

Editor's Overview

The 35th issue of the *International Productivity Monitor* contains eight articles featuring two individual articles and two symposia. The topics of the two articles are employment and productivity in U.S. manufacturing and the role of demand and digitization in solving the productivity puzzle. The topic of the first symposium of four articles is explaining slower productivity growth since 2000 in Canada. The topic of the second symposium of two articles is the global productivity slowdown.

The manufacturing sector experienced very rapid productivity growth in the United States up to the Great Recession of 2008-2009. Since 2010 however, the productivity performance of the sector has been dismal, with the absolute level of labour productivity falling. The counterpart of falling labour productivity has been strong employment growth, with U.S. manufacturing since 2010 enjoying the second longest period of rising employment growth in the post-war period.

In the first article of the issue, **Richard Schmalensee** from Massachusetts Institute of Technology provides a detailed industry analysis of recent developments in U.S. manufacturing related to productivity, output, and employment. After advancing at a 4.2 per cent average annual rate in 1980-2000 and 5.3 per cent in 2000-2010, output per hour in U.S. manufacturing fell at a 0.1 per cent annual rate in 2010-2017. The computer and semi-conductors industry (NAICS 334) is found to account for 38 per cent of the slowdown in manufacturing productivity growth, with the fall in the rate of decline of deflators for computers and semiconductor responsible for around 85

per cent of this contribution.

The puzzle of slower productivity growth in advanced economies in a period of rapid technological change has intrigued many researchers. In the second article **Jaana Remes**, **Jan Mischke** and **Mekala Krishnan** from the McKinsey Global Institute offer a comprehensive and cogent explanation of the slowdown in labour productivity growth in seven countries between 2000-2004 and 2010-2014. They identify three waves or drivers of productivity growth: the waning of effects of the first ICT revolution; financial crisis aftereffects, including weak demand and uncertainty; and digital disruption. They estimate that the first two waves reduced labour productivity growth by 1.9 percentage points, on average in the countries studied, between the two periods, from 2.4 per cent per year to 0.5 per cent. The impact of the digital revolution is uncertain, but the authors argue that it has the potential to boost labour productivity growth by at least 2 per cent per year over the next decade. Capturing this potential requires promoting both demand growth and digital diffusion in addition to the traditional supply-side approaches.

The first symposium in the issue containing four articles is on explaining slower productivity growth in Canada and is based on papers presented at two sessions of the annual meeting of the Canadian Economics Association held at McGill University in June 2018. The sessions were organized by the Centre for the Study of Living Standards and the Productivity Partnership.

Any analysis of the productivity slowdown must be based on a solid grasp of the stylized facts associated with slower productivity growth. The first paper in the symposium by **Andrew Sharpe** and **John Tsang** from the Centre for the Study of Living Standards provide these stylized factors. The article shows that it was multifactor productivity that accounted for the lions share of the post-2000 labour productivity slowdown in Canada, that the slowdown was primarily a within-industry phenomenon and not due to resource re-allocation, and that the slowdown was largely in the goods sector, with manufacturing making by far the largest industry contribution to the slowdown, especially to the labour productivity slowdown. Since 2000, labour productivity growth has been around 0.9 per cent per year in both the 2000-2008 and 2008-2016 sub-periods, but the sources of this growth have been different, with multifactor productivity much more important in the more recent period and capital intensity growth less important. This post-2008 pick-up in multifactor productivity growth may bode well for future labour productivity growth.

A major focus of the productivity

debate in Canada has been comparisons with the United States. From the mid-1980s to 2010 productivity growth in Canada trailed that in the United States, but since 2010 this situation has been reversed. In the second article in the symposium **Wulong Gu** and **Michael Willox** from Statistics Canada provide a detailed industry analysis of labour productivity growth and the sources of labour productivity growth in Canada and the United States in the 1987-2010 and 2010-2014 periods and shed light on this reversal. Factors that contributed to this reversal of labour productivity growth were stronger demand and output growth in Canada after 2010 and the greater waning of the productivity gains from ICT production and use south of the 49th parallel. For example, one third of the much faster business sector MFP growth in the United States in 1987-2010 relative to Canada was due to the computers and electronics products industry. By 2010-2014, the contribution to MFP growth from this industry was the same in both countries. The authors conclude that the search for the determinants of productivity growth should focus on the factors contributing to demand growth such as access to international markets and financial stability.

It is widely recognized that the ICT revolution boosted productivity growth in the second half of the 1990s in Canada and the United States. But is the post-2000 slowdown in productivity growth in Canada explained by a weaker contribution to productivity from ICT? This is the issue addressed in the third arti-

cle of the symposium by **Jeff Mollins** and **Pierre St-Amant** from the Bank of Canada. The authors investigate a number of models with different channels by which ICT affects productivity, including production effects, the use effect, and the impact of the relative price of ICT goods. They find that 0.1-0.2 percentage points (20-40 per cent) of the labour productivity slowdown in Canada since the early 2000s can be explained by a weaker ICT contribution, but point out that the timing of the two developments do not coincide. While productivity growth slowed in the first half of the 2000s, the ICT contribution only fell around the time of the Great Recession. The authors note that future work on this topic needs to address both potential price mismeasurement and the growing role of ICT services, especially cloud computing, which because of data limitations, they were unable to do.

Likely the most widely given explanation for slower productivity growth is that the pace of fundamental technological change has fallen off. But how does one in fact quantify technological change? Multifactor productivity growth is affected by many factors so cannot be used as a proxy in this regard. Direct measures of the pace of technological change may be more promising. In the fourth article in the symposium **Michelle Alexopoulos** and **Jon Cohen** from the University of Toronto provide such direct measures of innovation for Canada, namely books held in Canadian libraries. They find that a fall-off in the commercialization of new technologies in this country after 2000, as

evidenced by book-based indicators of technological change, did indeed contribute to slower productivity growth. The large fall-off in titles in mechanical/manufacturing and electrical technologies is consistent with the greater slowdown in productivity growth in the goods sector. The authors conclude on an optimistic note, arguing that data suggest that Canada may be on the threshold of major technological breakthrough in the areas of artificial intelligence and robotics and that this may lead to a pick-up in productivity growth.

The second symposium in the issue contains two articles on the productivity slowdown in a global context. The articles are based on presentations made at the Third Annual OECD Global Forum on Productivity held at the Bank of Canada in Ottawa, Canada in June 2018.

A key issue for economists is whether the slower output and productivity growth observed in advanced countries since 2000 represents the new normal or whether this is a transitory state that will be replaced by stronger growth. In the first article in this symposium **John Fernald** from INSEAD argues the former. He points out that the demographic developments that have led to slower population growth are unlikely to be reversed. In addition, labour quality improvements are likely to be weaker and a drag on future labour productivity growth. He notes that neither mismeasurement issues nor regulation appear to explain slower productivity growth. In terms of total factor productivity, he sees 0.5 per cent per year as the new

trend, not enough to revive the current modest labour productivity growth. This situation reflects a return to normal after the exceptional 1995-2005 period when IT drove productivity gains.

An industry perspective on the productivity slowdown can provide insight into its nature and causes. In the second article in the symposium **Kevin Fox** from the University of New South Wales-Sydney presents industry data to shed light on the productivity slowdown in Australia. He finds that for the 15 industries in his sample, virtually all (14 of 15) experienced slower multifactor pro-

ductivity growth in the 2003/04-2016/17 period than in the 1989/90-2003/04 period, even though the productivity experiences of the industries were very diverse. He suggests that this pattern may mean a common factor, such as a slower pace of technological change or a rise in inefficiency, is behind the slowdown. He concludes by identifying a number of directions or areas for future research to shed light on the productivity slowdown, namely the treatment of new and disappearing goods, the valuation of new free goods and services, better time-use data, and exploitation of firm-level data.