

IZA DP No. 7205

Ageing and Productivity: Introduction

David E. Bloom
Alfonso Sousa-Poza

February 2013

Ageing and Productivity: Introduction

David E. Bloom

*Harvard School of Public Health
and IZA*

Alfonso Sousa-Poza

*University of Hohenheim
and IZA*

Discussion Paper No. 7205
February 2013

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

Ageing and Productivity: Introduction^{*}

Population ageing will be the dominant feature of the world's demographic landscape in the coming decades, raising concerns about labor productivity and about economic outcomes at both the individual, enterprise, and macro levels. The articles in this special issue of *Labour Economics* define and address key issues with respect to the interplay of ageing, workforce productivity, and economic performance. Taken as a whole, the articles dispel some of the concerns, sharpen our understanding of others, and highlight behavioural changes, business practice adaptations, and public policy reforms that can offset the economic effects of population ageing.

JEL Classification: J11, J14, J18

Keywords: ageing, productivity

Corresponding author:

David E. Bloom
Harvard School of Public Health
Department of Global Health and Population
665 Huntington Avenue
Building I 12th Floor, Suite 1202
Boston, MA 02115
USA
E-mail: dbloom@hsph.harvard.edu

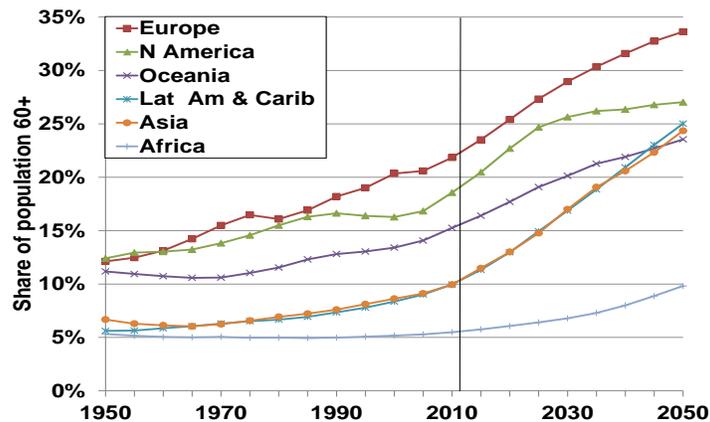
^{*} Forthcoming in *Labour Economics*. The Guest Co-Editors dedicate this special issue to the memory of Professor Thomas Lindh, who passed away on January 17, 2013 at the age of 60. In addition to being an excellent economist and a pioneer in the study of the interplay between population and economics, Thomas was a fine person and good friend. He will be missed.

Ageing and Productivity: Introduction

Population ageing is perhaps the most significant feature of global demography, with every country projected to experience an increase in the share of people aged 60 and over in the coming decades. The UN projects that by 2050 there will be 2 billion people aged 60 or over, compared with 680 million today, with the number of those aged 80 and over projected to increase at an even faster rate (United Nations Population Division, 2011).¹ Although population ageing has been most widely discussed in relation to Europe and North America, Asia and Latin America will reach those regions' current 60+ shares within a few decades (see Figure 1).

Figure 1: Population ageing is taking place everywhere

(Share of population aged 60+, by region of the world)



Source: UN, World Population Prospects (2011)

¹ All of the demographic data in this introduction are from this source.

In both popular and academic discourse, the rising proportion of older people has set off a series of alarms. Books with titles such as *AgeQuake*, *Gray Dawn*, and *Workforce Crisis* have sought to alert readers to the potential problems that ageing might bring. *The Economist* weighed in with a cover story, “The End of Retirement”. Peter G. Peterson, a past US Secretary of Commerce and former CEO of the now-defunct Lehman Brothers, went so far as to describe global ageing as a “threat more grave and certain than those posed by chemical weapons, nuclear proliferation, or ethnic strife” (Peterson, 1999).

The concerns being expressed stem from several observations:

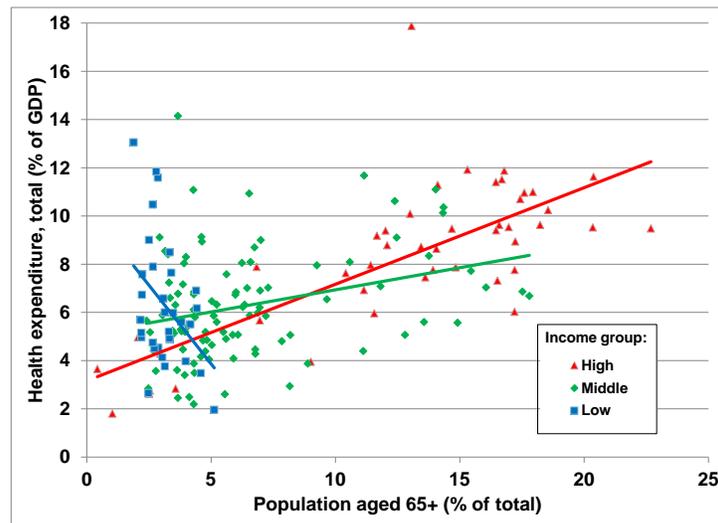
- Fertility is falling in most countries, and the share of the population that is below age 14 (and even the share of people aged 15-29) is shrinking in many countries, with corresponding shifts in current and projected workforce growth, and potentially output growth.
- When the youth population share is stagnant and the elderly population share rises, the relative size of the working-age segment of the population (ages 15-64) necessarily declines. Empirically, the ratio of the working-age population to the non-working-age population has been falling in Japan and Europe and is beginning to fall in the United States. This ratio is about to reach a peak in China, and it will soon be falling rapidly, both there and in Russia. Brazil is not far behind, with the ratio there projected to peak around 2020.

- The working-age cohort produces the lion's share of a country's economic output. When that share is smaller and there are relatively more people (young or old) who are economically dependent on working-age groups, a country's output per capita may grow more slowly or even decrease, or it may become more difficult to channel sufficient resources to the elderly to support them.
- Older people have skills and capacities, based on experience, that many younger workers lack, but in some instances they may be less productive than younger workers. In some cases, firms may find they are paying more for labour, by retaining older workers, than would be economically efficient.
- Working-age people are the prime savers in an economy. Older people typically draw on savings to support themselves. But if large numbers of older people are liquidating their assets at the same time, asset values will tend to decrease, undermining stocks of wealth throughout the population.
- Public pension systems, particularly those that operate on a pay-as-you-go basis, are under stress. Some countries are already funding pensions to some extent from general funds (which was typically not the intent), because current contributions to the country's pay-as-you-go pension system are inadequate. In Brazil, a country that is only beginning to experience a rapid rise in its elderly population share, pensions already account for 13% of all public spending. In Italy, for every 100 workers, there are 71 pensioners. And in addition to Brazil and Italy, France and Germany also spend more than 10% of GDP on public pensions, with Japan not far behind.²

² *The Economist*. "Brazil's Pension System: Tick Tock: The Senate debates a small measure to help disarm an economic time bomb". March 24, 2012. <http://www.economist.com/node/21551093>

- The elderly tend to put greater demands on health care systems. With health expenditure already accounting for substantial portions of GDP in many high-income countries and in some middle-income countries as well, these greater demands will be all the more stressful (see Figure 2).

Figure 2: Health expenditures rise as populations age



Source: World Bank, *World Development Indicators 2012*. Data for 2010.

Academic papers have been more cautious, highlighting the potential for policy reform and changes in behaviour to address the challenges of ageing (see, for example, Bloom et al., 2011). First, individuals' behaviour may evolve, particularly in response to incentives regarding labour force participation and saving. Second, firms can actively choose to take advantage of an older workforce by implementing retraining programs, adjusting to different capabilities and schedules, investing in worker health and promoting early detection of disease, and fostering work environments that encourage the continued productive participation of older workers. And finally, policy makers can

take major steps to address the viability of pension systems, and to improve access to quality health care for workers of all ages. Some analysts have suggested that increased immigration of working-age individuals could counterbalance the growing share of older people. However, for social and political reasons, this is unlikely to be possible on a scale large enough to counteract the potential economic effects of population ageing.

It is worth noting here that doomsday scenarios based on demographic change are hardly new. Paul Ehrlich's controversial 1968 book, *The Population Bomb*, is a well-known example. But rather than the impoverishment of the world as a result of population doubling from 3 to 6 billion from 1960 to 2000, income per capita more than doubled in that time frame (World Bank, 2012). And instead of increasing immiseration, the world has seen huge advances in health and education: Between 1970 and 2010, life expectancy at birth rose from 59 to 70, and infant mortality fell from 95 infant deaths per 1,000 live births to 38. The primary school gross enrolment rate was already high (89%) in 1970, but the corresponding rate for secondary school increased from 40% to 70% over this period (World Bank, 2012). These markers of economic and social progress, which have come about even as population has grown tremendously, have been spurred by technological advances, institutional innovations, and changes in behaviour. Thus, for many economists, doomsday scenarios associated with population ageing seem likely to be another example of overblown concern.

Several core issues raised by population ageing were examined in a conference on “Ageing & Productivity”, held in October 2011 at the University of St. Gallen, Switzerland. Most of the papers from that conference appear in this issue of *Labour Economics*.

Taken as a whole, the papers are methodologically quite novel. Several take advantage of matched employer-employee datasets to study the implications for productivity, pay, and profitability of age and other employee characteristics, and employer characteristics related to scale, capital intensity, and technological modernity. In addition, many of the papers are focused on specific rapidly ageing countries, mostly but not exclusively in Europe.

Mahlberg et al. (2013) examine age profiles of productivity and wages in Austria between 2002 and 2005, using a matched employer-employee dataset covering a broad range of economic sectors. In contrast to widespread belief, and acknowledging that determining causal connections is difficult, they find that having a larger share of younger employees (defined as less than age 30) is, *ceteris paribus*, associated with lower productivity and wages, while having a larger share of older employees (defined as age 50+) is not. They find no evidence that older workers are overpaid relative to their productivity. These results conform closely to those reported by Hellerstein and Neumark (1995) and Hellerstein et al. (1999) in their pioneering work on the age trajectories of pay and productivity across Israeli and US firms.

Green and Riddell (2013) analyse data from the 1994 and 2003 International Adult Literacy Surveys for Norway, Canada, and the United States. Their cross-sectional analyses show that literacy declines modestly with age. They also show, based on quasi-longitudinal analyses, that these declines reflect sharper declines with age that are offset by cross-cohort declines in literacy. These findings are reminiscent of George Borjas's (1985) path-breaking analyses of immigrant assimilation, which showed that cross-cohort declines in "immigrant quality" increased the steepness of immigrants' cross-sectional age-earnings profiles. The authors' results apply to all three countries and are potentially highly consequential, insofar as literate workers are a crucial factor underlying productivity, especially during periods of rapid technological change. The results are also potentially important for the targeting of programs for increasing literacy.

Vandenberghe (2013) uses firm-level panel data from Belgium (from the Bel-first database) to examine the effect of the age and gender of employees on firms' profits. Although a greater share of older men among a firm's employees is not detrimental, the opposite is true of older women employees – and this finding pertains as well to services. In addition, the service sector, which employs a very large number of women, does not seem to be taking steps that would counteract the current lower productivity of female workers. The results have major implications for public policies: if labour shortages become acute, they may be partially alleviated by taking measures that could boost the productivity of older women.

Lovasz and Rigo (2013) study the impact on the value of workers' skills of changed production methods associated with Hungary's transition to a market economy that began in the early 1990s. They do this by analysing a nationally representative, employer-employee matched dataset, the Hungarian Wage and Employment Survey, covering the years 1986 to 2008. They find that older workers suffered the most, that the effects of skill obsolescence were particularly acute among the most-skilled workers and those in foreign-owned companies, and that policies are needed to provide training for older workers in response to sudden changes that devalue their skills. In general, experience matters greatly, but when that experience is concentrated in skills that are no longer in great demand, and when younger workers enter the workforce with more up-to-date skills, both firms and society as a whole can benefit by shoring up the skills of those who would otherwise be left behind. This paper highlights the vulnerability of older workers' human capital to economic change.

Romeu Gordo and Skirbekk (2013) advance a line of research initiated by Autor et al. (2003) and use the German Qualification and Career Survey to study the effect of technological change on job content and how workers of different ages adapt. In particular, they examine changes in task use (i.e., changes in the mix of skills workers use in their jobs) in Germany between 1986 and 2006. They point out that earlier studies found that younger workers had greater abilities in both physical tasks and cognitive tasks with intense use of fluid abilities. This would imply problems for older workers if they are in fact less able to adapt to technological change that includes a shift toward tasks that are more cognitively demanding. The authors find, however, that

those older workers who have remained in the labour force have actually adapted well to technological changes, as evidenced by the fact that they have experienced greater growth in tasks with intense use of cognitive abilities. This is a partial explanation of the larger increase of wages for older worker in this period, as compared with younger workers.

Prettner et al. (2013) build on earlier studies on the nature and contribution of human capital to economic growth (Bloom and Canning, 2000, 2003; Lee and Mason, 2010; Lucas, 1988; Mankiw et al., 1992) and find evidence, using a cross-country panel dataset for 1980-2005, that greater investment in education and health can help to counter the declining labour supply that may come about because of declining fertility. This conclusion is consistent with the view that economic growth and development are not merely a function of the quantity of labour but also of its quality, which is increased by the contributions of education and health to human capital. The authors point out that lower fertility can lead to a larger effective labour force of the future, because (a) fewer children generally mean healthier and better educated children, and (b) better health, cognition, and education generally translate into more productive adults. This effective enlargement of the labour force will help offset the shrinking of it that comes from population ageing.

Zwick and Göbel (2013) analyze a linked employer-employee dataset for a panel of German establishments during the years 1997-2005. They do this to test the implications of different human resource practices for the shape of the age-productivity

profile. Notable among their findings is that creation of mixed-age working teams is beneficial for the productivity of all workers, i.e., they find evidence of a productivity-enhancing synergy between older and younger workers. The authors also find that adoption of certain practices (e.g., equipment changes that mitigate hearing and vision problems and age-specific job assignments that are less physically demanding or in which the work environment is modified to match older workers' capabilities) can prevent the decline in productivity that might otherwise take place as workers age. By contrast, they do not find a significant effect from reducing working hours or offering training for older workers. The authors suggest that employers' successful adoption of appropriate age-focused measures helps to explain the fact that older workers' productivity is on average not lower than prime-age workers' productivity.

Sanchez-Romero et al. (2013) build on the important recent work of Imrohoroglu and Kitao (2012) on the responsiveness of older workers labour supply and savings behaviour to changes in the incentives for retirement, and corresponding aggregate impacts of those changes. The authors present an extremely careful, detailed analysis of the fiscal sustainability of Austria's pay-as-you-go pension system and the recent pension reforms in that country. The context for their study is that (a) the share of Austria's population aged 60+ is projected to increase from 21% in 2000 to 33% in 2030; (b) although normal retirement age for men is 65 (and gradually rising to that age for women), many workers retire much earlier; and (c) public pensions in Austria are among the highest in Europe. To carry out their research, the authors develop and calibrate a rational expectations computable general equilibrium model for an open

economy. They find that the reforms made to date are not sufficient to deal with problems in Austria's pension system – difficulties that stem from low fertility, rising longevity, and early retirement ages. Their simulations suggest that alternative policies could overcome current incentives for early retirement, would therefore tend to lead workers to remain in the labour force longer, would be a key step in addressing inadequate labour supply, and would promote the fiscal sustainability of the pension system by limiting the growth of expenditures. Another result, similar to the findings of Prettnner et al. in this issue, is that higher public spending to raise educational attainment can also buttress the fiscal sustainability of the pension system.

In sum: population ageing is underway, and is taking many countries into historically uncharted waters with respect to its effects on productivity – and on countries' economies more broadly. Although major concerns abound in many quarters, the doomsday scenarios may not ring true. Nevertheless, we do have to investigate and take seriously the economic challenges that ageing will bring. The papers in this issue are an admirable effort in this direction. They define key issues with regard to the ways in which, and the circumstances under which, an ageing workforce may affect productivity, along with careful analyses of those issues. They help to dispel some of the more overblown concerns but do not shy away from detailing issues with which mature economies will need to deal.

Acknowledgments

We thank Ian Walker, the editor of *Labour Economics*, and his assistant, Bernadette Walker, for their guidance and assistance in bringing this special issue to fruition. We also thank the following referees for their extremely valuable comments. The referees were Günther Fink, Didier Fouarge, Michael Gerfin, Xiadong Gong, Helmut Hofer, Lukas Inderbitzin, Stephan Klasen, Christian Keuschnigg, Thomas Lindh, Bo Malmberg, Maite Martinez Granado, Andrew Mason, Margaret Anne McConnell, Carsten Ochsen, Tuomas Pekkarinen, Alexia Prskawetz, Uwe Sunde, Alma Van Doesburg, Jan Van Ours, José M. Varejao, David Weil, Matthias Weiss, Conny Wunsch, Yu Zhu, and Thomas Zwick.

This work was funded by the WDA Forum, the Ecosciencia Foundation, the Pfizer Foundation, the Swiss National Science Foundation, and the Program on the Global Demography of Aging at Harvard University. The Harvard funding is derived from Award Number P30AG024409 from the National Institute on Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Aging or the National Institutes of Health.

References

Autor, D., Levy, F., Murnane, R.J., 2003. The Skill Content of Recent Technological Change: an Empirical Exploration. *Quarterly Journal of Economics* 118(4), 1279-1333.

Bloom, D.E., Canning, D., 2003. Health as Human Capital and its Impact on Economic Performance, *The Geneva Papers on Risk and Insurance* 28(2), 304–315.

Bloom, D.E., Canning, D., 2000. The Health and Wealth of Nations, *Science* 287, 1207-9.

Bloom, D.E., Canning, D., and Fink, G., 2011. Implications of Population Aging for Economic Growth. *Oxford Review of Economic Policy* 26(4), 583-612.

Borjas, G., 1985. Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants. *Journal of Labor Economics* 3, 463-489.

Green, D.A., Riddell, W.C., 2013. Ageing and Literacy Skills: Evidence from Canada, Norway and the United States. *Labour Economics*, this issue.

Hellerstein, J.K., Neumark, D., 1995. Are Earnings Profiles Steeper than Productivity Profiles? Evidence from Israeli Firm-Level Data. *Journal of Human Resources* 30, 89-112

Hellerstein, J.K., Neumark, D., Troske, K.R., 1999. Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations. *Journal of Labor Economics* 17, 409-446.

Imrohoroglu, S., Kitao, S., 2012. Social security reforms: Benefit claiming, labor force participation, and long-run sustainability. *American Economic Journal: Macroeconomics* 4 (3), 96–127.

Lee, R., Mason, A., 2010. Fertility, Human Capital, and Economic Growth over the Demographic Transition. *European Journal of Population* 26(2), 159-182.

Lovasz, A., Rigo, M. 2013. Vintage Effects, Ageing and Productivity. *Labour Economics*, this issue.

Lucas, R. E., 1988. On the mechanics of economic development. *Journal of Monetary Economics* 22, 3-42.

Mahlberg, B., Freund, I., Cuaresma, J.C., Prskawetz, A., 2013. Ageing, productivity and wages in Austria. *Labour Economics*, this issue.

Mankiw, N. G., Romer, D., Weil, D. N., 1992. A contribution to the empirics of economic growth. *Quarterly Journal of Economics* 107(2), 407-437.

Peterson, Peter G., 1999. Gray Dawn: The Global Aging Crisis. Foreign Affairs, January-February 1999.

Prettner, K., Bloom, D.E., Strulik, H., 2013. Declining fertility and economic well-being: do education and health ride to the rescue? Labour Economics, this issue.

Romeu Gordo, L., Skirbekk, V., 2013. Skill demand and the comparative advantage of age: Jobs tasks and earnings from the 1980s to the 2000s in Germany. Labour Economics, this issue.

Sanchez-Romero, M., Sambt, J., Prskawetz, A., 2013. Quantifying the role of alternative pension reforms on the Austrian economy. Labour Economics, this issue.

United Nations Population Division, 2011. World Population Prospects: The 2010 Revision.

Vandenberghe, V., 2013. Are firms willing to employ a greying and feminizing workforce? Labour Economics, this issue.

World Bank, 2012. World Development Indicators 2012.

Zwick, T., Göbel, C., 2013. Are Personnel Measures Effective in Increasing Productivity of Old Workers? Labour Economics, this issue.