# ADULT EDUCATION AND TRAINING PARTICIPATION TRENDS BY THE MIDDLE-AGED ADULTS IN THE U.S. AND SELECTED OECD COUNTRIES

## PRESENTED AT THE COMMISSION FOR INTERNATIONAL ADULT EDUCATION ANNUAL CONFERENCE OCTOBER 1, 2018 MYRTLE BEACH, SC

Phyllis A. Cummins, Ph.D.[1]
Takashi Yamashita, Ph.D.[2]
A. Katherine Harrington, MS, MA[3]

*ABSTRACT:* Participation in adult education and training (AET) programs is increasingly important for people of all ages and is necessary to remain competitive in a world experiencing rapid technological advances. Lifelong learning activities are especially important for middle-aged and older adults who intend to work at older ages to ensure they have the skills desired by employers. This study used data from three international surveys conducted between 1994 and 2015 to examine patterns of AET participation for ages 45 to 65 by employment status, comparing the US with Canada, Italy, and Norway. To contextualize these data, we also compared AET participation with employment and unemployment rates in the survey years for each of the countries. In all countries, the 45 to 54 age group participated in AET at higher rates than did the 55 to 65 age group and the employed participated at higher rates than did the unemployed and those not in the labor force.

*Keywords: Adult education, PIAAC, middle-aged adults*

### Background

Population aging is a global phenomenon impacting labor markets and pension programs in economically developed and less developed countries. In most member countries of the Organization for Economic Cooperation and Development (OECD), life expectancy at retirement has experienced a substantial increase over the past 50 years. For example, in the US, life expectancy at retirement was 12.8 years in 1958 and 16.8 years in 2010; while the OECD average increased from 13.4 years to 18.5 years over the same period (OECD, 2011). In an effort to ensure the adequacy of pensions and maintain continued economic growth, many OECD countries have implemented policies to encourage people to remain in the labor force at older ages. Retirement reforms, such as higher retirement ages linked to increases in life expectancy have been implemented, and early retirement plans have been eliminated; a retirement age of 67 is now quite common (OECD, 2017b). Research suggests that increasing labor force participation at older ages and delaying retirement could increase gross domestic product while also benefiting national wealth

[1] Scripps Gerontology Center, Miami University; cumminpa@miamioh.edu
[2] Department of Sociology, Anthropology, and Health Administration and Policy University of Maryland, Baltimore County; yamataka@umbc.edu
[3] Scripps Gerontology Center, Miami University; harrinak@miamioh.edu

and reducing public debt (Eberstadt & Hodin, 2014; Franklin, 2014; Ogawa, Lee, & Matsukura, 2005).

The combination of a shrinking labor force and the economic crisis of recent years has increased the focus on growing employment at older ages. The Great Recession, which lasted between December 2007 and June 2009 (National Bureau of Economic Research, 2010), had a major impact on labor markets in nearly all OECD countries (Imbs, 2010) and is generally considered to be the worst economic downturn since the Great Depression (Elsby, Hobijn, & Sahin, 2010). In 2009, the US Congress enacted the American Recovery and Reinvestment Act, which provided funding to train those who became unemployed during the Great Recession (US Congress, 2009). Participation in education and training programs is especially important during an economic downturn for the employed and unemployed to ensure skills are current.

## Theoretical Framework

Globalization and automation have increased the need for investments in human capital (i.e., job related skills and knowledge) among those currently in the workforce. Rapid technological advancement speeds up obsolescence of job skills, increasing the need for occupational training in new skills for those of all ages (Baptista, 2016; Guzman, Pawliczko, Beales, Till, & Voelcker, 2012). Despite potential benefits, older workers are less likely to participate in training programs than their younger counterparts perhaps because of a lack of understanding of the economic benefits or fear of returning to the classroom (Börsch-Supan, 2003; Fouarge, Schils, & De Grip, 2013; Zwick, 2011). In addition, employers may be reluctant to provide training opportunities for older workers because of perceived lack of return on investment due to the time required to recover training (Angotti & Belmonte, 2012; Johnson, 2007; OECD, 2004)

Adult education and training (AET) programs are necessary to facilitate work at older ages because ongoing training is essential to remain competitive in a knowledge economy. The computerization of work places threatens substantial numbers of jobs, especially lower skilled jobs that are more easily automated (Arntz, Gregory, & Zierahn, 2016; Frey & Osborne, 2017) and technological advances are expected to continue (National Academies of Sciences Engineering and Medicine, 2017). AET can be either formal (learning that takes place in education and training institutions and leads to recognized credentials and diplomas), non-formal (learning that takes place in educational and training settings, but does not typically lead to a formalized credential), or informal (learning that takes place in everyday life and is not necessarily intentional and may not even be recognized by the individuals themselves as contributing to their knowledge and skills) (Commission of the European Communities, 2000). Most middle-aged and older adults, who participate in AET, participate in non-formal or informal learning activities (Hyde & Phillipson, 2015).

Gaining a better understanding of the benefits of learning at older ages is necessary for policy makers to make informed decisions for the funding of such programs. Despite the recognized importance of participation in AET, little research has compared patterns of

participation over time in OECD countries. The purpose of this study was to examine patterns of lifelong learning and compare trends among several OECD countries and discuss those patterns in relation to employment status.

## Research Questions

This research examines patterns of participation in AET by employed, unemployed, and out of the labor force groups between 1994 and 2012. Given longer working lives and rapidly changing technologies that require continual skill upgrading, gaining a better understanding of participation in AET by middle-aged and older adults is important to both policy makers and practitioners. The following research questions are addressed in this research:

1. What are the patterns of AET participation between 1994 and 2012 in the U.S. by the employed, unemployed, and out of the labor force groups for ages 45 to 54 and ages 55 to 65?
2. How do the patterns of AET participation in the U.S. compare with Canada, Italy, and Norway?
3. Did countries with higher levels of AET participation experience lower levels of unemployment and higher rates of employment following the 2008 economic downturn?

## Methodology

### Data

We used data from The International Adult Literacy Survey (IALS), conducted between 1994 and 1998, the Adult Literacy and Life Skills Survey (ALL), conducted between 2003 and 2008, and the Program for the International Assessment of Adult Competencies (PIAAC), conducted between 2011 and 2015 (OECD, 2014, 2016; Statistics Canada, 2011a, 2011b) to compare AET participation in the U.S. with Canada, Italy, and Norway. The OECD coordinated these surveys, but actual implementation was the responsibility of each participating country. IALS, ALL and PIAAC data are the most suitable for this study as they provide sufficient information and sample sizes for the middle-aged to older adults (age range 45 – 65) (see Table 1). The goal of the three surveys was to assess and compare basic skills and a broad range of competencies of adults. In addition, these data sets include the survey weights to adjust for the complex sampling design to estimate nationally representative figures (OECD, 2016). Statistics Canada provided us with IALS and ALL data for the U.S. and comparison countries while PIAAC data are publicly available through the OECD and the National Center for Educational Statistics. Data from OECD Statistics (OECD, 2017a) were used to compare employment and unemployment rates with AET participation for the countries included in the study. For purposes of this study, employment data during the years of data collection in the U.S. were used (i.e. 1994, 2003, and 2012).

Table 1. *Sample Sizes for Data Analysis*

| | United States | | Canada | | Italy | | Norway | |
|---|---|---|---|---|---|---|---|---|
| **Age Groups** | **45-54** | **55-65** | **45-54** | **55-65** | **45-54** | **55-65** | **45-54** | **55-65** |
| **IALS** | 599 | 524 | 658 | 576 | 565 | 468 | 698 | 479 |
| **ALL** | 693 | 572 | 4,723 | 3,485 | 1,324 | 1,597 | 1,174 | 966 |
| **PIAAC** | 1,301 | 1,229 | 6,223 | 5,905 | 1,025 | 1,035 | 1,108 | 959 |

**Measures**

*AET Participation*

Although the questions varied slightly, IALS, ALL, and PIAAC all included questions regarding participation in AET activities. For IALS, the variable description is "during the past 12 months did you take any education and training?" (F1), for ALL the variable description is "took education and training last 12 months" (F1), while the PIAAC variable description was more specific "participated in formal or non-formal AET in 12 months preceding the survey." We assumed that for IALS and ALL, respondents considered both formal and non-formal AET when answering the question.

*Employment Status*

The variable for employment status included categories of "employed," "unemployed," and "of the labor force" and was included in all three surveys ("D1" in IALS and ALL and "C_D05" in PIAAC).

**Statistical Analysis**

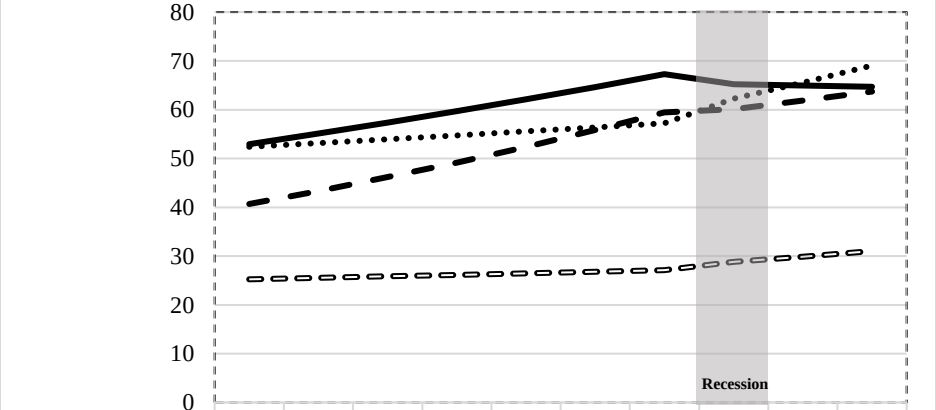
In order to summarize the average trends and examine the possible impacts of the 2008 recession, we used interrupted time series (ITS) analysis (Bernal, Cummins, & Gasparrini, 2017). ITS is a useful analytic approach when observational data at multiple time points are available. ITS summarizes the changes in rates over time, taking trends observed prior to a specified event into account. In this study, we considered the 2008 recession as an event of interest. ITS includes the indicator (dichotomous) variable for the pre- and post-event phases (i.e., pre- and post-recession), time (year) variable, and interaction between these two variables. The model quantifies the estimated effect of the event on the AET participation rate in comparison to the baseline (i.e., pre-event phase). Results from preliminary analysis (e.g., the equi-dispersion assumption was met) suggested that the Poisson regression models were appropriate for the yearly rates. The log-link function and maximum likelihood function were used to estimate the models. The estimated coefficients were exponentiated and interpreted as the rate ratio - percent increase given the rate from one year ago**.**

## Results

**Research Question 1:** *What are the patterns of AET participation between 1994 and 2012 in the U.S. by the employed, unemployed, and out of the labor force groups for ages 45 to 54 and ages 55 to 65?*

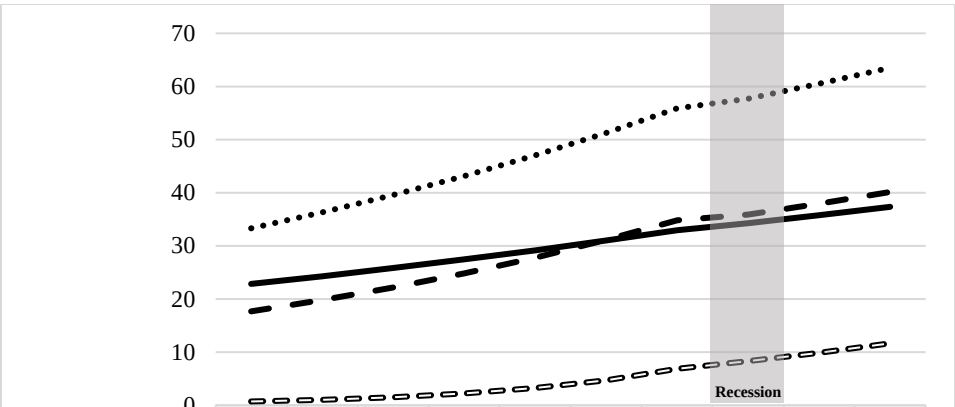
***Ages 45 – 54.*** AET participation by the employed in the U.S. was 53% in 1994 and trended upward until 2006 (67%) and declined slightly thereafter ending at 64% in 2012. For the unemployed in that age group, AET participation rates were much lower at 23% in 1994 and trended upward throughout the period of analysis with a 37% participation rate in 2012. Participation by the out of the labor force group was 20% in 1994 and peaked at 39% in 2006 but by 2012 had declined to 23% (see Figures 1 – 3).

***Ages 55 – 65.*** AET participation by the employed in the U.S. was 42% in 1994 and with the exception of 2008 when there was a slight decline, experienced a steady increase over the period of analysis. By 2012, 63% of employed participated in AET, a rate quite similar to the employed in the 45 – 54 age group. The unemployed participated in AET at a lower rate than the employed, with 14% participating in 1994 and increased steadily over the period of analysis, reaching 44% by 2012. Those who were not in the labor force participated at the lowest rates with 12% participating in 1994. Participation gradually increased then stabilized at about 21% between 2006 and 2012. (see Figures 4 – 6).



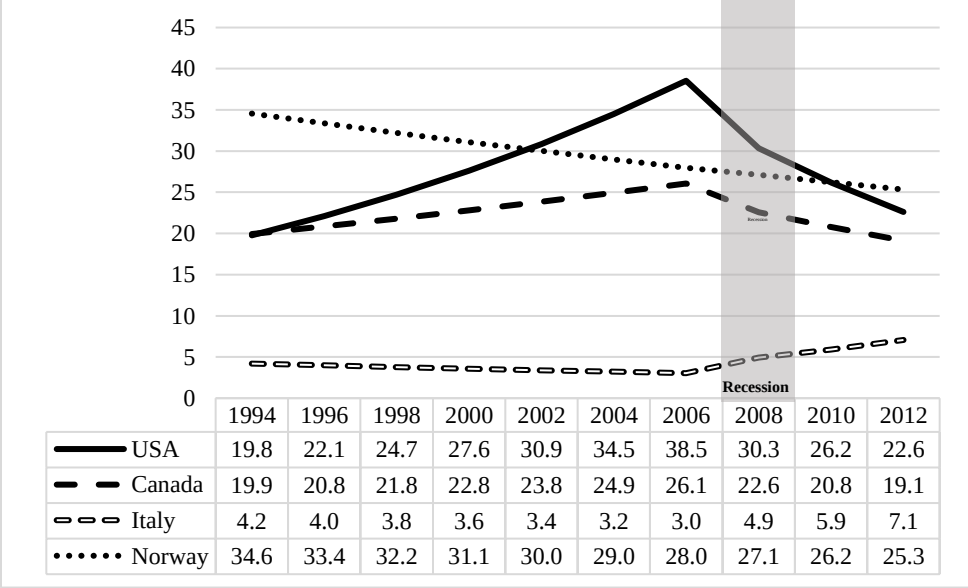

| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 52.9 | 55.1 | 57.3 | 59.7 | 62.1 | 64.6 | 67.3 | 65.2 | 65.0 | 64.7 |
| Canada | 40.7 | 43.3 | 46.2 | 49.2 | 52.4 | 55.8 | 59.5 | 60.1 | 61.9 | 63.7 |
| Italy | 25.2 | 25.5 | 25.9 | 26.2 | 26.5 | 26.8 | 27.1 | 28.8 | 29.9 | 31.0 |
| Norway | 52.4 | 53.2 | 53.9 | 54.7 | 55.5 | 56.4 | 57.2 | 62.2 | 65.6 | 69.0 |

*Figure 1.* Participation in Adult Education and Training by Employed 1994 – 2012, Ages 45 - 54 (percent)



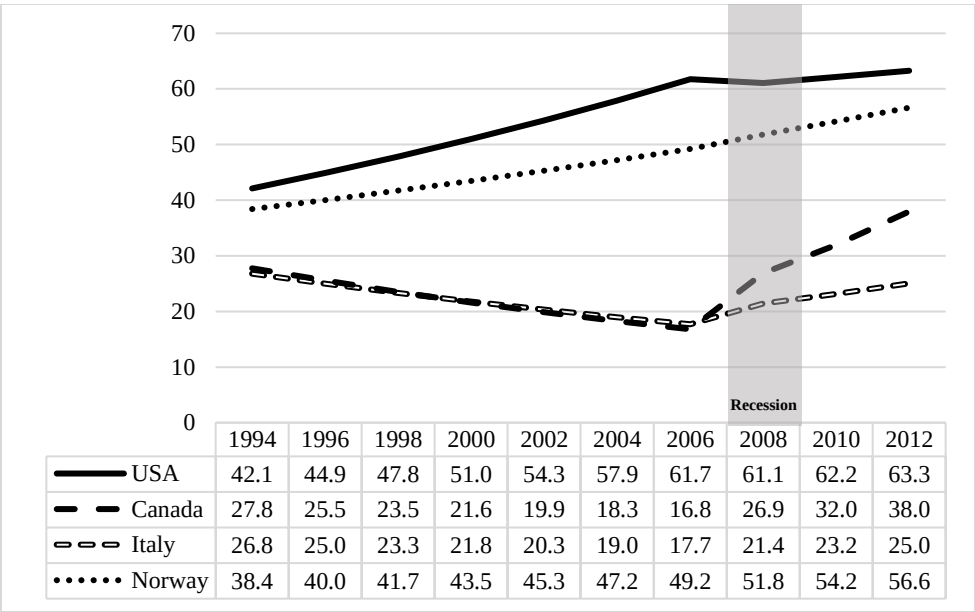

| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 22.8 | 24.3 | 25.8 | 27.4 | 29.2 | 31.0 | 32.9 | 34.3 | 35.8 | 37.3 |
| Canada | 17.7 | 19.8 | 22.2 | 24.8 | 27.8 | 31.1 | 34.8 | 35.9 | 38.0 | 40.1 |
| Italy | 0.7 | 1.1 | 1.5 | 2.2 | 3.3 | 4.7 | 6.9 | 8.3 | 9.9 | 11.7 |
| Norway | 33.3 | 36.3 | 39.6 | 43.1 | 47.0 | 51.3 | 55.9 | 57.7 | 60.5 | 63.5 |

Figure 2. Participation in Adult Education and Training by Unemployed 1994 – 2012, Ages 45 - 54 (percent)




| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 19.8 | 22.1 | 24.7 | 27.6 | 30.9 | 34.5 | 38.5 | 30.3 | 26.2 | 22.6 |
| Canada | 19.9 | 20.8 | 21.8 | 22.8 | 23.8 | 24.9 | 26.1 | 22.6 | 20.8 | 19.1 |
| Italy | 4.2 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 4.9 | 5.9 | 7.1 |
| Norway | 34.6 | 33.4 | 32.2 | 31.1 | 30.0 | 29.0 | 28.0 | 27.1 | 26.2 | 25.3 |

*Figure 3.* Participation in Adult Education and Training by Out of the Labor Force 1994 - 2012, Ages 45 - 54 (percent)

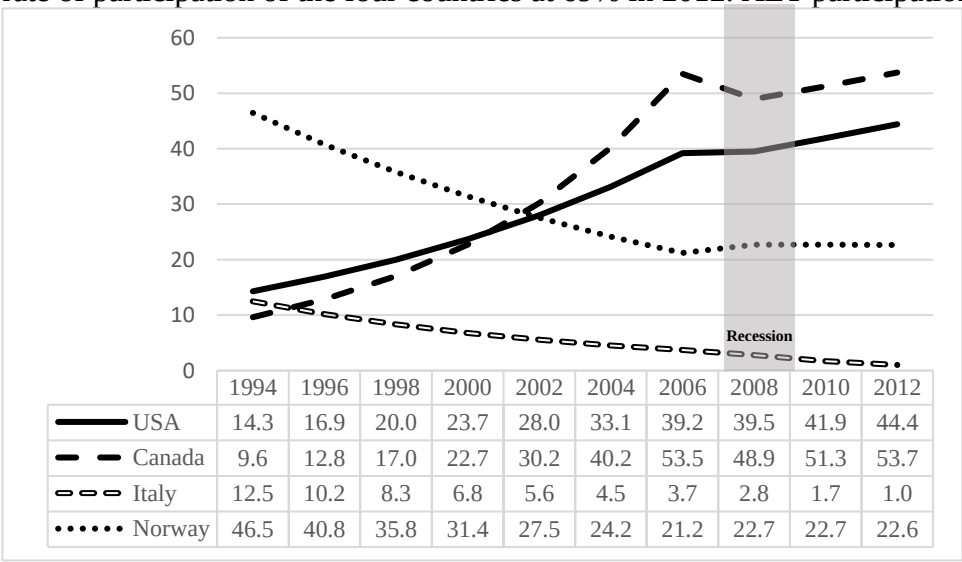



| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 42.1 | 44.9 | 47.8 | 51.0 | 54.3 | 57.9 | 61.7 | 61.1 | 62.2 | 63.3 |
| Canada | 27.8 | 25.5 | 23.5 | 21.6 | 19.9 | 18.3 | 16.8 | 26.9 | 32.0 | 38.0 |
| Italy | 26.8 | 25.0 | 23.3 | 21.8 | 20.3 | 19.0 | 17.7 | 21.4 | 23.2 | 25.0 |
| Norway | 38.4 | 40.0 | 41.7 | 43.5 | 45.3 | 47.2 | 49.2 | 51.8 | 54.2 | 56.6 |

*Figure 4.* Participation in Adult Education and Training by Employed 1994 - 2012, Ages 55 - 65 (percent)

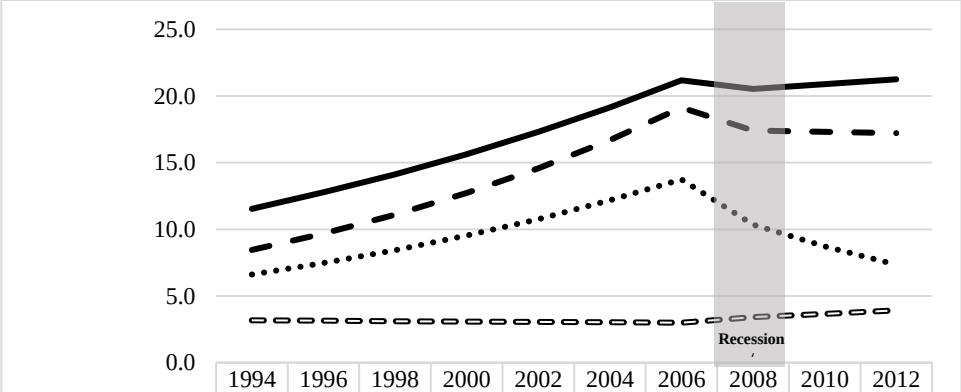
**Research Question 2:** *How do the patterns of AET participation in the US compare with Canada, Italy, and Norway?*

***Ages 45 – 54***. Until the start of the Great Recession, the U.S. had the highest rate of AET participation for the employed group. Norway surpassed the U.S. in 2010 with the highest rate of participation of the four countries at 69% in 2012. AET participation for the




| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 14.3 | 16.9 | 20.0 | 23.7 | 28.0 | 33.1 | 39.2 | 39.5 | 41.9 | 44.4 |
| Canada | 9.6 | 12.8 | 17.0 | 22.7 | 30.2 | 40.2 | 53.5 | 48.9 | 51.3 | 53.7 |
| Italy | 12.5 | 10.2 | 8.3 | 6.8 | 5.6 | 4.5 | 3.7 | 2.8 | 1.7 | 1.0 |
| Norway | 46.5 | 40.8 | 35.8 | 31.4 | 27.5 | 24.2 | 21.2 | 22.7 | 22.7 | 22.6 |

*Figure 5*. Participation in Adult Education and Training by Unemployed /1994 – 2012, Ages 55 - 65 (percent)




| | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 11.5 | 12.8 | 14.1 | 15.6 | 17.3 | 19.1 | 21.2 | 20.5 | 20.9 | 21.3 |
| Canada | 8.5 | 9.7 | 11.1 | 12.7 | 14.6 | 16.7 | 19.1 | 17.4 | 17.3 | 17.2 |
| Italy | 3.2 | 3.1 | 3.1 | 3.1 | 3.1 | 3.0 | 3.0 | 3.4 | 3.7 | 3.9 |
| Norway | 6.6 | 7.5 | 8.4 | 9.5 | 10.8 | 12.2 | 13.7 | 10.3 | 8.7 | 7.3 |

*Figure 6.* Participation in Adult Education and Training by Out of the Labor Force 1994 - 2012, Ages 55 - 65 (percent)

employed in Canada rose steadily over the analysis period, increasing from 41% to 64%. In 2012, the U.S., Canada, and Norway were clustered with participation between 64% and 69%. Italy's participation rate for the employed lagged the other countries with 25% participating in 1994 increasing to 31% in 2012. Norway had the highest AET participation rates for the unemployed throughout the period of analysis, increasing from 33% in 1994 to 64% in 2012. Both the trend and participation rates by the unemployed were similar for the U.S. and Canada; in 1994 Canada lagged the U.S. (18% versus 23%) but by 2012 the U.S. lagged Canada (40% versus 37%). Italy had by far the lowest participation rates for the unemployed. Participation rates by those not in the labor force were more erratic. For example, participation in Norway steadily declined whereas participation in the U.S. and Canada increased until about 2006, then fell to rates lower than Norway. Italy experienced the lowest rate of participation for the out of the labor force group (see Figures 1 – 3).

**Ages 55 – 65.** The U.S. experienced the highest rate of AET participation for the employed group over the entire period with Norway following close behind. Participation rates for the employed in Canada and Italy were very similar and declined in a similar pattern between 1994 and 2006, after which rates in both countries increased but at a much slower rate in Italy. Participation in AET by the unemployed in Norway exceeded the comparison countries between 1994 and 2002, experiencing a steady decline (47% to 28%) and continued to decline until 2006, at which time it stabilized at about 22%. Patterns of participation were similar for the U.S. and Canada with the U.S. slightly ahead of Canada between1994 and 2000, after which Canada's participation rate exceeded the U.S., Norway, and Italy, which continued through the period of analysis. Italy's participation rate for the unemployed declined over the entire period, dropping from 13% in 1994 to 1% in 2012. The U.S. had the highest participation rates for the out of the labor force group over the entire period, followed by Canada, Norway, and Italy (see Figures 4 – 6).

**Research Question 3:** *Did countries with higher levels of AET participation experience lower levels of unemployment and higher rates of employment following the 2008 economic downturn?*

***Ages 45 – 54.*** Employment (the proportion of a country's population that is employed) and unemployment (the proportion of a country's population that is unemployed) rates are shown in Figures 7 and 8. Norway had the highest rates of employment and lowest rates of unemployment in the years IALS, ALL, and PIAAC data were collected. Norway had the highest rate of AET participation for the unemployed, perhaps allowing them to return to workforce more quickly resulting in lower unemployment rates and preventing withdrawal from the labor market. Employment rates in the U.S. declined between 2003 and 2012 (79% versus 75%), which coincided with a decline in AET participation by the out of the labor force group. Employment rates in the U.S. declined during the Great Recession and have not fully recovered (Executive Office of the President of the United States, 2016). Low levels of education and automation contributed to the decline in employment rates in the U.S. of prime age workers (Abraham & Kearney, 2018; Executive Office of the President of the United States, 2016) as did increases in Social Security Disability Claims (Maestas, Mullen, & Strand, 2013). Italy had the highest rate of unemployment in 2012 and the lowest employment rate for the entire period of analysis and had the lowest rates of AET participation for the employed, unemployed, and out of the labor force groups. Canada's employment and unemployment rates in 2012 were both stronger than in the U.S. yet they had lower levels of participation in AET for the employed, unemployed, and out of the labor force groups.

***Ages 55 to 65.*** Norway had the highest rates of employment and lowest rates of unemployment throughout the analysis period, but did not lead other countries in AET participation. Employment rates in the U.S. were higher than in Italy and Canada, but were


*Figure 7*. Employment to Population Rate, Ages 45 – 54
Source: (OECD, 2017a)

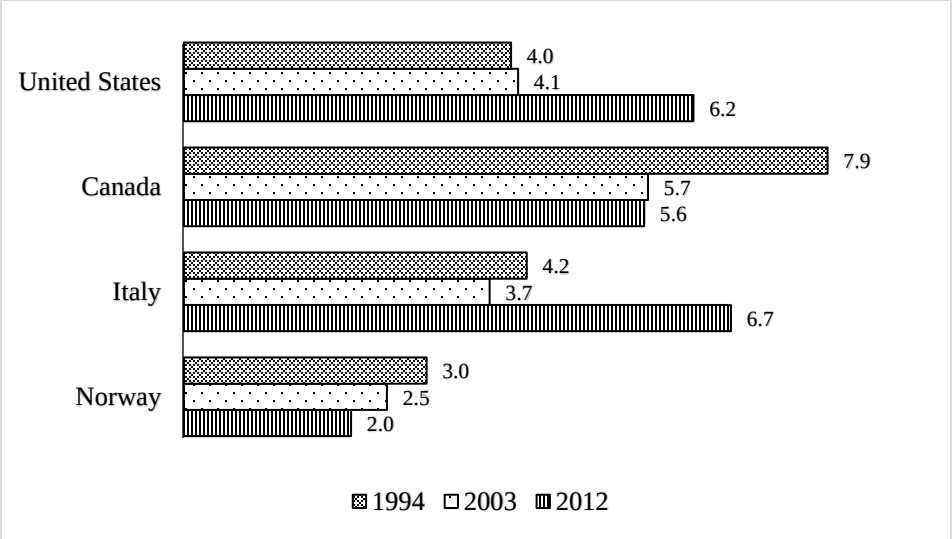



*Figure 8*. Unemployment Rates, Ages 45 – 54
Source: (OECD, 2017a)

behind both Italy and Norway in unemployment rates. Italy had the lowest employment rate for the entire period, which ties closely with their low rates of AET participation by all groups. Italy's low unemployment rate is not surprising given their very low employment rate. With the exception of Italy, there were no obvious patterns of employment and unemployment that could be explained by AET participation.

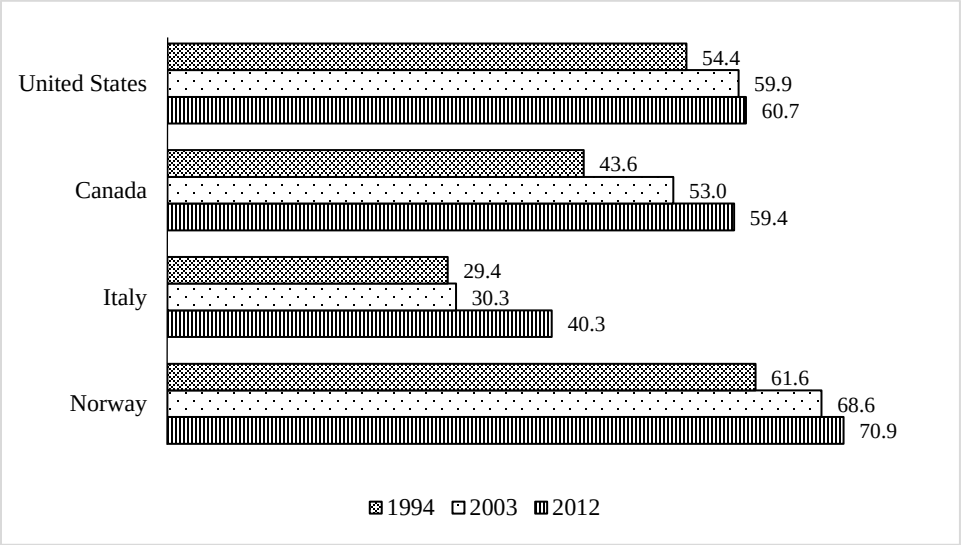



*Figure 9*. Employment to Population Percent, Ages 55 – 64
Source: (OECD, 2017a)


*Figure 10*. Unemployment Rates, Age 55 – 64
Source: (OECD, 2017a)

## Summary and Implications for Practice

Employed and unemployed ages 45 to 54 generally experienced upward trends in AET participation between 1994 and 2012. Patterns were less consistent for those not in the labor force, who with improved skills through AET participation might return to work. With the exception of the employed in Italy in 1992, the employed ages 55 to 65 participated in AET at lower rates than did their younger counterparts during the entire period of analysis. Employed in the 55 to 65 age group in the U.S., Canada, and Norway had higher rates of AET participation in 2012 than in 1994, but only the U.S. and Canada had increases for the unemployed. For ages 55 to 65 not in the labor force, AET participation rates increased from 1994 to 2006, then stabilized in the U.S. and declined in Norway and Canada.

Participation in both formal and non-formal education will be important in coming years for all age groups, especially for those who intend to continue working at older ages. Declines in labor force participation in the U.S. for the 45 – 54 age group might be alleviated by increasing AET participation for all employment groups. Those who are employed can benefit from ongoing skill upgrades to reduce their risk of unemployment during the next economic downturn and the unemployed are likely the most in need of skill upgrading.

There are many challenges in facilitating AET participation, including funding and making adults aware of the importance of formal and non-formal learning. Funding for lifelong learning is generally considered a shared responsibility among the government, the individual, and employers, with the government playing an important role in funding AET for the unemployed and low-skilled workers (Cummins & Kunkel, 2015). Identifying strategies to fund lifelong learning activities, especially for low skilled

workers, and increasing awareness of the importance of AET will continue to challenge policy makers and practitioners.

**Acknowledgements**

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A170183 to Miami University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

## References

Abraham, K. G., & Kearney, M. S. (2018). *Explaining the decline in the U.S. employment-to-population ratio: A review of the evidence*. (Working Paper No. 24333). Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w24333.

Angotti, R., & Belmonte, S. (2012). Investigating the learning-age gap in Europe and Italy: Attractiveness and benefits of learning later in life. *Working and Ageing, 1771*, 131-325.

Arntz, M., Gregory, T., & Zierahn, U. (2016). *The risk of automation for jobs in OECD countries: A comparative analysis*. (OECD Social, Employment, and Migration Working Paper No. 1815). Paris: OECD Publishing Retrieved from http://dx.doi.org/10.1787/5jlz9h56dvq7-en.

Baptista, A. (2016). Revisting lifelong learning in light of the Bologna Process and beyond. In E. A. Panitsides & J. Talbot (Eds.), *Lifelong learning: Concepts, benefits and challenges* (pp. 17-35). New York, NY: Nova Science Publishers, Inc.

Bernal, J. L., Cummins, S., & Gasparrini, A. (2017). Interrupted time series regression for the evaluation of public health interventions: A tutorial. *International Journal of Epidemiology, 46*(1), 348-355.

Börsch-Supan, A. (2003). Labor market effects of population aging. *Labour, 17*(s1), 5-44.

Commission of the European Communities. (2000). *A memorandum on lifelong learning* (Commission Staff Working Paper). Retrieved from https://uil.unesco.org/i/doc/lifelong-learning/policies/european-communities-a-memorandum-on-lifelong-learning.pdf.

Cummins, P., & Kunkel, S. (2015). A global examination of policies and practices for lifelong learning. *New Horizons in Adult Education and Human Resource Development, 27*(3), 3-17.

Eberstadt, N., & Hodin, M. (2014, March 10). America needs to rethink 'retirement': Unleashing the economic power of older workers is essential for U.S. prosperity. *The Wall Street Journal.* Retrieved from https://www.wsj.com/articles/nicholas-eberstadt-and-michael-w-hodin-america-needs-to-rethink-retirement-1394493226 .

Elsby, M. W., Hobijn, B., & Sahin, A. (2010). *The labor market in the Great Recession*. (Working Paper No. 15979). Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15979.

Executive Office of the President of the United States. (2016). *The long-term decline in prime-age male labor force participation*. Retrieved from https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160620_cea_primeage_male_lfp.pdf.

Fouarge, D., Schils, T., & De Grip, A. (2013). Why do low-educated workers invest less in further training? *Applied Economics, 45*(18), 2587-2601.

Franklin, B. (2014). *How changes in the rates of migration and variations in the 65+ employment rate can boost UK output* [PowerPoint slides]. London, UK: International Longevity Centre.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation? *Technological Forecasting and Social Change, 114*, 254-280.

Guzman, J., Pawliczko, A., Beales, S., Till, C., & Voelcker, I. (2012). *Ageing in the twenty-first century: A celebration and a challenge*. New York, NY: United Nations Population Fund. Retrieved from https://www.unfpa.org/sites/default/files/pub-pdf/Ageing%20report.pdf.

Hyde, M., & Phillipson, C. (2015). *How can lifelong learning, including continuous training within the labour market, be enabled and who will pay for this? Looking forward to 2025 and 2040 how might this evolve?* London, UK: Government Office for Science Retrieved from http://dera.ioe.ac.uk/23660/1/gs-15-9-future-ageing-lifelong-learning-er02.pdf.

Imbs, J. (2010). The First Global Recession in Decades. *IMF Economic Review, 58*(2), 327-354. doi:10.1057/imfer.2010.13

Johnson, R. W. (2007). *Managerial attitudes toward older workers: A review of the evidence*. Retrieved from https://www.urban.org/sites/default/files/publication/46731/411548-Managerial-Attitudes-Toward-Older-Workers.PDF

Maestas, N., Mullen, K. J., & Strand, A. (2013). Does disability insurance receipt discourage work? Using examiner assignment to estimate causal effects of SSDI receipt. *American Economic Review, 103*(5), 1797-1829. doi:10.1257/aer.103.5.1797

National Academies of Sciences Engineering and Medicine. (2017). *Information technology and the U.S. workforce: where are we and where do we go from here?* Washington, DC: National Academies Press. Retrieved from https://www.nap.edu/catalog/24649/information-technology-and-the-us-workforce-where-are-we-and.

National Bureau of Economic Research. (2010). *U.S. business cycle expansions and contractions*. Retrieved from http://www.nber.org/cycles.html

OECD. (2004). *Co-financing lifelong learning: Towards a systematic approach*. Paris, France: OECD Publishing.

OECD. (2011). *Pensions at a glance 2011: Retirement-income systems in OECD and G20 countries*. Paris, France: OECD Publishing

OECD. (2014). *Public data & analyses, online data [PIAAC public use data files]*. Retrieved from: http://www.oecd.org/site/piaac/publicdataandanalysis.htm

OECD. (2016). *The survey of adult skills: Reader's companion* (Second ed.). Paris, France: OECD Publishing.

OECD. (2017a). *OECD Statistics*. Retrieved from http://stats.oecd.org/

OECD. (2017b). *Pensions at a glance 2017: OECD and G20 indicators*. (9264240632).

Ogawa, N., Lee, S.-H., & Matsukura, R. (2005). Health and its impact on work and dependency among the elderly in Japan. *Asian Population Studies, 1*(1), 121-145.

Statistics Canada. (2011a). *Adult Literacy and Life Skills Survey (ALL): Public use microdata file* [codebook].

Statistics Canada. (2011b). *International Adult Literacy and Skills Survey (IALS): Public use microdata file* [codebook].

U.S. Congress. (2009). American Reinvestment and Recovery Act of 2009. Retrieved from https://www.congress.gov/bill/111th-congress/house-bill/1/text

Zwick, T. (2011). *Why training older employees is less effective* (ZEW Discussion Papers, No. 11-046). Retrieved from http://nbn-resolving.de/urn:nbn:de:bsz:180-madoc-32005