

Has the Canadian Labour Market Polarized?

David A. Green and Benjamin M. Sand

IN RECENT DISCUSSIONS ABOUT INEQUALITY, ONE PERSISTENT POINT OF CONCERN HAS been whether the Canadian labour market has been experiencing job and wage polarization — that is, a separating of workers into high- and low-income groups, with a declining middle class (Beach, in this volume). Underlying this concern is the notion that well-paid blue-collar and clerical jobs are being replaced by low-paid jobs in the services sector. There is a considerable literature on the polarization of labour markets in the United States and Europe, but not in Canada. In an article in the *Canadian Journal of Economics* (Green and Sand, forthcoming), we begin to fill that gap.

Defining Polarization

THE CONCEPT OF POLARIZATION IN THE ECONOMICS LITERATURE HAS COME TO MEAN an increase in the proportion of workers in both low-skill and high-skill jobs, with a corresponding decline in middle-skill jobs. Jobs themselves are associated with occupations, ranked according to some measure of skill, whether in terms of the average education level of those who work in the occupation or the wages workers in the occupation receive in some base year. The idea behind the latter is that wages reflect the value of the marginal product of a worker and, as a result, will be higher for higher-skilled workers. Of course, wages might vary for other reasons — for example, they could be higher for more dangerous jobs. In Canada, however, the data show that the average wage in an occupation is highly correlated with measures of skill, such as years of education. Evidence from other

countries (for example, Autor, Katz and Kearney 2008; Goos and Manning 2007) shows a similarly high association between wages and measures of skill across occupations.

Much of the theorizing about why polarization might occur has focused on the role of information technology (IT). David Autor and co-authors, in a series of influential articles (for example, Acemoglu and Autor 2011; Autor, Katz and Kearney 2008; Autor, Levy and Murnane 2003), have broken down occupations into

- > *cognitive-task* occupations, such as professional and management jobs, which mainly entail abstract thinking and which tend to have experienced an increase in productivity with the advent of computers;
- > *routine-task* occupations, such as manufacturing and clerical jobs, in which tasks tend to be repetitive and replaceable with computers; and
- > *nonroutine manual* occupations, such as services jobs, in which tasks tend to be nonrepetitive and sometimes interactive and so are neither replaced nor enhanced by computers.

In practice, the high-skill occupations tend to be cognitive-task occupations, and the middle-skill occupations tend to be routine-task occupations that historically have paid well compared with lower-skill services occupations.

Finally, to paint a complete picture of labour market polarization, one needs to know about wage changes as well as employment changes. If more people are entering low-paying services jobs, the implications for inequality will differ depending on whether the wages in those jobs are rising or falling. A pattern in which wage growth is greater for low- and high-skill occupations than for occupations in the middle is called *wage polarization*, while a U-shaped employment growth pattern is called *job polarization*.

International Evidence

RESEARCH ON THE EXISTENCE AND TIMING OF BOTH WAGE AND JOB POLARIZATION IN the United States and European countries is based on insights from a model of how the IT revolution has affected wages and employment. In particular, Autor, Levy and Murnane (2003) offer a model of computer adoption based on the types of tasks that computers are likely to complement or replace, and argue that computers complement cognitive-task workers and replace routine-task workers. Following up on this model, Goos and Manning (2007) show

that, in the United Kingdom, high-wage occupations tend to involve cognitive tasks, middle-wage occupations are more likely to involve routine tasks and the lowest-wage occupations, such as those in the services sector, are likely to be intensive in nonroutine manual tasks. On this basis, therefore, the introduction of computing technology should have increased employment in the highest- and lowest-paid occupations relative to occupations in the middle of the wage distribution. And, indeed, Goos and Manning (2007) provide evidence for this “routinization” hypothesis in occupational employment changes in the United Kingdom since the late 1970s.

Also building on this model using US census data, Autor, Katz and Kearney (2006) rank occupations based on either the average wage workers receive or their average number of years of schooling, and sort them into the percentiles of employment that existed in 1980. They then examine the percentage change in employment in each occupational skill percentile over time. They find that the 1980s were characterized by change in the demand for skills that was monotonic — that is, in relative terms, employment fell in the lowest-skill occupations and increased in each successive skill percentile. In contrast, in the 1990s, employment fell in occupations in the middle of the skill distribution and grew at both the top and bottom ends.

Similar patterns have been found in a variety of European countries. For example, Dustmann, Ludsteck and Schönberg (2009) show that, in Germany, employment polarized through the 1980s and 1990s, a finding confirmed by Kampelmann and Rycx (2011) for the period between 1985 and 2008. Goos, Manning and Salomons (2009) document that employment grew in both high- and low-wage occupations relative to middle-wage occupations in 16 European Union countries between 1993 and 2006.

In the United States, the experience of employment polarization is similar to that in Europe, but the timing is different. In Europe, polarization began as early as the late 1970s, while in the United States it appears to have started in the 1990s. Leter and Sand (2011) reconcile this difference in timing, however, by showing that, when correcting for a change in the definition of occupations in the US data, a longer-term polarization pattern similar to that in Europe becomes evident in the United States.

Although employment has been polarizing for decades in these countries, wages have followed a different pattern. Goos and Manning (2007) find that, over

the period they consider, wages at the high end of the UK occupational distribution grew along with employment, but wages in low-skill occupations declined. Similarly, Dustmann, Ludsteck and Schönberg (2009) find that, in Germany, jobs polarized through the 1980s and 1990s, but wages in low-skill occupations tended to fall farther behind those in middle-skill occupations starting in the mid-1990s. In contrast, the evidence for the United States shows a straightforward increase in wage inequality in the 1980s and again in the 2000s, but something more like wage polarization in the 1990s. That is, in the 1990s, wages for US workers in the middle of the skill distribution fell relative to the wages for those of both lower- and higher-skilled workers (Acemoglu and Autor 2011; Autor, Katz and Kearney 2008). Thus, in the 1990s, the US experience stands out as peculiar, but in other decades — and in all decades for Europe — the consistent pattern is a combination of job polarization and a simple increase in wage inequality.

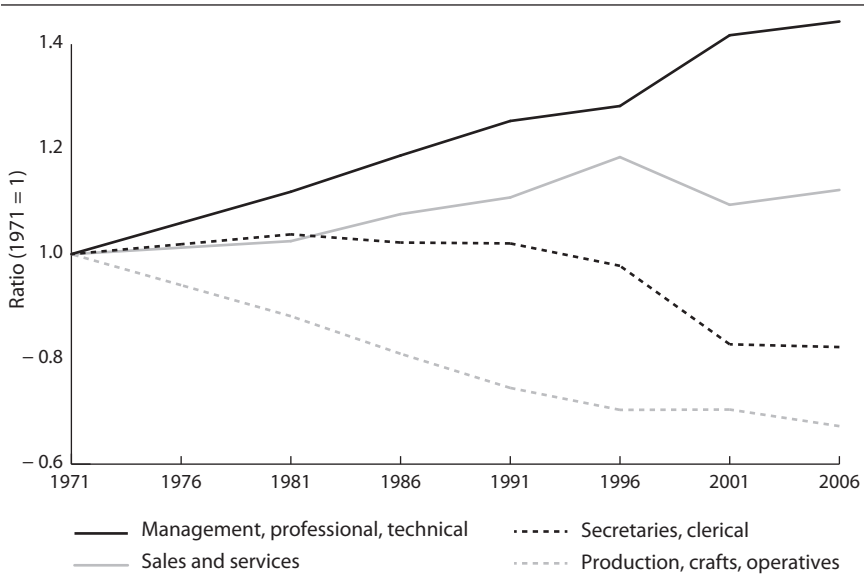
To sum up, the main models of polarization emphasize an increase in demand for both nonroutine manual occupations and cognitive-task occupations (Acemoglu and Autor 2011). This fits with the US pattern in the 1990s, when wages and employment were increasing for both occupational groups, but the relevance of these models for other countries, and possibly for the United States in other decades, is less clear. This is certainly the case for Canada, where, to our knowledge, there has been no attempt to assess the extent of wage and employment polarization.

Canadian Evidence

IN GREEN AND SAND (FORTHCOMING), WE INVESTIGATE POLARIZATION IN THE CANADIAN labour market using data from the 1971, 1981, 1986, 1991, 1996, 2001 and 2006 Censuses. We do not use Statistics Canada's 2011 National Household Survey since it is not comparable to the censuses and has a relatively low response rate. Instead, we fill in the picture for the years after 2005 using Statistics Canada's Labour Force Survey; not only does it have a high response rate, but its period of overlap with the censuses allows us to assess the extent of its comparability with those data sources. From both datasets, we use the real weekly wages of full-time workers as our wage measure and total hours worked in each occupation as our employment measure (for details on sample choices and variable definitions, see Green and Sand, forthcoming).

Figure 1 shows the change in the ratio of employment in four groups of occupations between 1971 and 2006. Management, professional and

Figure 1

Change in employment since 1971 (ratio) in four occupational categories, Canada, 1971-2006

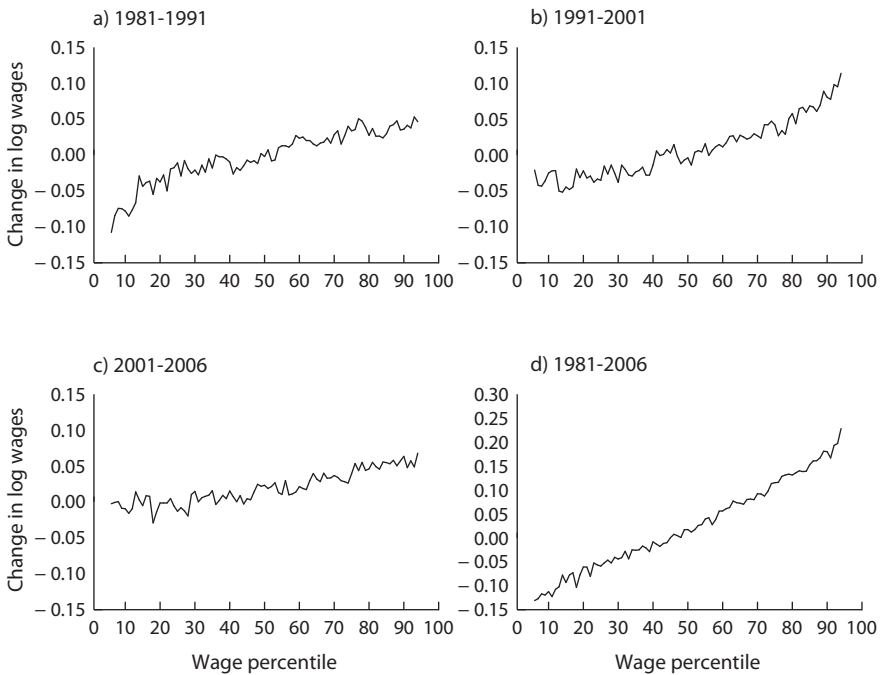
Source: Authors' calculations based on Statistics Canada, Census of Canada, 1971, 1981, 1986, 1991, 1996, 2001 and 2006.

technical occupations roughly correspond to those requiring cognitive tasks and sit at the top of the occupational wage distribution; secretaries and clerical occupations, and production, crafts and operatives (including labourers) essentially involve routine tasks and are in the middle of the wage distribution; and sales and services occupations are mainly at the bottom of the wage distribution. As the figure shows, a movement toward management and professional occupations and away from production, crafts and operatives occupations has been ongoing since at least 1971, although that trend has slowed down in recent years. Thus, in Canada, polarization, in the sense of the loss of well-paying middle-skill jobs and the growth of higher-skill jobs, fits the patterns observed in Europe and the United States. The cause of this movement, at least in the 1970s, cannot have been computerization. On the other hand, the decline in the proportion of workers in clerical occupations (offset by a growth in employment in sales and services occupations) is likely due to the advent of computers in office settings, particularly after the early

1990s. Thus, our first conclusion is that Canada has experienced a polarization in employment, and that polarization has been going on for decades.

Our second conclusion, however, is that the polarization in employment stopped after 2000, when the lines for all four occupation groups become relatively flat. In Green and Sand (forthcoming), our plots from the Labour Force Survey show that this relative flatness continues after 2005. The stalled growth in Canada’s employment in the professional and management occupations after 2000 is the same as that in the United States, but in that country employment in low-end service jobs continued to grow after 2000 while its growth is flat in Canada (Beaudry, Green and Sand, forthcoming). This could be because the resources boom offered low-skill workers an employment alternative to low-paying services jobs.

Figure 2
Proportional change in men’s real wages by percentile, based on census data, Canada, selected periods, 1981-2006 (2000 dollars)



Source: Authors’ calculations based on Statistics Canada, Census of Canada, 1971, 1981, 1986, 1991, 1996, 2001 and 2006.

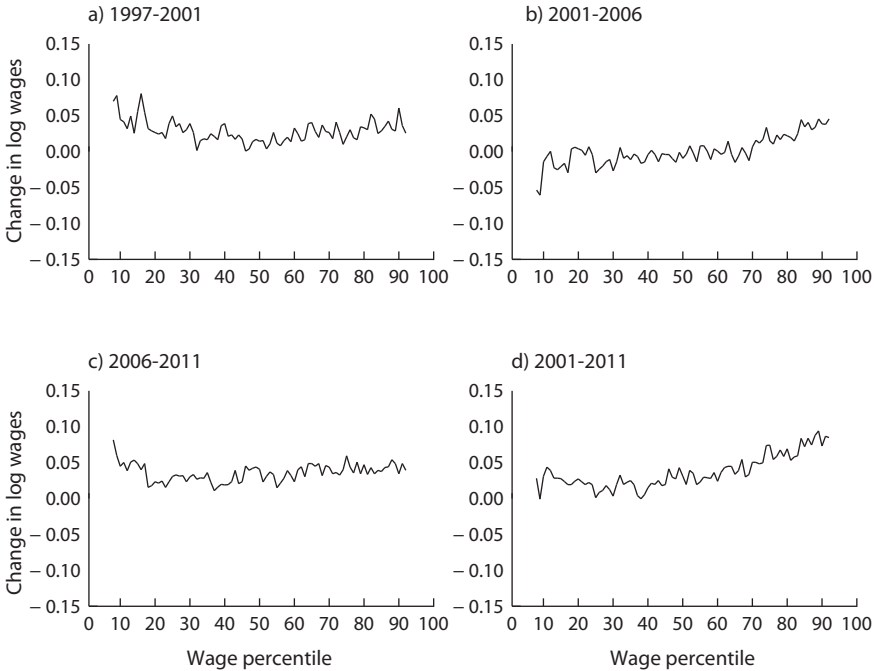
We next turn to wage patterns. Figure 2 shows the proportional change in wages of Canadian men at each percentile of the real wage distribution in each decade and over the entire period from 1981 to 2006. In figure 2a, for example, the leftmost vertical line, which corresponds to the 10th percentile of the wage distribution in 1981, shows that the real wage at this percentile fell by approximately 8 percent between 1981 and 1991. In general, a line that rises gradually upward shows an increase in inequality over the period being examined. Polarization, instead, would appear as a U-shaped line on these graphs. Accordingly, over both the 1980s and 1990s, a simple increase in wage inequality seems to have occurred in Canada, with the lower part of the wage distribution experiencing a decline in real wages, the middle showing little change and the upper part showing an increase. There was no change in the lower part of the distribution between 2001 and 2006 (figure 2c), which might suggest something like polarization was taking place, but it clearly was not true polarization in the sense of an actual increase at the bottom relative to the middle. The pattern for the whole period from 1981 to 2006 (figure 2d) is again one of a simple increase in wage inequality. In Green and Sand (forthcoming), we also show the patterns for women, which are similar to those for men except that women's wages in the 1990s look a bit more polarized.

Figure 3 shows the same type of plots, but using data from the Labour Force Survey for the period from 1997 to 2011, since the survey has included wages only since 1997. Again, the pattern is that of a lack of decline in wages below the median but some increases above the median over the period from 2001 to 2006 (figure 3b). For 2006 to 2011 (figure 3c), the pattern is relatively flat but indicates overall wage increases. This contrasts with the United States, where median wages have declined since 2000.

For the entire decade 2001 to 2011, the Canadian pattern looks slightly polarized, with a small increase in wages at the low end relative to the middle and a larger increase at the high end relative to the middle. Is this simply the US polarization pattern from the 1990s showing up in the Canadian labour market with a lag of a decade? If so, it might imply that Canadian wages and employment in the 2000s were being driven by the same technological changes that some suggest have driven the US wage patterns in the 1990s. Fortin and Lemieux (forthcoming) show, however, that the Canadian wage patterns have a strong regional dimension (see the summary in this volume). They argue convincingly that the relatively

Figure 3

Proportional change in men's real wages by percentile, based on Labour Force Survey data, Canada, selected periods, 1997-2011 (2000 dollars)



Source: Authors' calculations based on Statistics Canada, Labour Force Survey, 1997-2011.

good performance of wages at the bottom of the wage distribution has to do with minimum-wage increases in the 2000s and that wages rising in Canada while they fell in the United States can be attributed to the effects of Canada's resources boom. In Green and Sand (forthcoming), we show, in fact, that the patterns of wages and employment in Ontario look much like those in the United States in the 1990s and 2000s, while the patterns in Alberta after 2000 look substantially different, with better wage performance at the middle and bottom of the wage distribution.

In the end, we characterize the Canadian labour market as having undergone a polarization in employment over the 1971-2000 period, with that pattern flattening after 2000. Wages, in contrast, underwent a simple increase in inequality between 1981 and 2005, but showed signs of polarization in the middle and

late 2000s. The post-2000 wage pattern has a strong regional dimension, however, that suggests it is being shaped by provincial policies and the effects of the resources boom, rather than by the forces of technological change.

Interpretation

A SUBSTANTIAL LITERATURE ARGUES THAT WAGE AND EMPLOYMENT PATTERNS IN THE United States, in particular, can be explained by IT-related technological change. In a classic version of that model (for example, Autor and Dorn 2013), IT replaces workers in manufacturing and clerical jobs who perform routine tasks but enhances the productivity of high-skilled workers. With their higher income, high-skilled workers increase their demand for low-skill services, causing the wages and employment of these workers to rise. This is first and foremost a story about demand shifts: increases in demand for high- and low-skilled workers and a relative decrease in demand for routine-task workers in the middle. The effects of demand shifts then show up in the data as wages and employment moving in the same direction. This is what Acemoglu and Autor (2011), Autor and Dorn (2013) and others argue happened in the United States in the 1990s, but does this story fit for Canada?

It is possible that, in Canada before 2000, increases in both employment and wages at the top end of the occupational wage distribution relative to employment and wages of occupations in the middle of the distribution fit with a technologically driven story. But at the bottom end — again, before 2000 — employment increased while wages declined. This pattern fits, instead, with an increasing supply of workers in these occupations. Thus, one could construct a model in which declining demand for manufacturing workers prior to 2000 drove them into lower-paid services occupations, resulting in an increase in employment but a decrease in wages in the services occupations. For that to happen, however, there must be a reason wages in the manufacturing and clerical sectors did not fall enough so that those workers could have kept their jobs. Such an outcome could be the result of, for example, wage rigidities as older unionized workers struck bargains in which they kept their high wages while new hires faced wage declines.

After 2000, however, the picture is different: Canadian employment stopped polarizing, but wages became more polarized, although the strong regional dimension to these patterns suggests that they have more to do with

the demand for resources than with IT-related changes. Overall, then, it seems reasonable to conclude that one should be cautious about applying models of technological change constructed for the United States to movements in the Canadian wage distribution, especially after 2000.

Conclusion

IN INVESTIGATING WHETHER EMPLOYMENT AND WAGE PATTERNS SHOW EVIDENCE OF polarization in the Canadian labour market, we find that our conclusions need to be divided into pre- and post-2000 components. Before 2000, there was a long-term increase in the polarization of jobs dating back at least to the 1970s, with a secular decline in production jobs matched by a secular increase in management and professional jobs. This job polarization occurred alongside a long-term increase in inequality in the wage distribution. Together, these patterns could imply that workers who lost well-paying jobs in the manufacturing and clerical sectors were pushed into lower-skill services jobs, which drove down wages in those jobs.

After 2000, the polarization pattern in employment flattened out, which, in itself, signals an end to the secular increase in demand for high-skilled workers that characterized preceding decades. This coincides with the argument in Beaudry, Green and Sand (forthcoming) that, after 2000, university graduates in the United States could no longer count on an ever-increasing demand for their skills. At the same time, wages in Canada have undergone some polarization since 2000. As Fortin and Lemieux (forthcoming) show, however, this is due to a combination of the effects of the resources boom and increases in the minimum wage — regional or provincial forces that imply that policies to respond to inequality and polarization in Canada also must have a distinctly regional dimension.

References

- Acemoglu, D., and D. Autor. 2011. "Skills, Tasks and Technologies: Implications for Employment and Earnings." In *Handbook of Labor Economics*, vol. 4B, edited by D. Card and O. Ashenfelter. Amsterdam: Elsevier.
- Autor, D.H., and D. Dorn. 2013. "The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market." *American Economic Review* 103 (5): 1553-97.
- Autor, D.H., L.F. Katz, and M.S. Kearney. 2006. "The Polarization of the US Labor Market." *American Economic Review* 96 (2): 189-94.
- . 2008. "Trends in U.S. Wage Inequality: Revising the Revisionists." *Review of Economics and Statistics* 90 (2): 300-23.
- Autor, D.H., F. Levy, and R.J. Murnane. 2003. "The Skill Content of Recent Technological Change: An Empirical Exploration." *Quarterly Journal of Economics* 118 (4): 1279-333.
- Beaudry, P., D.A. Green, and B.M. Sand. Forthcoming. "The Great Reversal in the Demand for Skill and Cognitive Tasks." *Journal of Labor Economics*.
- Dustmann, C., J. Ludsteck, and U. Schönberg. 2009. "Revisiting the German Wage Structure." *Quarterly Journal of Economics* 124 (2): 843-81.
- Fortin, N.M., and T. Lemieux. Forthcoming. "Changes in Wage Inequality in Canada: An Interprovincial Perspective." *Canadian Journal of Economics*.
- Goos, M., and A. Manning. 2007. "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain." *Review of Economics and Statistics* 89 (1): 118-33.
- Goos, M., A. Manning, and A. Salomons. 2009. "Job Polarization in Europe." *American Economic Review* 99 (2): 58-63.
- Green, D.A., and B.M. Sand. Forthcoming. "Has the Canadian Labour Market Polarized?" *Canadian Journal of Economics*.
- Kampelmann, S., and F. Rycx. 2011. "Task-Biased Changes of Employment and Remuneration: The Case of Occupations." IZA Discussion Paper 5470. Bonn, Germany: Institute for the Study of Labor.
- Lefter, A., and B.M. Sand. 2011. "Job Polarization in the U.S.: A Reassessment of the Evidence from the 1980s and 1990s." Discussion Paper 2011-03. St. Gallen, Switzerland: School of Economics and Political Science, University of St. Gallen.

