

Abstract

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Why is the Demand for Science and Technology Skills lower in Canada than in the United States?

In today's world, the expansion of knowledge-based industries, globalization of R&D, increased mobility of science and technology (S&T) workers and the international outsourcing of highly skilled jobs have raised concerns in many OECD countries: will supply of S&T workers meet their ever increasing demand? However, in case of Canada, many experts suggest that innovation is not constrained by a lack of *supply* of S&T workers¹. They argue that low *industry demand* for these workers may be a key cause of our low innovation performance relative to many OECD countries, including the US. Indeed, the recent Government of Canada's Panel report on Commercialization (2006) and Science and Technology Strategy (2007) put emphasis on generating demand for highly skilled people as a way to make Canada a world leader in technology frontier.² Therefore, it is important that we monitor the market, both in terms of supply and demand, for S&T workers. To our knowledge, there is no empirical study that provides evidence for the weaker industry demand for S&T workers in Canada.

This study attempts to address the question: *Is demand for S&T skills weaker in Canada than in the US? If so, what are the contributing factors, and what is the relative importance of these contributing factors?*

Changes in relative wages over time – wages of more educated relative to the less-educated – is one of the key indicators reflecting the impact of demand and supply conditions within the labour market. This study examines changes in real and relative wages of S&T workers over time to examine how different is Canada's labour market for S&T workers from its largest trading partner, the US. Some preliminary data suggest that there is stronger labour market for S&T workers in the US than in Canada. For example, the National Graduate Surveys (1984 and 2002) show that during the 1990s, the earnings of recent PhDs in engineering rose much faster in the US than in Canada. The rise in earnings acted as a catalyst for migration of these individuals to the US. During the 1990s, nearly seven times as many engineers emigrated from Canada to the US as from the US to Canada. The reasons for higher mobility of Canadian S&T professionals to the US are not entirely clear. The most obvious suspects are that there might be sectoral premium in the industry where S&T workers are employed disproportionately higher and/or there might be higher wage premium to more-educated S&T workers in the US than in Canada. If that is the case, an important question is what factors determine

¹ See, for example, The Institute for Competitiveness and Prosperity Report, 2004.

² Report of the *Expert Panel on Commercialization*, 2006; and *Mobilizing Science and Technology to Canada's Advantage*, 2007

sectoral and/or educational wage premiums and why their roles differ in two countries despite deeper integration between them through product and capital markets.

This study uses a framework for understanding changes in the real and relative wage structure of S&T workers and to assess the determinants of changes in relative wage differentials between Canada and the US. This paper falls broadly on educational wage premium literature, and follows the approach of Katz and Murphy (1992) and Murphy, Riddell and Romer (1998). These papers examine between-group relative wage changes using a supply and demand framework in which different demographic groups, defined by sex, education, age/experience are treated as distinct labour inputs. We adopt a similar approach in this paper that links relative wage and employment changes among different S&T skills groups to changes in shifts in the supply of and demand for these skills. Potential sources of shifts in the relative demand among skill groups include skill-biased technological change, capital-skill complementarity, or product demand shifts across sectors with different skill intensities, and the forces of globalization (trade and outsourcing). Sources of relative supply shifts include variation in the rate of growth of relative skill supplies across time periods (see, for example, Katz and Autor, 1999). We combine the literature on skill-bias, sector-bias, off-shoring and productivity and trade and technology³ to determine wage premium differentials between Canada and the US

To address these issues, we begin by examining a number of indicators to assess the labour market for S&T skills in Canada and the US over the period 1980 – 2000.

- We examine changes in real and relative wages of S&T workers in Canada and the US over the last two decades; and evaluate whether there is a higher skill premium to more-educated S&T workers in the US than in Canada;
- We assess the role of market forces such as supply and demand for S&T skills in explaining the divergence in relative wages over time between Canada and the US;
- We compute relative S&T skills supply and demand changes over time in both countries to assess whether supply and demand shifts kept pace with each other, and more importantly, whether demand for S&T skills has been weaker in Canada than in the US; and
- Finally, we identify the factors that may contribute to relatively low demand for S&T skills in Canada, and assess the relative importance of these contributing factors.

For the study we use three consecutive Census's data for Canada and the US. Canadian census is conducted at 5-year intervals. Canadian estimates are available for five separate census years: 1981, 1986 1991, 1996 and 2001. By comparison, the US census is

³ See, for example, Acharya (2005) for a detailed discussion of sector-bias and skill-bias technology.

conducted at 10-year intervals. Therefore US data are available only for three census years, 1980, 1990 and 2000. Canada-US comparison will be based on data collected at adjacent years (e.g. 1981 Canada vs. 1980 US). In the study, we focus on three census periods for both countries (1981, 1991 and 2001 for Canada and 1980, 1990 and 2000 for the US). The database contains information encompassing almost 75 industries, covering both goods-producing and services-producing industries.

For definition of S&T occupations, we follow National Science Foundation's framework and designate two types of occupations: S&T-based and non-S&T-based. S&T occupations are drawn from five basic categories: computer and mathematical scientists, physical sciences, life sciences, social sciences and engineering. S&T-related occupations include health-related occupations, S&T management occupations, S&T pre-college teachers, S&T technicians and technologists, and other S&T-related occupations.

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