z_{it}} \right| - \left| \frac{\Delta E_t}{Z_t} \right| \right) + \sum_i \frac{Z_{it}}{Z_t} \left(R_t - \left| \frac{\Delta E_{it}}{Z_{it}} \right| \right), \tag{7}$$

The excess job reallocation rate is an absolute deviation measure of dispersion while Lilien measures the standard deviation. But the Davis-Haltiwanger measure is based on firm-level data while the Lilien measure is based on industry-level data.

3. DATA

This paper uses three different data sources. The first is the Labour Force Survey (LFS) from 1987-2008. This survey can be used to calculate employment for each 3-digit NAICS industry.[3] The advantage of the LFS is that it provides the most up-to-date information on net employment growth. The main disadvantage of the LFS is that the NAICS system of industry classification goes back only until 1987; the SIC system was used before then. Therefore, it is not possible to easily obtain a consistent time series of industry employment that goes back before 1987.

To see how the more recent data compares to that pace of reallocation in the more distant past, this paper uses the KLEMS data (1961-2004). The KLEMS data is a

[3]It is possible to calculate employment at the 4-digit level, but the size of the coefficient of variation in many industries would suggest the data are not reliable at that level of disaggregation.

by-product of the MFP estimates produced by Statistics Canada. It contains for each industry in the business sector: real gross output, real value-added, capital services, quality-adjusted labour, hours of labour, real energy input, real materials input, real services input, price indices for all the aforementioned variables, labour productivity and MFP measures. In addition to hours worked, this paper also uses the industry MFP and hourly wage data in KLEMS to explain changes in excess job reallocation. Data are available at the 3-digit level for the manufacturing industries and 2-digit level for other industries. The Longitudinal Employment Analysis Program (LEAP) (1991-2006) is the source of data used to compute gross job flows. The LEAP file is constructed by Statistics Canada using administrative T4-payroll tax data from the Canada Revenue Agency and the Survey of Employment, Payroll and Hours (SEPH).[4] The LEAP provides a measure of employment for each firm, incorporated or not, that issued a T4 remittance slip for tax purposes. The measure of labour is the payroll of a given business divided by an annual average earnings measure for individuals in the business's industry, province and firm size class. For each major industry, this measure of labour is found to exhibit trends similar to those in the SEPH and LFS. Thus it is referred to as employment in this paper. An older version of LEAP that spans the period 1983-1998 can be used to examine patterns of job reallocation before 1991.[5] However, this version of LEAP is based on the SIC system, so only numbers for the aggregate economy are used.

4. RESULTS

4.1. *Recent evidence on the pace of net labour reallocation, LFS 1987-2008*

Figure 1 shows the measure of employment growth dispersion, as described in (1), in the LFS. It is first calculated at the 2-digit level (18 industries), and then for a combination of 3-digit manufacturing industries and other 2-digit level industries (37 industries). Finally, the measure is calculated for the case where the remaining 2-digit level industries are also mostly disaggregated into 3-digit industries (88 industries).[6] The

[4]See Kanagarajah (2003) for more information on the LEAP.

[5]These numbers are taken from Statistics Canadas *Employment Dynamics*, catalogue number 61F0020XCB.

[6]There are 102 3-digit industries. Six were merged with other larger industries because of sample size concerns. Building and material supplies wholesalers were mereged with building and garden equipment retailers because of a large upward shift in the former in 1999 and a downward shift in the latter in the same year. Similarly, the eight 3-digit transportation industries are collected together because of a

measure for the 18 industries indicates heightened reallocation in 1991, 1999, 2001, 2005 and 2008. The measures using more industry disaggregation naturally point to more dispersion in every year, but the pattern is similar to the one exhibited by the measure for the 18 major industries. There is a minor difference in 1994, where the 88-industry measure shows increased reallocation not shown by the 18 and 37 industry measures. There is also another minor difference in 2001, where the 18 industry measure shows an upturn in reallocation not evident in the other measures.

Figure 2 gives the approximate industry contributions to the 18-industry dispersion measure in 1991, 1999, 2005 and 2008. Specifically, it plots:

$$\frac{s_{it}(g_{it} - g_t)^2}{\sum_{i=1}^{N} s_{it}(g_{it} - g_t)^2},$$

for each of the industries. As described by Kavcic and Yuen (2005), the increased pace of reallocation in 1991, a recession year, was due mainly to reallocation out of manufacturing and construction and into service industries, the most important of which were professional services and health care. Negative employment growth in manufacturing and construction accounted for nearly 60 per cent of the dispersion in 1991. This is a primary example of how the employment growth dispersion predictably increases during a recession because of a sharp slow down in some goods industries.

The increased reallocation in 1999 was caused by strong growth in wholesale trade (38 per cent) and weak growth in mining, oil and gas (21 per cent) and agriculture, forestry and fishing (10 per cent). The source of the strength in employment growth in wholesale trade is unclear, but the declines in mining oil and gas and agriculture, forestry and fishing could be linked to weak commodity prices.

In 2001, roughly 50 per cent of the increased pace in reallocation can be traced to sharp employment losses in agriculture, forestry, and fishing. This large drop is likely related to the drought that occurred in that year.

large upward shift in support activities for transportation in 1999. The fact that the LFS changed from the SIC to NAICS industrial classification system in 1999 may be the source of these anomalies.

Kavcic and Yuen (2005) find a large spike in the dispersion index in 1999 when it is calculated using all 102 three-digit industries. The distance between this spike and the peak exhibited by the dispersion index for the 19 two-digit industries in 1999 is much larger than the gap between these two indicies in other times. After making the two adjustments described in the preceding paragraph, the distance between the two indicies in 1999 is in line with what is observed in other years.

In each of the years since 2004, the shift out of manufacturing has contributed significantly to reallocation. In 2005, the decline in manufacturing employment accounted of 31 per cent dispersion, while in 2008 it accounted for 21 per cent of the dispersion. Strong employment growth in construction also contributed substantially over that time period, but mostly in 2005 at 16 per cent and 2008 at 22 per cent. The shift into mining, oil and gas contributed significantly early on in the 2004-2008 period. In 2005, it accounted for 12 per cent of the dispersion.

The divergence in the employment growth rates of manufacturing and construction in the 2004-2008 period is an interesting one.[7] As suggested by Rissman (1997), manufacturing and construction are two industries with pronounced cyclical patterns in the United States. Figure 3 presents the employment growth rates for Canadian manufacturing and construction. Up to 2003, the changes in the growth rates followed a similar pattern. They also both dipped substantially into negative territory during the 1991 recession. In contrast, in the two most recent peaks in the measure of employment growth dispersion, employment growth in construction and manufacturing have had the opposite sign. This suggests that typical (macroeconomic) business cycle factors have had minimal impact on the pace of sectoral reallocation in 2005 and 2008.

Detailed analysis of the industry contributions at a more disaggregated level does not reveal many more insights than the one obtained from the decomposition of the 19 industry employment dispersion measure. Analysis at the more disaggregated level does show that within each broad industry group there is much heterogeneity in employment growth rates. On some occasions, this heterogeneity within the 2-digit industries can produce a spike in a dispersion measure not evident at higher levels of aggregation. For example, in 1994, retail and wholesale trade accounted for 0.9 and 0.2 per cent of the 18-industry dispersion measure. However, for the 88-industry dispersion measure, they accounted for 5.4 and 4 per cent, respectively.

To obtain a better sense of how the pace of reallocation today compares to the amount of reallocation in a more distant past, the dispersion measure is calculated using the KLEMS data for 16 2-digit level industries[8], and 35 3-digit manufacturing industries

[7]For a detailed analysis of sectoral adjustment in Canada over 2003-2007 relative to 1998-2002, see Dupuis and Marcil (2008).

[8]Public administration is eliminated because the KLEMS covers only the business sector. Education is omitted because data for it are confidential and incomplete. The management of companies is included

and 2-digit non-manufacturing industries. The results using the KLEMS are broadly consistent with the results using the LFS over the time period covered by both data sets. Furthermore, in comparison to the spikes in reallocation in 1991 and the late 1990s, the spikes in the more distant past are of similar size. See appendix A for more details of the results using the KLEMS.

4.2. *Relative prices and structural change*

The previous section suggests that two things must be taken into account when examining the role of relative price shocks in explaining changes in employment growth dispersion. First, labour growth in manufacturing and in construction generally decline sharply during business cycle downturns. Second, one-time special events can have a large impact on the dispersion measure. To address the first issue, this paper follows the works of Rissman (1997) and Aaronson et al. (2004) on the United States in the use of a state-space model to simultaneously estimate the business cycle and the sensitivity of industry labour flows to the cycle. In addition to the issues faced by Rissman (1997), it is necessary to deal with the fact that there are more industries in the LFS data than Rissmans data (18 versus 10) and that observations are on an annual basis.[9] Rissman (1997) uses quarterly data. There are too many parameters to estimate if data from all 18 industries are used. Therefore, the cycle is first estimated using data only from manufacturing and construction. The cycle is assumed to follow an AR(1) process, and the cycle is allowed to enter contemporaneously and with a lag in the signal equation. The remaining parameters for the 16 other industries are estimated using OLS regressions taking the cyclical indicator as given. See appendix B for more details on the estimates from the state-space model.

Figure 4 compares the cyclically-adjusted dispersion measure computed following (3) with the unadjusted measure. The cyclically-adjusted measure exhibits lower dispersion in each year, but the amount that it is lower varies. As expected, the gap is largest

in administrative services.

[9]Rissman (1997) works with data from ten industries in creating her measure of dispersion corrected for cyclical flows. Only data from eight industries enter the state-space model. Mining is dropped because its share of total employment is small and because its employment growth is highly volatile. Services is omitted to deal with the fact that the sum of the industry shares is equal to one. The parameters for mining and services are obtained from OLS regressions that take as given the cyclical indicator estimated in the state-space model.

in 1991 when the recession caused both manufacturing and construction employment growth to drop sharply.

To ascertain the extent to which fluctuations in the exchange rate and commodity prices have driven labour reallocation, the cyclically-adjusted growth of industry employment relative to aggregate employment is regressed on growth in the real exchange rate, non-energy commodity prices, and energy prices. The real exchange rate is the C-6 trade-weighted real exchange rate from the Bank of Canada. The commodity price indices are the energy and non-energy components of the Bank of Canada commodity price index, converted into Canadian dollars using the nominal Canada-U.S. bilateral exchange rate and deflated using the GDP deflator:

$$\begin{aligned}\hat{a}_i + \hat{u}_{it} &= \alpha_{0i} + \sum_{j=0}^{J_1} \alpha_{1ij}(\hat{a}_i + \hat{u}_{it-1}) + \sum_{j=0}^{J_2} \alpha_{2ij}\Delta RER_{t-j} + \sum_{j=0}^{J_3} \alpha_{3ij}\Delta \ln ener_{t-j} \\ &\quad + \sum_{j=0}^{J_4} \alpha_{4ij}\Delta \ln nonener_{t-j} + \varepsilon_{it}, \qquad (8)\end{aligned}$$

where RER is the real exchange rate, *ener* is the real energy price, and *nonener* is the real non-energy commodity price.[10] Lagged dependent variables are included to control for omitted factors that may be correlated with the other variables.[11] In addition to these explanatory variables, indicator variables are entered for certain industries and time periods to control for special events that would otherwise skew the results. A 1999 year dummy for wholesale trade is included to pick up the unusually strong employment growth that year, and a 2001 year dummy is included for agriculture to account for the drought. Lags are chosen using the general-to-specific approach. A maximum of two lags are allowed and insignificant variables are dropped. The regressions are carried out for the 18 major 2-digit industries because the pattern of employment growth dispersion is similar to that exhibited at higher levels of disaggregation.

The results of the industry regression are presented in Table 1. A depreciation in the real exchange rate leads to above average growth in manufacturing. Increases in employment due to increased foreign demand outweigh any possible negative effects of increased imported inputs costs. Employment in accommodation and food also benefits from the depreciation in the exchange rate, possibly from increases in tourism. Other

[10] Unit root tests confirm that the dependent and explanatory variables are $I(0)$.

[11] Tests of the estimated residuals show that there is no autocorrelation in the errors in each of the industry regressions.

industries such as mining, oil and gas, construction, FIRE, administration and support services, and education services tend to have lower than average employment growth when the Canadian dollar depreciates. Since commodities are priced in U.S. dollars, a depreciation of the Canadian dollar increases revenues in Canadian dollar terms for exporters in mining, oil and gas, but it does not lead to the increase in foreign demand as in the case of manufacturing. So it is not entirely surprising that increased imported input costs in a capital and energy intensive sector like mining, oil and gas could dampen its growth. Another possible explanation, which is applicable to the other sectors, is that the positive effect on manufacturing is so great that it attracts labour from other sectors.

In line with expectations, an increase in non-energy commodity prices increases the employment share of mining, oil and gas and transportation, but not the employment share of agriculture, forestry, fishing and hunting. The non-energy commodity price index is correlated to the food portion of the commodity price index, so the explanatory variable itself is not the problem.[12] The reason for the negative relationship probably lies in what is generally driving the fluctuations in food prices. Arguably, the role of supply shocks is consistently more pronounced for agriculture than for other sectors. For example, an increase in food prices could be more likely to reflect a poor harvest and falling employment in agriculture, than increased demand for food and rising agricultural employment. Rising non-energy commodity prices also act to reduce the employment share of manufacturing.

Rising energy prices leads to falling employment shares in manufacturing, agriculture, other services, and public administration and increasing employment shares in mining, oil and gas, construction, trade, information and culture, and arts and recreation. This suggests that energy and labour are more complementary than subsitutes in sectors using energy as an intermediate input. As a net exporter of energy, Canada saw a substantial increase in the gross domestic income that is due to the rising energy prices. Therefore, it is not surprising that along with employment in mining, oil and gas, employment in mainstays of the domestic demand, construction and trade, benefit from increases in energy prices. On the other hand, manufacturing and agriculture are among the more

[12]The correlation between the food and the entire non-energy component of the commodity price index is 0.7. Even when the food portion of the index is uses as a regressor the result is a negative coefficient.

energy intensive industries. The others are utilities and transportation, but these sectors also benefit from the generation and export of energy.

The final column of Table 1 gives the goodness of fit for the regressions. Overall, the fit is reasonable given the small number of regressors. In most cases, the fit does not wholly depend on the lagged dependent variables and dummies. The omission of these explanatory variables reduces the R^2 from 0.81 to 0.63 for manufacturing, and 0.56 to 0.47 for retail trade. Two industries in which the indicator variables were very important were agriculture and wholesale trade. Without the 2001 dummy, the R^2 for agriculture falls from 0.65 to 0.07, and without the 1999 dummy, the R2 for wholesale trade falls from 0.92 to 0.16. This underlines how extraordinary these growth rates were for agriculture and wholesale trade in those particular years.

Using the estimated coefficients from the industry regressions, it is possible to calculate the employment growth in each industry and the employment growth dispersion predicted by the regressions. The results without using the dummy variables for wholesale trade and agriculture are presented in Figure 5. Since not all the variation in the industry employment is captured by the regression, the predicted dispersion is generally below that of the cyclically-adjusted dispersion. On average, the predicted dispersion without the indicator variables is 75 per cent that of the cyclically-adjusted dispersion.[13] It does, however, capture the general movements in the cyclically-adjusted dispersion. The indicator variables are necessary to match the peaks, but as discussed previously, this is not surprising because the industry movements that drove theses peaks are generally unrelated to the prices used in the regression. Importantly, one aspect that the data that the regressions do pick up is the rise in reallocation that occurred in the 2004-2008 period, which is thought to be driven by shifts in these prices. The predicted dispersion as a fraction of the actual also rises to 83 per cent in the last four years.

[13]The predicted change in industry employment shares when there are no changes in the exchange rate or commodity prices, the constant terms in the regressions, yields a predicted dispersion measure of 0.011 or 43 per cent of the cyclically-adjusted dispersion on average. This suggests that the changes in the real exchange rate and commodity prices account for the remaining 32 percentage points accounted for by the regression model.

4.3. *Labour productivity growth and labour reallocation across industries*

The reallocation of labour across industries can lead to gains in labour productivity growth if labour is shifted toward more productive industries, or if labour is shifted toward industries whose labour productivity growth is higher and away from industries whose labour productivity growth is negative. Shift-share analysis captures both of these effects:[14]

$$\frac{LP_t - LP_{t-1}}{LP_{t-1}} = \frac{1}{LP_{t-1}} \sum_{i=1}^{N} LP_{it-1}(s_{it} - s_{it-1}) + \frac{1}{LP_{t-1}} \sum_{i=1}^{N} (LP_{it} - LP_{it-1})(s_{it} - s_{it-1}) + \frac{1}{LP_{t-1}} \sum_{i=1}^{N} (LP_{it} - LP_{it-1}) s_{it-1}, \quad (9)$$

where LP_{it} is the labour productivity of industry i at time t, and LP_t is aggregate labour productivity at time t. Shift-share analysis decomposes aggregate labour productivity growth into three terms. The first term, the static effect, measures gains attributable to shifts toward more productive industries. The second term, the dynamic effect, measures gains due to shifts toward industries with higher productivity growth. The third term measures the contribution of within-industry gains in labour productivity.

The results of the decomposition for the entire 1987-2008 period and for subperiods of above average and below average employment growth dispersion are presented in Table 2. In this decomposition, labour productivity is defined as real-value added in 2002 constant dollars over employment from the LFS. Within-industry productivity growth accounts for the bulk of the aggregate productivity growth over the 1987-2008 period and almost all subperiods. The dynamic shift component is negative mainly because of the movement away from manufacturing, an industry that experienced strong productivity growth. Since the static shift component is close to zero, this implies that, overall, employment reallocation across industries has been a drag on aggregate productivity. The results for the subperiods suggest that periods of greater employment reallocation do not necessarily imply larger a shift effect on aggregate productivity. Indeed, the sum of the shift effects is largest for the 1987-1989 period, a period of lower than average employment dispersion.[15]

Table 3 presents more detail for the decomposition of the 2004-2008 period. Within-

[14] See Fagerberg (2000) for more details.

[15] The 1987-1989 period saw the employment shares of FIRE and utilities grow, both industries with above average labour productivity levels.

industry productivity growth accounts for 1.3 percentage points of the 1.6 per cent aggregate productivity growth over that time.[16] The static shift component is 1.2 percentage points, but it is counteracted by a dynamic shift effect of -0.9 percentage points. The static shift component is positive because the rising dollar and commodity prices shifted employment from away from manufacturing, to industries with as high or higher levels of productivity, mining, oil and gas, and FIRE. The dynamic shift component is negative because mining, oil and gas, FIRE and construction have weaker productivity growth than manufacturing. In fact, construction and mining, oil and gas exhibited negative productivity growth.

4.4. *Aggregate job creation, destruction and reallocation*

Job reallocation rates for the business sector[17], as defined in (4), are shown in Figure 6. Between 1992 and 2006, the rate of job reallocation declined from 23.7 per cent to 20.3 per cent.[18] Figure 6 also plots employment growth. The average of the absolute values of employment growth is 2.1 per cent, much lower than the 21.3 per cent average job reallocation rate. Furthermore, the correlation between the rate of job reallocation and absolute value of employment growth is -0.57 over the 1992-2006 period. Together this evidence suggests that aggregate employment variations play only a small role in explaining aggregate job reallocation.

Figure 7 presents the job creation and destruction rates. As in the previous literature, job creation appears less volatile than job destruction. Job creation is pro-cyclical, while job destruction is counter-cyclical. Furthermore, it is evident that the decline in job reallocation since 1992 is due to a decline in job destruction.

4.5. *Industry job creation, destruction and reallocation*

Table 4 presents statistics for 17 2-digit industry-levels. There are many non-manufacturing industries with higher job reallocation rates than manufacturing. The industries with the

[16]Labour productivity growth based on employment is lower than labour productivity based on hours worked because hours per job fell over the 2004-2008 period. A decomposition using value-added per hours worked would result in a higher within-industry component, but similar shift components.

[17]The business sector excludes public administration, private households and the public portions of education and health.

[18]The job reallocation rates before 1992 from the old version of LEAP are more volatile, but do suggest that the decline in job reallocation rates is a relatively recent phenomenon.

highest rates of reallocation on average are construction, agriculture, forestry, fishing and hunting, and professional services. Not surprisingly, these industries are characterized by a smaller average firm size than other industries. At the other end of the spectrum, education and utilities have lower rates of reallocation than manufacturing. The lower rates of reallocation in these industries are not surprising as they are quasi-government in nature. Furthermore, utilities are dominated by large employers. Interestingly, the industries with the lowest level of reallocation have the highest variability (as measured by the coefficient of variation), and industries with the highest level of reallocation have the lowest variability. The reasons behind this relationship are unclear. Finally, employment growth generally accounts for a small fraction of job reallocation.

Table 5 shows the changes in job reallocation rate between the 1992-1999 and 2000-2006 period. The majority of the industries, 13 of 18 industries, exhibit declining rates of job reallocation. Thus the phenomenon at the business sector is not concentrated in a few industries. Accommodation and food, arts and recreation, construction, utilities, and agriculture exhibited the largest declines in job reallocation.

To this point we have spoken of excess reallocation at the aggregate level, the left-hand side of equation (7), and excess reallocation at the industry-level, the second term in the right-hand side of equation (7). The importance of net employment shifts between industries, the first term in the right-hand side of equation (7), has yet to be ascertained. For the 1992-2006 period, the average aggregate job reallocation rate was 21.3 per cent and the average absolute value of the employment growth rate was 2.1 per cent. This yields an average excess reallocation rate of 19.2 per cent. On average, net employment shift between sectors accounts for 0.6 percentage points or 2.8 per cent of that excess reallocation. Excess reallocation within each sector primarily accounts for the excess reallocation at the aggregate level.

4.6. *Explaining variation in job reallocation*

Davis et al. (1996) find that plant size and the level of real wages are negatively correlated with the pace of excess job reallocation. Smaller firms experience more volatility and are more likely to exit, thus they have higher rates of reallocation. Higher real wages indicate higher levels of human capital, especially specific human capital. Employment

relationships are likely more durable in industries with higher levels of specific human capital. Davis et al. (1996) also consider the exposure to international trade as a cause of greater job reallocation, but do not find any supportive evidence once human capital is taken into account.

Table 6 presents the results of a cross-sectional regression of industry average excess job reallocation rates on the fraction of employees working in firms with more than 500 employees in the industry, average age of the employees in the industry, the fraction of workers in the industry with a Bachelors degree or above and net trade exposure as follows,[19]

$$\tilde{R}_i = \beta_0 + \beta_1 \ln(size_i) + \beta_2 \ln(age_i) + \beta_3 \ln(educ_i) + \beta_4 (trade_i) + \varepsilon_i, \tag{10}$$

where $\tilde{R}_i$ is industry i's average rate of excess job reallocation, $size$ is fraction of workers employed in firms with more than 500 employees, age is the average age of the employees, $educ$ is the fraction of employees with a Bachelors degree or above, and $trade$ is the average net trade exposure, where net trade exposure is defined as export orientation (export as a fraction of gross output) plus import competition (imports of goods produced by the industry divided by total domestic availability of those goods) minus the industry's imported inputs as a fraction of its gross output.

For the 2-digit industries, firm size is the only significant variable, but it is negative as expected. A 10 percentage point increase in the fraction of employees in large firms decreases the excess job reallocation rate by 1.5 percentage points. Across the 3-digit manufacturing industries, the effect of firm size is of similar magnitude, but once again proxies for human capital are not statistically significant. Unlike results in Davis et al. (1996), increasing trade exposure has a positive effect on excess reallocation even after

[19]The fraction of employees working in firms with more than 500 employees is taken from the LEAP, while age and education measures are calculated from the LFS. Measures of trade exposure are computed following Dion (1999-2000). Trade exposure cannot be calculated for industries that produce goods or services that are not traded. Davis et al. (1996) also examine the relationship between energy and capital intensity and job reallocation. They suggest that capital intensity is negatively related to excess reallocation because a complementarity between human capital and physical capital. Since age and education are already entered into the regression, capital intensity is not considered. Energy intensity was considered, but was not significant in the cross-sectional regressions or the panel regressions presented later. Davis et al. (1996) and Davis and Haltiwanger (1999) also show evidence that job reallocation and plant age are negatively related, but firm age is not used here because it is defined only for firms that entered after 1991 in the LEAP.

controlling for human capital.

Table 7 presents the results of panel regressions that examine the factors that account for the time variation in excess reallocation rates within each industry. The panel unit-root test by Im et al. (2003) indicates that size, age, education and trade exposure are integrated of order one, and excess is integrated of order zero. Therefore, the first difference of excess reallocation is used as the dependent variable,[20]

(11)
$$\Delta\left(R_{it}-\left|\frac{\Delta E_{it}}{Z_{it}}\right|\right)=\gamma_1\Delta\ln(size_{it})+\gamma_2\Delta\ln(age_{it})+\gamma_3\Delta\ln(educ_{it})+\gamma_4\Delta\ln(trade_{it})+\Delta\varepsilon_{it}.$$

A full set of year dummies also enter the regression when possible. Firm size is negative and significant in each of the regressions for the 2-digit industries and the 3-digit manufacturing industries, while age and education are not statistically significant in any of the regressions. Although trade exposure was not statistically significant, some evidence that the degree of import competition has an impact is found (Column 1, 3-digit manufacturing industries). However, neither firm size nor trade exposure can account for the decline in excess job reallocation. The fraction of workers in large firms fell in the early 1990s and has remained relatively stable since then. This would imply a rise in excess job reallocation. Increasing trade exposure and the degree of import competition would also imply higher excess job reallocation.

As in the case of employment flows across sectors, it is possible that relative prices such as the real exchange rate and commodity prices affect the amount of labour reallocation across firms within industries. For example, a low Canadian dollar may limit diminish the competitive pressures faced by Canadian exporters, but it may also increase the pressure on firms that rely on imported inputs. Thus the effect relative prices is an empirical question. To investigate the impact of relative prices on excess job reallocation, the growth in the real exchange rate and the growth in commodity prices are entered as additional regressors in (11) and replace the year dummies. The effect of the real exchange rate is not significant for the 2-digit industries, but higher non-energy and energy commodity prices are found to lower the degree of excess job reallocation. Perhaps

[20]Industry fixed effects are omitted since an F-test indicates they are jointly insignificant.

increases in commodity prices raise the income of Canadians and profitability of firms so much that competitive pressures are lowered. While the direction of the effect is in line with the reduction in excess job reallocation, the timing is off. While much of the decline in reallocation occurred in the early 1990s, commodity prices only increased in more recent years.

As expected, the impact of the real exchange rate is greater in manufacturing, but it is still not statistically significant (Column 2, 3-digit manufacturing industries). Unlike the regression for the 2-digit industries, commodity prices are not statistically significant either. An attempt was made to see if interacting the real exchange rate with net trade exposure and interacting energy prices with energy intensity would given stronger results, but the coefficients remain insignificant (Column 3, 3-digit manufacturing industries).

4.7. *Productivity and gross flows within industries*

In this section, the estimates of the correlation between the excess job reallocation and MFP growth and labour productivity are described. In many previous works, accounting procedures were applied to plant-level data on output and labour to decompose the productivity growth into within and between components. For example, Foster et al. (2001) find that more than 60 percent of industrial productivity growth can be accounted for by within-plant effects in the U.S. manufacturing sector. The evidence presented here is based on regression analysis using industry-level data on job reallocation and productivity growth. Although firm-level data on labour input is available in the LEAP, firm-level output data is not. In the case of gross flows within industries, excess job reallocation may be a proxy for the pace of the increasing importance or birth of more productive firms, and the declining importance or death of less productive ones. An increase in the pace of this continual process should be positively correlated to an increase in productivity growth. But the causality issue is unable to be addressed. On the one hand, a positive productivity shock might lead to more reallocation within an industry if firms vary in their ability to adjust to the shock. On the other hand, firms need to incorporate the new technology and ideas before measured MFP gains can be realized. In the following regressions it is the relationship between measure MFP and reallocation that is examined. Nevertheless, the estimated coefficients presented in the next section

need to be interpreted with caution.

Table 8 presents first panel regressions of MFP and labour productivity growth on excess job reallocation rates at the 2-digit industry level. The first column in Table 8 shows the results when MFP growth is regressed on excess job reallocation rates and industry dummies. In this specification, the effect of reallocation is not statistically significant. Since MFP growth has been shown to be procyclical in Canada and because job reallocation has a cyclical component, the change in the unemployment rate is entered into the regression in column two.[21] The coefficient on the unemployment rate is allowed to be industry-specific. Although job creation and job destruction move in opposite directions over the cycle, job destruction is more variable, so it would be expected that job reallocation is weakly countercyclical. The results in Table 8 are in line with that expectation. The positive correlation between job reallocation and MFP growth becomes more positive when controlling for cyclical effects that tend to depress MFP growth in recession periods when total reallocation tends to increase because of the greater sensitivity of job destruction than job creation. An excess job reallocation rate of 20 percent adds 1.3 percentage points to MFP growth, which is roughly the same magnitude as that obtained from the decomposition in the U.S. manufacturing sector.

Since the change in the unemployment rate may be an imperfect measure of the cycle, a full set of year dummies is included in the panel regressions in place of the change in the unemployment rate in column three. Year dummies not only control for the cycle, but any other effect that is common across industries in a particular year. The introduction of year dummies only decreases the estimated coefficient slightly to 0.064.

The remaining three columns of Table 8 repeat the exercise for labour productivity growth. Without the change in unemployment or year dummies the effect of the job reallocation on labour productivity growth is 0.0963. A job reallocation rate of 20 per cent adds 1.9 percentage points to labour productivity growth each year. Accounting for cyclical effects only increases the magnitude of the effect.

This large and positive correlation between job reallocation and productivity growth provides evidence of the role of job reallocation in productivity growth. Job reallocation is endogenous and partly determined by the fluctutations in productivity shocks. Sur-

[21] See Paquet and Robidoux (2001), for example.

prisingly, regressions of reallocation rates on lags of productivity growth and regressions of productivity growth on lags of reallocation rates do not yield statistically significant coefficients. There can be many reasons why the lagged correlation between job reallocation and productivity growth is mall or even negative. First, large adjustment cost of labor can arise from the hold-up problem of sunk investment in human capital or physical capital, which may have harmful negative effects. If adjustment cost is large enough, the firm's optimal decision can be inaction in responding to a productivity shock. Other frictions, both informational and financial, play a similar role in preventing firms from optimally adjust employment.[22] Second, An increase in reallocation does not necessarily contribute to a positive productivity growth because the employment does not always move from less productive firms to more productive firms. Financial constraint or policy distortion may allow employment of less productive firms to increase.

Nevertheless, relative to the effect of the reallocation of labour across industries and productivity, the relationship between the labour reallocation between firms within industries and industry-level productivity is large.

5. CONCLUSION

The paper documents the rate at which labour flows between industries and between firms within industries using the most recently available data. It examines the determinants of these flows and their effect on productivity growth. It is found that the dispersion of employment growth rates has picked up in recent years. The current level of dispersion is small relative to some past episodes of employment dispersion, but it is more likely to reflect actual structural changes as the employment of two cyclical industries, manufacturing and construction are going in opposite directions, in contrast to previous episodes of cyclical downturn. Regression analysis suggests that changes in the real exchange rate and commodity prices can account for large fraction of the employment growth dispersion in the data, especially in the 2004-2008 period. Employment shifts between industries, however, have had little positive impact on aggregate labour productivity growth.

With respect to gross movements of labour between firms within industries, it is found that the job reallocation rate has fallen steadily over the past decade and a half. The

[22]See Davis and Haltiwanger (1999) for more examples.

increase in average firm size in more recent years is found to be associated with part of this decline. Finally, unlike net labour flows between industries, the gross flows of labour within industries are found to be positively related to industry MFP and labour productivity growth rates.

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Table 1. Relative Employment Growth and Relative Prices, LFS 1988-2008

	Lagged dependent variable		Δln(real exchange rate)			Δln(non-energy commodity price)		Δln(energy price)			
	t-1	t-2	t	t-1	t-2	t	t-1	t	t-1	t-2	R^2
Agriculture	-----	-----	-----	-----	-----	-0.1712 (0.0786)	-----	-0.0691 (0.0337)	-----	-----	0.650
Mining, oil and gas	-----	-----	-0.5574 (0.1587)	-----	-----	0.0399 (0.1224)	0.3192 (0.1227)	-0.0558 (0.0524)	0.2576 (0.0519)	-----	0.745
Utilities	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Construction	-----	-----	-0.0933 (0.1240)	-0.3117 (0.1186)	-----	-----	-----	0.0649 (0.0338)	-----	-----	0.543
Manufacturing	0.4879 (0.1829)	-----	0.0541 (0.0461)	0.0522 (0.0481)	0.0809 (0.0444)	-0.0643 (0.0300)	-----	-0.0053 (0.0146)	-0.0038 (0.0113)	-0.0233 (0.0121)	0.813
Wholesale trade	-0.2928 (0.0990)	-----	-----	-----	-----	-----	-----	0.0682 (0.0178)	0.0419 (0.0166)	-----	0.916
Retail trade	0.3173 (0.1772)	-----	-----	-----	-----	-----	-----	0.0091 (0.0110)	0.0434 (0.0103)	-----	0.559
Transportation	-----	-----	-----	-----	-----	0.1099 (0.0488)	-----	0.0349 (0.0207)	-----	-----	0.286
Information and culture	-----	-----	-----	-----	-----	0.0626 (0.0995)	0.2947 (0.1004)	-0.0461 (0.0416)	0.0866 (0.0426)	-----	0.475
FIRE	-----	-----	-0.1572 (0.0543)	-----	-----	-----	-----	-----	-----	-----	0.305
Professional services	-----	-----	-----	-----	-----	-----	-----	-0.0539 (0.0301)	-----	-----	0.131
Administration	-----	-----	-0.0509 (0.1057)	0.1867 (0.1052)	-----	-----	-----	-----	-----	-----	0.164

Note: Standard errors in parentheses. Dependent variable is the cyclically-adjusted growth of industry employment relative to aggregate employment. Commodity prices are relative to the GDP deflator. Insignificant variables have been dropped. All regressions include a constant Regression for wholesale trade includes a 1999 year dummy, and regression for agriculture includes a 2001 year dummy.

Table 1. Relative Employment Growth and Relative Prices, LFS 1988-2008, continued

	Lagged dependent variable		Δln(real exchange rate)			Δln(non-energy commodity price)		Δln(energy price)			
	t-1	t-2	t	t-1	t-2	t	t-1	t	t-1	t-2	R^2
Education	-----	-----	-0.0491 (0.0821)	0.1469 (0.0945)	-0.1986 (0.0865)	0.0991 (0.0585)	-----	-----	-----	-----	0.265
Health services	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Arts and recreation	-----	-----	0.1388 (0.2151)	0.0032 (0.2531)	0.3826 (0.2187)	-----	-----	0.0615 (0.0568)	0.0247 (0.0608)	0.0987 (.0551)	0.391
Accommodation and foo	-----	-----	0.1151 (0.0594)	-----	-----	-----	-----	-----	-----	-----	0.165
Other services	0.2351 (0.1723)	-----	-----	-----	-----	-----	-----	-0.0599 (0.0303)	-0.0676 (0.0298)	-----	0.420
Public administration	-----	-----	0.0289 (0.0803)	-0.1291 (0.0801)	-----	-----	-----	0.0168 (0.0215)	-0.0436 (0.0216)	-----	0.275

Note: Standard errors in parentheses. Dependent variable is the cyclically-adjusted growth of industry employment relative to aggregate employment. Commodity prices are relative to the GDP deflator. Insignificant variables have been dropped. All regressions include a constant Regression for wholesale trade includes a 1999 year dummy, and regression for agriculture includes a 2001 year dummy.

Table 2. Decomposition of Labour Productivity Growth (%), 1987-2008

	Static Shift	Dynamic Shift	Within Industry Growth	Total
1987-2008	0.1	-4.6	27.5	22.9
Periods of higher than average dispersion in employment growth:				
1989-1991	0.0	-0.1	0.5	0.4
1996-2002	-2.2	-0.7	12.5	9.6
2004-2008	1.2	-0.9	1.3	1.6
Periods of lower than average dispersion in employment growth:				
1987-1989	0.9	-0.1	0.3	1.1
1991-1996	-1.5	-0.5	9.5	7.5
2002-2004	0.4	-0.1	0.8	1.2

Note: Labour productivity growth is defined as real value added in 2002 constant dollars divided by LFS employment.

Table 3. Detailed Decomposition of Labour-Productivity Growth (%), 2004-2008

	Static shift	Dynamic shift	Within-industry growth	Total
Total economy	1.2	-0.9	1.3	1.6
Mining, oil and gas	1.5	-0.4	-1.4	-0.3
Manufacturing	-3.3	-0.3	1.6	-2.0
Non-tradable	3.1	-0.1	1.3	4.2
Construction	1.2	-0.1	-0.5	0.5
Agriculture, forestry, fishing and hunting	-0.3	0.0	0.1	-0.2
Utilities	0.2	0.0	-0.2	0.0

Note: Labour productivity growth is defined as real value added in 2002 constant dollars divided by LFS employment. The non-tradable sector includes: North American Industry Classification System (NAICS) sectors 23, 41, 44-45, 48-49, 51, 52, 53, 54, 56, 61, 62, 71, 72, 81 and 92.

Table 4. Characteristics of Job Reallocation by Major Industry

	Job reallocation rate		|Employment growth| as fraction of rellocation
	Mean	CV	
Construction	0.342	0.102	0.129
Agriculture, forestry fishing and hunting	0.323	0.088	0.081
Professional services	0.296	0.047	0.159
Administrative and waste management	0.289	0.058	0.168
Accommodation and food	0.269	0.117	0.088
Arts and recreation	0.249	0.170	0.165
Other services	0.222	0.059	0.071
Wholesale trade	0.220	0.108	0.115
Mining, oil and gas	0.216	0.113	0.228
Information and culture	0.195	0.146	0.139
Health care and social services	0.194	0.089	0.145
Retail trade	0.192	0.140	0.114
FIRE	0.190	0.112	0.091
Manufacturing	0.187	0.074	0.128
Transportation and warehousing	0.177	0.052	0.089
Utilities	0.139	0.588	0.161
Education	0.107	0.767	0.110

Table 5. Change in Job Reallocation Rates by Major Industry

	1992-1999	2000-2006	Change
Agriculture, forestry fishing and hunting	34.4	29.9	-4.5
Mining, oil and gas	21.3	22.0	0.7
Utilities	16.1	11.5	-4.6
Construction	36.6	31.4	-5.2
Manufacturing	19.1	18.2	-0.9
Wholesale trade	23.5	20.3	-3.2
Retail trade	20.8	17.3	-3.4
Transportation and warehousing	17.8	17.7	-0.1
Information and culture	17.9	21.4	3.5
FIRE	18.0	20.3	2.3
Professional services	30.3	28.9	-1.4
Administrative and waste management	29.4	27.4	-2.1
Health care and social services	8.5	8.9	0.4
Education	19.9	18.9	-0.9
Arts and recreation	27.4	22.0	-5.4
Accommodation and food	29.4	24.0	-5.4
Other services	23.2	21.0	-2.1

Table 6. Explaining the Cross-sectional Variation in Excess Reallocation Rates

	2-digit industries	3-digit manufacturing industries	
		(1)	(2)
Fraction of employment in large (500+ employees) firms	-0.1456 (0.0449)	-0.1503 (0.0382)	-0.1267 (0.0378)
ln(average age)	0.0698 (0.1260)	0.6479 (0.2621)	0.7015 (0.2459)
ln(fraction of workers with B.A. or above)	-0.0178 (0.0176)	0.0182 (0.0188)	0.0187 (0.0175)
ln(net trade exposure)	-----	-----	0.0111 (0.0060)
R^2	0.573	0.554	0.637

Note: Standard error in parentheses.

Table 7. Explaining the Within-Industry Variation in Excess Reallocation Rates, 1992-2006

	2 digit industries		3-digit manufacturing industries		
	(1)	(2)	(1)	(2)	(3)
Fraction of employ-ment in large firms	-0.6245 (0.3240)	-0.6252 (0.3349)	-0.5876 (0.2578)	-0.6013 (0.2819)	-0.7034 (0.2839)
ln(average age)	-0.1801 (0.3535)	-0.4728 (0.3606)	0.2015 (0.2361)	0.1890 (0.2562)	0.1247 (0.2518)
ln(fraction of workers with B.A. or above)	0.0146 (0.0406)	0.0024 (0.0418)	0.0028 (0.0146)	-0.0045 (0.0161)	-0.0087 (0.0159)
ln(import competition)	-----	-----	0.1620 (0.0719)	0.0701 (0.0733)	0.0532 (0.0758)
ln(real exchange rate)	-----	-0.0172 (0.0585)	-----	-0.1767 (0.1178)	-----
ln(non-energy commodity price)	-----	-0.1711 (0.0461)	-----	-0.1086 (0.0820)	-0.1263 (0.0808)
ln(energy price)	-----	-0.0558 (0.0201)	-----	-0.0819 (0.0487)	-----
ln(real exchange rate)*trade exposure	-----	-----	-----	-----	0.0386 (0.0919)
ln(energy price)* energy intensity	-----	-----	-----	-----	0.0074 (0.0078)
Year dummies	Yes	No	Yes	No	No
R^2	0.251	0.108	0.258	0.067	0.054

Note: Standard error in parentheses. Dependent variable is change in excess reallocation rates. Explanatory variables are also first-differenced.

Table 8. MFP Growth, Labour Productivity Growth, and Excess Job Reallocation, 1992-2004

	MFP growth			Labour productivity growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Job reallocation rate	0.0358	0.0668	0.0638	0.0963	0.1586	0.1242
	(0.0310)	(0.0342)	(0.0354)	(0.0558)	(0.0664)	(0.0629)
ΔUnemployment rate	No	Yes	No	No	Yes	No
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	No	No	Yes	No	No	Yes

Note: Standard errors in parentheses. The coefficient on the unemployment rate is industry-specific.

Figure 1. Employment Growth Dispersion for Different Levels of Disaggreation, LFS 1988-2008

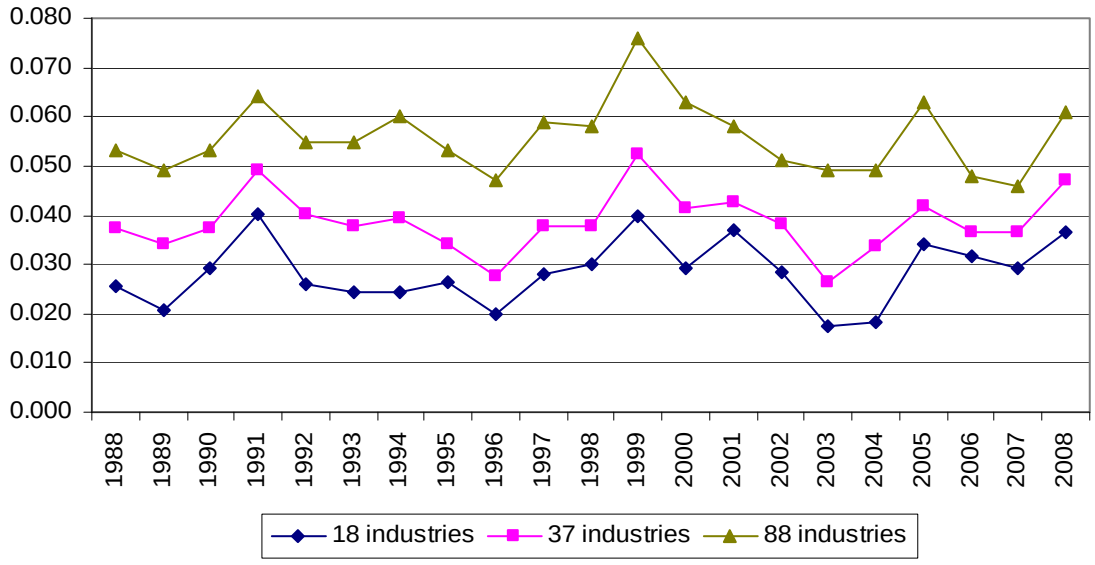


Figure 2. Industry Contributions to Dispersion, LFS 2-digit industries

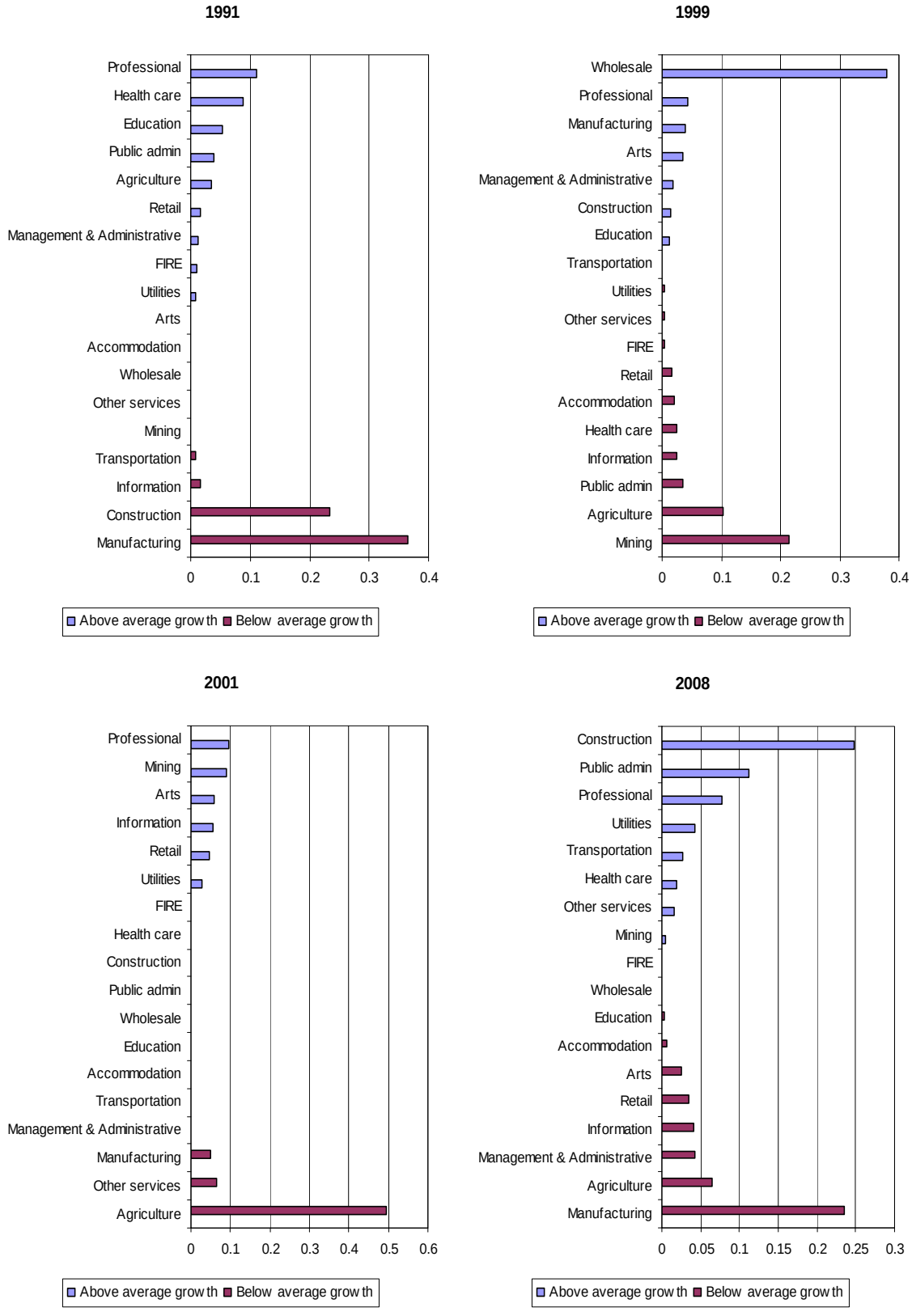


Figure 3. Employment Growth Rates, LFS 1988-2008

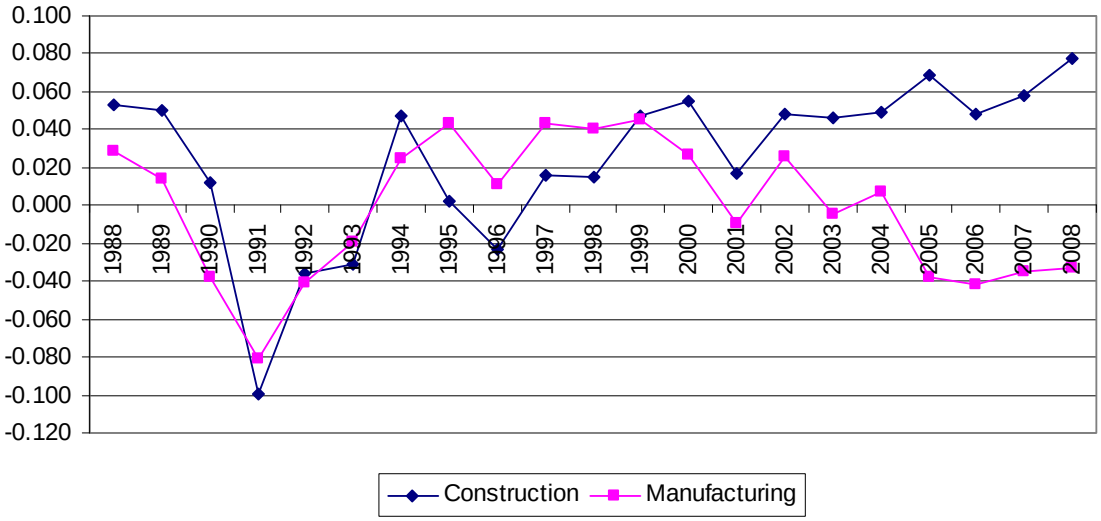


Figure 4. Actual and Cyclically-adjusted Dispersion

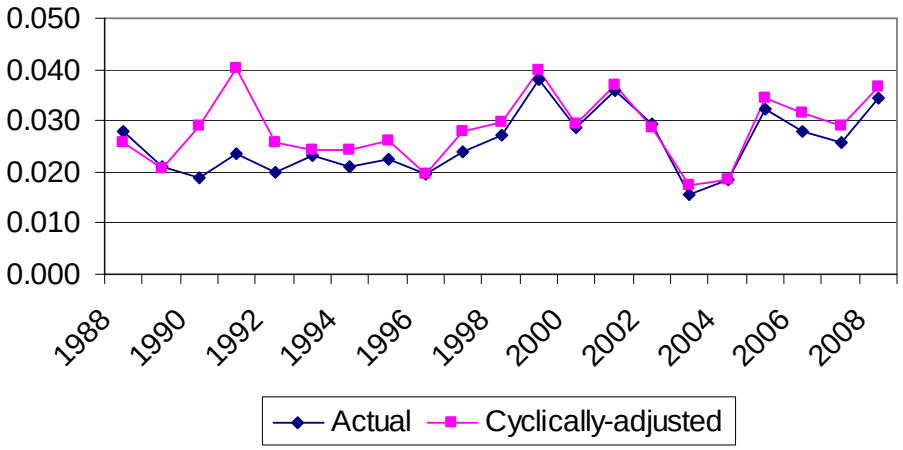


Figure 5. Cyclically-adjusted and Predicted Dispersion

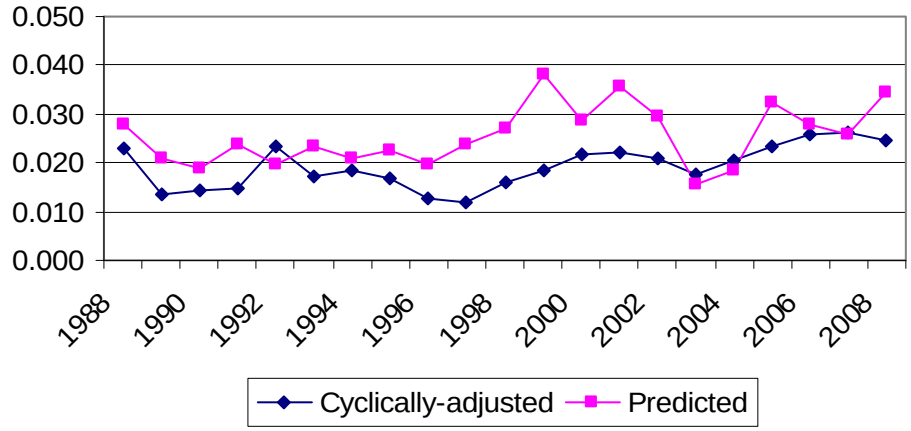


Figure 6. Job Reallocation and Employment Growth Rates, LEAP 1992-2006

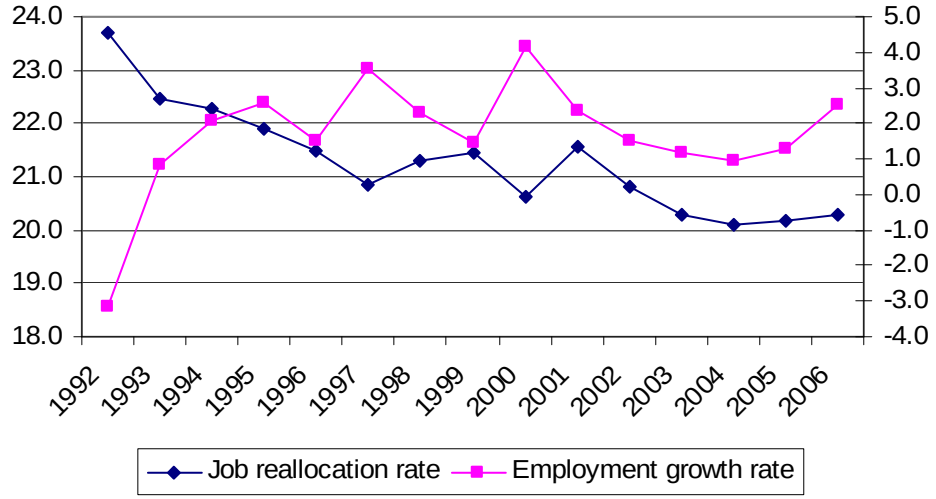
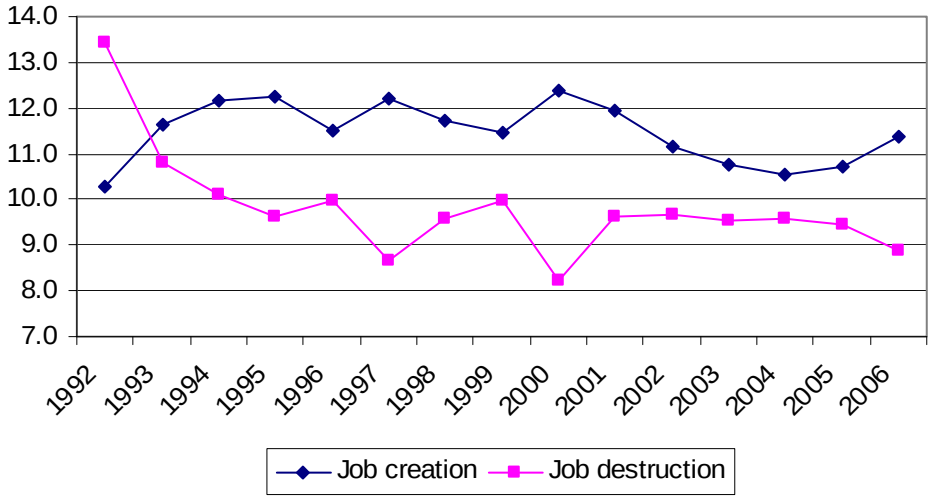


Figure 7. Job Creation and Job Destruction Rates, LEAP 1992-2006



Appendix A - Net labour reallocation, KLEMS 1962-2004

To obtain a better sense of how the pace of reallocation today compares to the amount of reallocation in a more distant past, the dispersion measure is calculated using the KLEMS data for 16 2-digit level industries, and 35 3-digit manufacturing industries and 2-digit non-manufacturing industries. The dispersion of hours growth is presented in Figure A1. In comparison to the spikes in reallocation in 1991 and the late 1990's, the spikes in the more distant past are of similar size. There are only two clearly larger peaks, in 1965 and 1982. Figure A1 also shows there is generally a peak in reallocation during recessions. This is true for the recessions in 1991, 1982, 1980, 1975 and to a lesser extent 1970. As with the LFS data, disaggregation of the manufacturing sector adds little additional dispersion.

Figure A2 presents the industry contributions to each large peak in hours growth dispersion. Agriculture, forestry and fishing alone accounted for 63 per cent of the hours growth dispersion in 1965. This strong decline in agriculture did not occur solely in 1965. Over the 1962-1972 time period, average hours growth in agriculture, forestry and fishing was -3.7 per cent, and on average agriculture, forestry and fishing account for 35 per cent of the hours growth dispersion. The decline in agriculture was just particularly strong in 1965.

The one year in the 1962-1972 period where the contribution of agriculture was less than 5 per cent was 1967. In this year, the strong negative hours growth in construction and the strong positive hours growth in arts, entertainment and recreation each accounted for 32 per cent of the reallocation. The strong negative hours growth in construction in 1967 was preceded by strong positive growth in 1966. The construction of many buildings across the country to mark Canada's centennial likely explains part of this pattern, as does the completion of the Bloor-Danforth metro line in Toronto and the inauguration of the Montreal metro system in 1967. Expo67 in Montreal and centennial celebrations could also explain the sharp rise in hours in arts, entertainment and recreation in 1967 and its subsequent large decline in 1968.

As typical in recessions, manufacturing hours growth fell sharply in 1975. Hours growth in construction was not as negative as in manufacturing, but it did decelerate sharply from 5.6 per cent in 1974 to -2.1 in 1975. Interestingly, hours growth in accommodation and food was very strong at 10.2 per cent in 1975. This strong performance in a period of weak hours growth caused accommodation and food to account for 45 per cent hours growth dispersion in 1975. Although an explanation for this strong growth is lacking, it is likely not a problem with the data because hours growth in accommodation and food was over 8 per cent in each of the previous two years.

FIRE contributed the most, 36 per cent, to the peak in hours growth dispersion in 1977. Again, the force behind the surge in growth in FIRE in 1977 is unclear. However, the zero hours growth in 1976 interrupted a string of 14 consecutive years of strong positive growth of on average 4.5 per cent a year. Furthermore, in the four years after

1977, hours growth in FIRE averaged 5.1 per cent. Thus, the 9.3 per cent growth in 1977 could be viewed reversion to a trend.

The early 1980s was a turbulent time with two recessions in 1980 and 1982, and with oil prices peaking in 1981 and then declining. Not surprisingly, unlike in the previous peaks, many industries contributed to the elevated dispersion throughout 1980-1982 period. Together, the below average growth in construction and manufacturing accounted for 17, 13 and 45 per cent of the dispersion in 1980, 1981, 1982, respectively. Due to high oil prices, particularly strong hours growth in mining, oil and gas accounted for 11 per cent of the dispersion in 1980. In general, however, it was service industries such as other services and health services that had above average growth.

With contribution of 32 per cent, construction played the most prominent role in the peak in reallocation in 1987. The boom in construction is likely related to the thriving housing market in the late 1980s.

The results for 1991 using the KLEMS are identical to the ones from the LFS, and again are typical of a recession. Negative growth in manufacturing and construction accounted for just over half of the peak in dispersion, and positive growth in health and professional services accounted for another 27 per cent. Unlike the LFS data, a peak in reallocation is not found in 1999, but in 1998. The main reason for the discrepancy is that, in 1999, wholesale trade employment growth was 15.3 per cent in the LFS, but hours growth was only 3.5 per cent in the KLEMS. Hours growth in mining, oil and gas was also not as weak as employment growth in 1999, -7 per cent versus -15 per cent. For 1998, hours growth in professional services is stronger than employment growth (11 per cent versus 9 per cent), and hours growth in mining, oil and gas is weaker than employment growth (-10 percent versus -2.6 per cent). Also, the 2001 peak in KLEMS hours growth dispersion is not as pronounced as the peak in LFS employment growth dispersion because the decline in agricultural employment was stronger than the decline in hours. In this case, however, the difference is not as large. Hours growth was -11.1 per cent and employment growth was -14.2 per cent.

As with the LFS employment data, labour growth in manufacturing and construction generally decline sharply during business cycle downturns. This can be clearly seen in Figure A3 that presents the hours growth rates for manufacturing and construction for KLEMS. Also presented in Figure A3 are the recession date taken from Cross (2001).

Figure A1. Hours Growth Dispersion, KLEMS 1962-2004

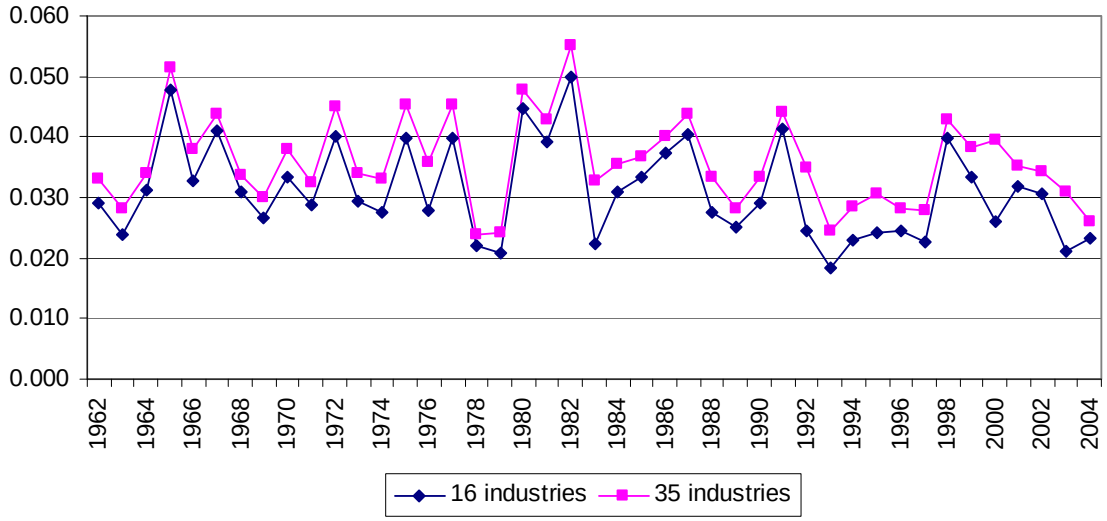


Figure A2. Industry Contributions to Dispersion, KLEMS 2-digit Industries

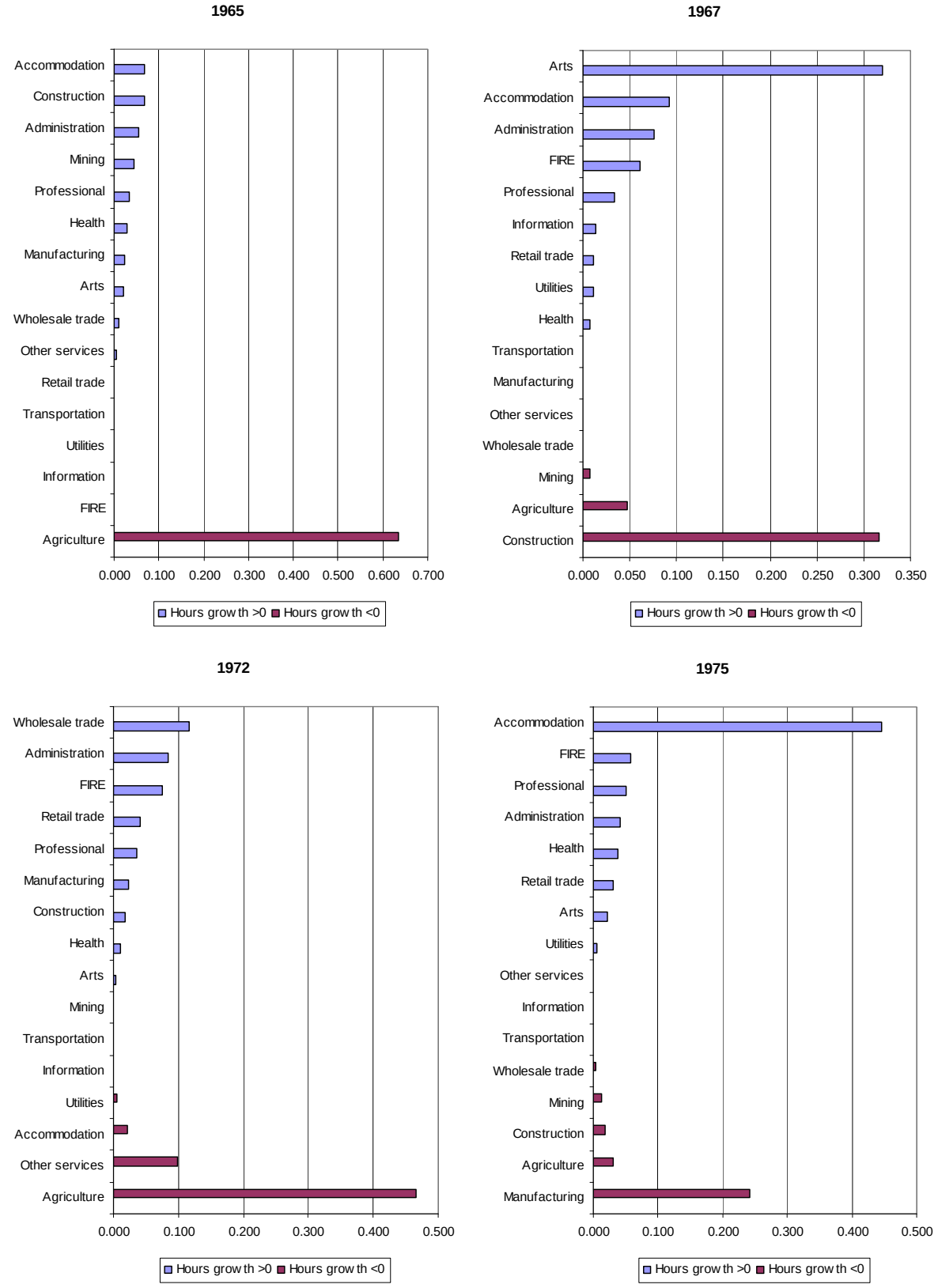


Figure A2. Industry Contributions to Dispersion, KLEMS 2-digit Industries, continued

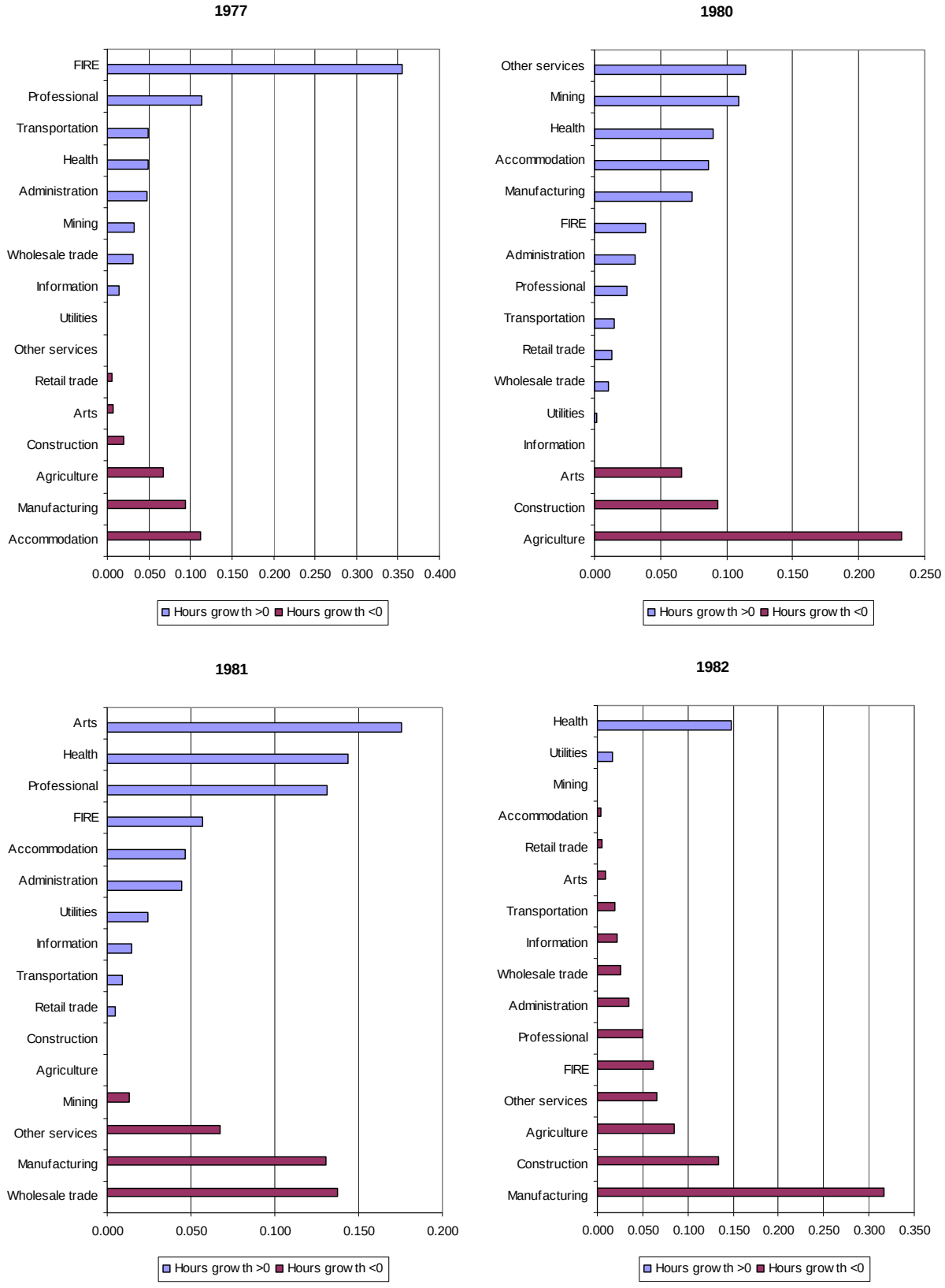


Figure A2. Industry Contributions to Dispersion, KLEMS 2-digit Industries, continued

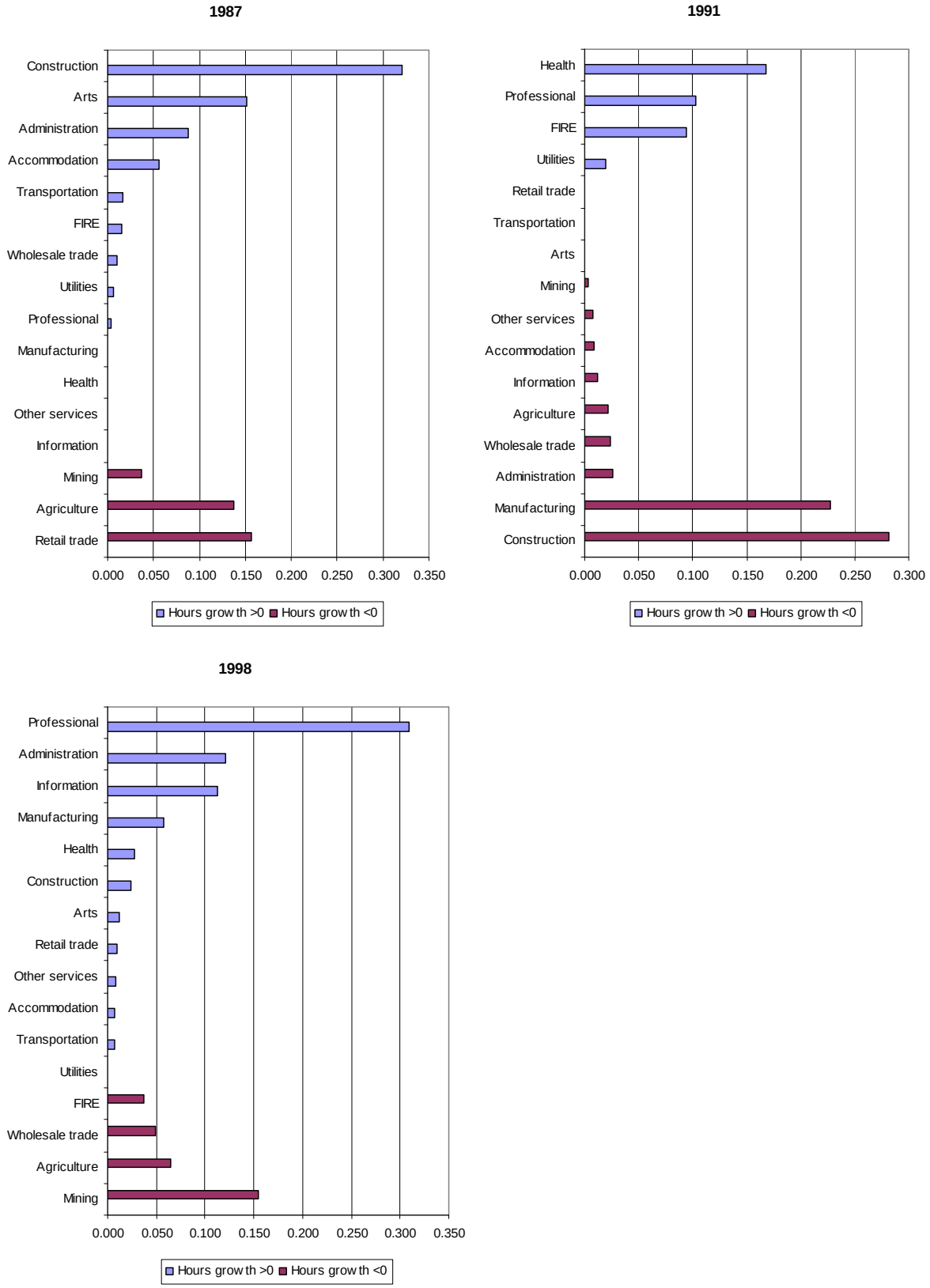
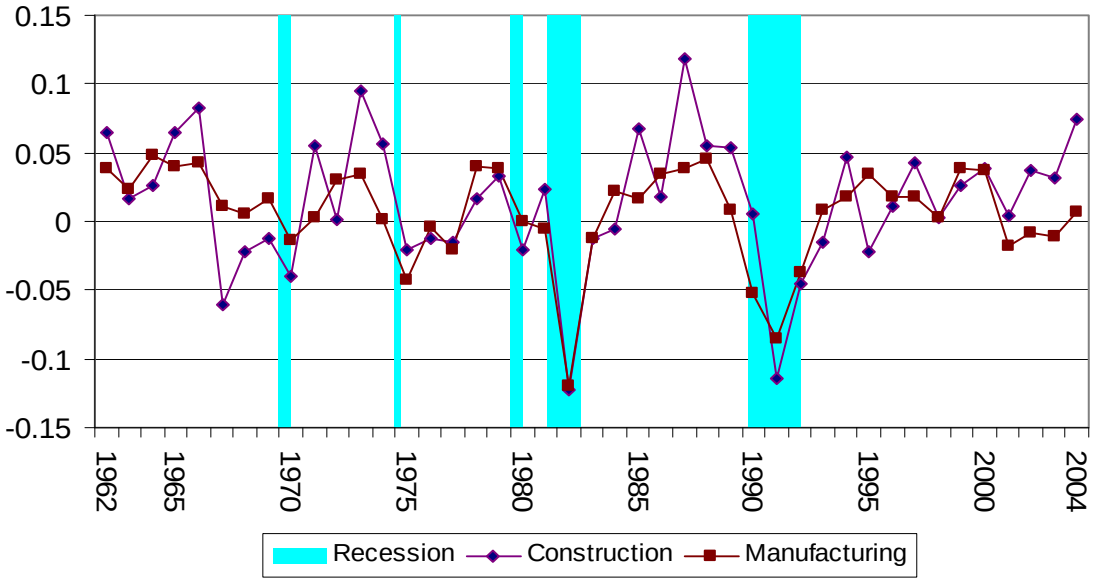


Figure A3. Hours Growth Rates, KLEMS 1962-2004



Appendix B - Cyclically-adjusted reallocation

An estimate of the business cycle is obtained following Rissman's (1997) state-space approach. Since industry employment data following the NAICS classification system is available from the LFS only from 1987 onwards, only manufacturing and construction are used to estimate the cycle. Estimates of the state-space model are given in Table B1. The estimate for trend growth is positive and statistically significant for construction, and negative but not statistically different from zero for manufacturing. While both industries exhibit a procylical tendency, it is stronger for manufacturing than construction. The lag of the cycle was not significant for any of the industries, so they are dropped to improve the accuracy of the other estimates. The estimated autoregressive coefficient is 0.56 and statistically significant. The smoothed estimates of the cycle are shown in Figure B1. The estimates reflect the recession in 1991 and the strong growth in 1997-2000 period. Unexpectedly, the model also predicts a slowdown in the 2005-2008 period, albeit milder than in 1991. This could be the result of the limited data used for the analysis.

To check the sensitivity of the predicted dispersion to different measures of the cycle, the regressions in (8) were performed using unadjusted growth in industry employment shares and a 1991 year dummy for the manufacturing and construction industry regressions. Since none of the slowdown in manufacturing employment growth is attributable to the cycle in this case, changes in the real exchange rate and commodity prices predict a modestly higher pickup in employment growth dispersion in the 2005-2008 period.

Table B1. Estimates from the State-Space Model

	Trend	$Cycle_t$	$Cycle_{t-1}$
Construction	0.0201	0.0166	----
	(0.0108)	(0.0051)	
Manufacturing	0.0057	0.0277	----
	(0.0117)	(0.0070)	
Transition equation	-----	-----	0.5604
			(0.0236)

Note: Standard errors in parentheses.

Figure B1. Kalman Filter Estimate of the Business Cycle