



Wittgenstein Centre

FOR DEMOGRAPHY AND
GLOBAL HUMAN CAPITAL

**Six ERC Grants
plus Wittgenstein Prize**
for a Centre with €2 million core funding

INTEGRATING RESEARCH OF THREE PILLAR INSTITUTIONS
2008-2012



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ECONOMICS
AND BUSINESS

The Wittgenstein Centre

The Wittgenstein Centre aspires to be a world leader in the advancement of demographic methods and their application to the analysis of human capital and population dynamics. In assessing the effects of these forces on long-term human well-being, we combine scientific excellence in a multidisciplinary context with relevance to a global audience.

The Centre is a collaboration among the World Population Program of the International Institute for Applied Systems Analysis (IIASA), the Vienna Institute of Demography of the Austrian Academy of Sciences (VID/ÖAW), the Demography Group and the Research Institute on Human Capital and Development of the Vienna University of Economics and Business (WU). In late 2010, a letter of understanding was signed by these three pillar institutions defining the terms for this collaboration under a common roof (see illustration below).

The Centre combines the partners' strengths in the fields of demography, human capital formation and analysis of the returns to education. It builds on a highly successful collaboration that has already generated significant scientific advances. "Human capital" refers to the human resource base in terms of the number of people and their changing structure by age, gender, location, education, health status, cognitive skills and other relevant characteristics. Our intent is to provide a sound scientific foundation for decision-making at various levels.

Scientific advice and guidance will be ensured by its International Scientific Advisory Board (see page 39).





Wolfgang Lutz
Founding Director,
Wittgenstein Centre

Introduction

I founded the Wittgenstein Centre as the result of an exciting new vision that developed in my thinking over the past few years while working for the three pillar institutions: Use the enormous untapped power of multidimensional demographic methods to analyse and forecast broader socioeconomic changes.

Societies and economies change as a consequence of the evolving composition of their membership as captured by selected key characteristics of people. Conventionally, demography has focused primarily on the changing composition of a population by age and gender. At the Wittgenstein Centre we have now added educational attainment as a third demographic dimension that should routinely be taken into account. In addition, labour force participation, health status, place of residence and other measurable characteristics of people can be captured and modelled using the powerful tools of multidimensional population dynamics that were developed at IIASA during the 1970s. Making further progress in these directions is the core of our research agenda.

This more comprehensive approach has the potential to develop into a new social science paradigm, the theoretical foundations of which are detailed in the article "Demographic metabolism: A predictive theory of socioeconomic change" in the 2013 PDR supplement *Population and Public Policy: Essays in Honor of Paul Demeny*.

This approach also has immediate practical potential for dealing with key policy challenges of our rapidly changing world, along the way providing new and sometimes surprising answers to such questions as: What is the desirable level of fertility and how can it be measured and assessed? Will population ageing actually result in the often feared massive increase in disability? Can education help to slow cognitive ageing and what should be the priority investments for our ageing Western populations? What are the population and human capital futures in today's developing countries and, in particular, what would be the best investments for enhancing the adaptive capacity for dealing with climate change? Researchers at the Wittgenstein Centre deal with many such questions in an innovative way.

The Centre was formally founded in January 2011 and combines ongoing research at its three pillar institutions in the Vienna area (see illustration, page 2). The Centre was established by the 2010 Wittgenstein Prize, the highest Austrian science award, which was explicitly dedicated to the creation of this collaborative Centre and also gave the Centre its name. I am privileged to work with an enthusiastic, highly competent team of international researchers.

Since much of our scientific work dates back to before the Centre's founding, we thought it would be a good idea to summarise this research over the past five years. I hope you find this report informative and sense some of the excitement we feel about this new line of research.

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Director Profiles



Founding Director **Wolfgang Lutz** says that at the age of 16 the newly published book *Limits to Growth* served as the wake-up call that led him to choose statistics and systems analysis as his profession. In terms of studies, he chose demography, which he defines as “the mathematics of people.” After earning his PhD in demography from the University of Pennsylvania in 1983, Lutz returned to Austria, where he was fortunate to enter IIASA and work under the mentorship of Nathan Keyfitz. Lutz became acquainted with both the specific methods of multidimensional demographic analysis and the broader interdisciplinary systems analytical approaches that lie at the heart of IIASA’s mission. His research goal is to apply the best available social science methods to addressing the biggest challenges for the future human condition.

In addition to founding the Wittgenstein Centre, Lutz is the leader of the World Population Program at the International Institute for Applied Systems Analysis, the director of the Vienna Institute of Demography of the Austrian Academy of Sciences and a professor of social statistics at the Vienna University of Economics and Business.

“The most important policy choices are the ones concerning our common future on this planet, how to assure lives in good health and dignity for all. We need to significantly strengthen the scientific basis for making such choices in an informed manner.”



Economist **William Butz** brought his deep experience in population studies to Austria in 2011 to assist Wolfgang Lutz in building the Wittgenstein Centre. As Director of Coordination and Outreach, Butz oversees research activities and leads efforts to bring the Centre’s work to policymakers in developing countries, Europe and international organisations. Working with the international media, he also translates the Centre’s data and technical research into language that can be readily understood by policymakers and the public.

Prior to coming to IIASA, Butz was the president of the Population Reference Bureau, a Washington, DC-based nonprofit research organisation that analyses complex demographic data to better inform people about issues related to population, health and the environment. Butz has also worked as a senior economist at the RAND Corporation, as a US National Science Foundation division director and as an associate director at the US Census Bureau.

“There are three defining characteristics of all of the work that we do at the Wittgenstein Centre. The first is that it is science. Second, it is science that is interdisciplinary. Third, it is science in the public good.”



Economist **Jesú Crespo Cuaresma**, the Centre's Director of Economic Analysis, oversees work that identifies unexplored niches in interdisciplinary approaches to the role of human capital as a determinant of economic performance. His research focuses on the benefits of education to economic growth, poverty alleviation and institutional change. His broader research includes work on applied macroeconometrics, economic growth, forecasting, business cycles and monetary and fiscal policy.

Crespo Cuaresma joined IIASA's World Population Program in 2006 and holds two PhDs in economics from the University of Vienna. He is currently a full professor in economics at the WU as well as a scientific advisor to the Österreichische Nationalbank.

"The role of the Wittgenstein Centre is to make our models more realistic and more policy relevant. We are adding a layer of complexity that we believe adds reality and value to our research—namely, to look at age dynamics and age/gender demographic dynamics in the framework of education."

Population economist **Alexia Fürnkranz-Prskawetz**, the Centre's Director of Research Training, coordinates instruction in advanced demographic and economic methods in order to strengthen the link between the Centre and international training programmes such as the European Doctoral School of Demography. In addition to overseeing teaching and expert lectures at the Wittgenstein Centre, Fürnkranz-Prskawetz conducts research on population ageing which, due to decreasing fertility and longer life spans, is causing pronounced changes in the age and education composition of the workforce. Her research analyses how educational and labour market policies must adjust to meet the new demographic challenges.

Fürnkranz-Prskawetz received her PhD in Technical Mathematics from the Vienna University of Technology in 1992 and is currently a professor of mathematical economics at the school. She was a Fulbright scholar at the University of Chicago program for postgraduate study in economics for the 1990–91 academic year and a Max Kade postdoctoral scholar at the University of California, Berkeley, for the 1997–98 academic year.



"Science is about people. Let us bring science back to people by really communicating our findings and offering some policy options."



Sergei Scherbov, Director of Demographic Analysis, develops the Centre's most requested data: population forecasts. Demographic analysis is critical to the Wittgenstein Centre's activities, as the size, composition and structure of populations affect virtually every aspect of human lives. Scherbov is developing new methodologies, such as probabilistic population projections, for forecasting the world's population. He first came to IIASA in 1982 as a participant in the Young Scientists Summer Program (YSSP). He received his PhD in control theory and systems analysis in 1983 from the All-Union Research Institute for Systems Studies of the USSR Academy of Sciences and a degree in control theory and systems studies from the Moscow Aviation University.

"Once you take into account the changing lifespan, then the history of ageing looks very different. Many populations, instead of becoming older, are becoming younger. If you look to the future, there is still ageing; however, this ageing is much less pronounced compared to traditional measures."



European Research Council
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ERC GRANTS

Wolfgang Lutz
Demographer
Advanced Grant
IIASA

Educated Societies Will Cope Better with the Dangers of Future Climate Change

“Demographers are better at studying differences between people and doing projections than any other social scientist, and we should use those strengths to help the world better understand differential vulnerability by age, gender and level of education, and anticipate future changes in the structures of societies in order to reduce vulnerability to climate change.”

— Wolfgang Lutz

Although there is substantial ongoing research assessing the impact of future climate change on the Earth's physical systems, there are few quantitative studies on the likely impacts that change will have on future human well-being, given that not all people are equally vulnerable. FutureSociety, a €2.4 million Advanced Grant awarded by the European Research Council, is an effort to better understand what changes societies are likely to undergo over the next several decades and determine how those changes will affect their vulnerability to a climate that is more extreme than it is today. This research can help develop strategies that enable societies to better cope with the consequences of climate change.

Understanding the climate threat to future societies requires more than studying global circulation models and projecting how extreme climate change will be, important as these efforts are. Matching the future climate with societal capabilities as they are observed today would be a serious mistake because societies also change over time. A meaningful assessment of likely climate impacts must relate the nature of the threats to the capabilities of societies as they are likely to be at the same time in the future.

The threats come most directly from increasingly intense extreme natural events, such as hurricanes, floods, forest fires and heat waves. Danger also comes from more gradual events, such as sea-level rise and changing regional temperature and humidity patterns that make agricultural production more difficult. Changing climate patterns also can increase the spread of disease.

The extent to which these events will increase human misery and death depends, in part, on the future vulnerability of the people affected. A robust and resilient society will be better able to weather the storms of climate change than a society with few resources and limited coping skills. In this study those skills and capabilities are being measured and projected through the educational attainment distributions of populations by age and gender.

The basic hypothesis being tested is that societies can develop the most effective long-term defence against the dangers of climate change by strengthening human capacity, primarily through education—which helps to improve health, eradicate extreme poverty and reduce population growth.

FutureSociety research uses a multidisciplinary approach to test this hypothesis. The results will be relevant to formulation of national and international development priorities. Should the significant funds allocated for adaptation to climate change be invested in improving existing infrastructure and agricultural practices, or should some money go instead to enhancing human empowerment through education and health? Which approach is more likely to enable people to cope with the long-term challenges posed by a climate that is becoming more violent?

Failure to wisely address these and related questions could result in ill-informed investment policies that lock countries into inflexible coping strategies that will not be effective under possible future climates. Given the significant uncertainties in place-specific climate forecasts, investments in an overall empowerment of human resources that leads to greater flexibility in reacting to the arising challenges may well be a wiser strategy.

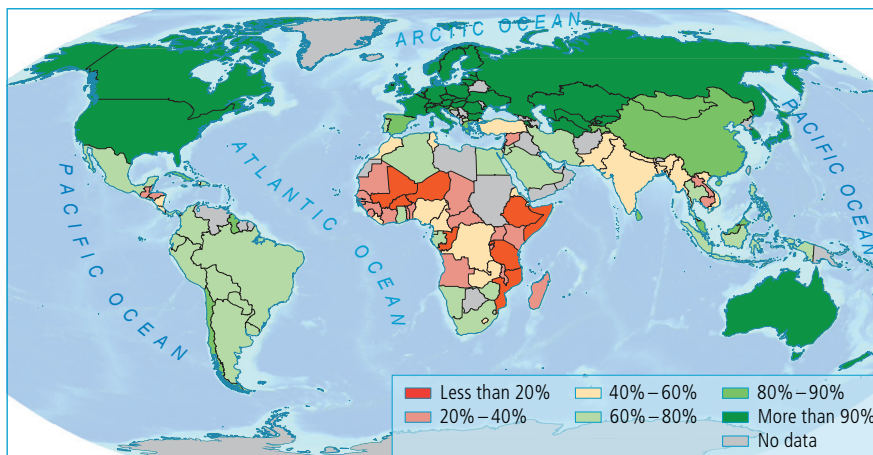
In a discussion of the FutureSociety Project, Lutz said: “If we can show empirically that in the past better educated people have been less vulnerable at the individual and societal level to natural disasters, that they could better overcome injuries and harm and even economic loss, then we can infer that education is an important aspect of creating protective mechanisms against the potential dangers of future climate change.”

To gather the empirical data needed to reach supportable conclusions about the role of education, FutureSociety includes multinational studies of the factors involved in vulnerability and adaptation of populations to Hurricane Mitch which devastated Central America and the Caribbean in 1998, the Asian tsunami of 2004 and various flooding events in South Asia. The lesson of these studies is how important education was in the overall susceptibility of the societies to the extreme event as compared to other factors such as income and wealth. This comparison holds true for both individual and governmental responses to the extreme events and is instructive because enhancing education can involve significantly different policy strategies compared to an approach that focuses on income and wealth.

Over the next several years, billions of Euros will likely be spent on adaptation programmes, primarily through the Kyoto Protocol adaption fund and national governments. But there is serious concern among many experts about the lack of a solid scientific basis to guide policymakers on how best to allocate the money.

FutureSociety is augmenting this scientific basis through multiple studies. As an example, Lutz and Wittgenstein Centre colleague Erich Striessnig conducted a study that examines the relationship between disaster fatalities in recent decades and national primary and secondary education levels, income and health indicators. The study, “Effects of educational attainment on climate risk vulnerability,” published in 2012 in the journal *Ecology and Society*, presents statistical evidence for 108 countries that show that the education-related indicators are of highest significance in reducing disaster vulnerability.

Lutz and Striessnig, using the Centre’s projections of populations by age and level of educational attainment, were able to model the future adaptive capacities of Sub-Saharan Africa and reach conclusions about the specific role of education in vulnerability reduction.



WORLD FEMALE EDUCATION

Proportion of women aged 20–39 with at least junior secondary education in 2010. (Map prepared by Sergei Timonin, participant in IIASA’s Young Scientists Summer Program, 2010)

Looking ahead to 2050, the study projects very different societies based on two education scenarios. In the first scenario, which assumes Constant Enrolment Rates (CER), the rate of school enrolments is kept constant, with enrolments only expanding in parallel with the growth of the school-age population. In the second scenario, based on Global Education Trends (GET), the rate of school enrolments increases, following the path of countries that started at the same level as Sub-Saharan Africa, then successfully expanded their education systems.

The first scenario leads to a society that “would be highly vulnerable to possible increases in natural disasters due to climate change, while the second kind of society would likely have considerably more adaptive capacity to cope with whatever changes the future will bring,” Lutz and Striessnig wrote.

Which scenario is more likely to occur depends on education policies put in place in the near future. FutureSociety research clearly indicates that viewing education as an investment in the adaptive capacity to cope with climate change should be an important new policy focus.

World Population and Human Capital in the 21st Century

One of the Wittgenstein Centre's first collaborative projects is an ambitious new set of science-based population projections by age, sex and level of educational attainment for more than 170 countries through the end of the century. The resulting book, *World Population and Human Capital in the Twenty-First Century* (Oxford University Press; circa 700 pages), will present the most comprehensive analysis to date of what is known about the drivers of future fertility, mortality, migration and education in different parts of the world and how this translates into global population trends between now and 2100.

The project, part of the FutureSociety Grant, began with an extensive on-line survey sent to all members of six international population associations. The survey questionnaire was structured around a large number of predefined arguments phrased in a way that allowed the responding experts to refer to existing scientific work in their fields of expertise and for specific countries, coming as close as possible to the principles of the scientific peer review process. Responses were then analysed and synthesised in five "MetaExpert" meetings held on five continents. The resulting set of assumptions reflects a synthesis of model-based values drawn from the collective past experience of all countries and of country-specific expert knowledge as gathered through this expert solicitation exercise. Altogether, more than 600 experts from around the world provided their scientific input.

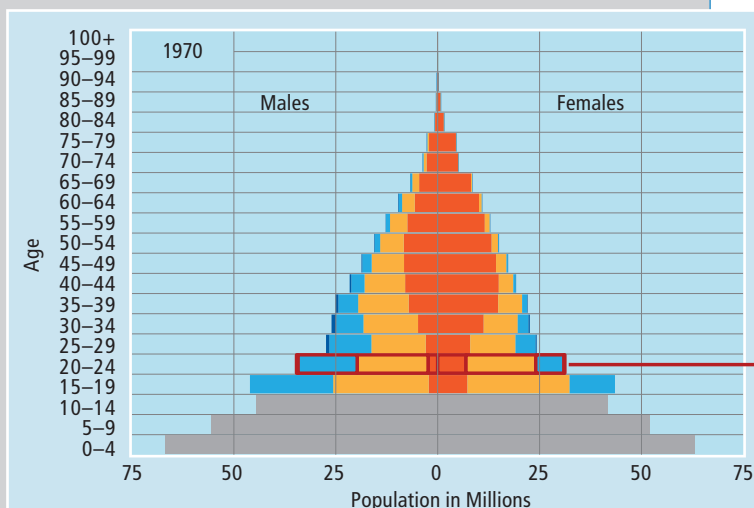
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ERC GRANTS

AGE AND EDUCATION PYRAMIDS FOR CHINA IN 1970, 2000, AND 2030 UNDER FAST EXPANSION SCENARIO

Colours indicate highest level of educational attainment.

- Children 0–14
- No education
- Primary
- Secondary
- Tertiary



PROVING THE CASE: EDUCATION AND ECONOMIC GROWTH

Using new demographic techniques, IASA researchers are now able to show that education has a clear positive effect on economic growth. Why had previous evidence for this link been ambiguous? "This was due to using education data without the necessary age detail," says Wittgenstein Centre Director Wolfgang Lutz. "Previous data considered the entire adult population aged 25 years and older as one age group. Therefore rapid improvements in the education of the young adult population—an important driver of economic growth—did not produce enough statistical signals in a very broad age group, which also includes elderly, poorly educated people."

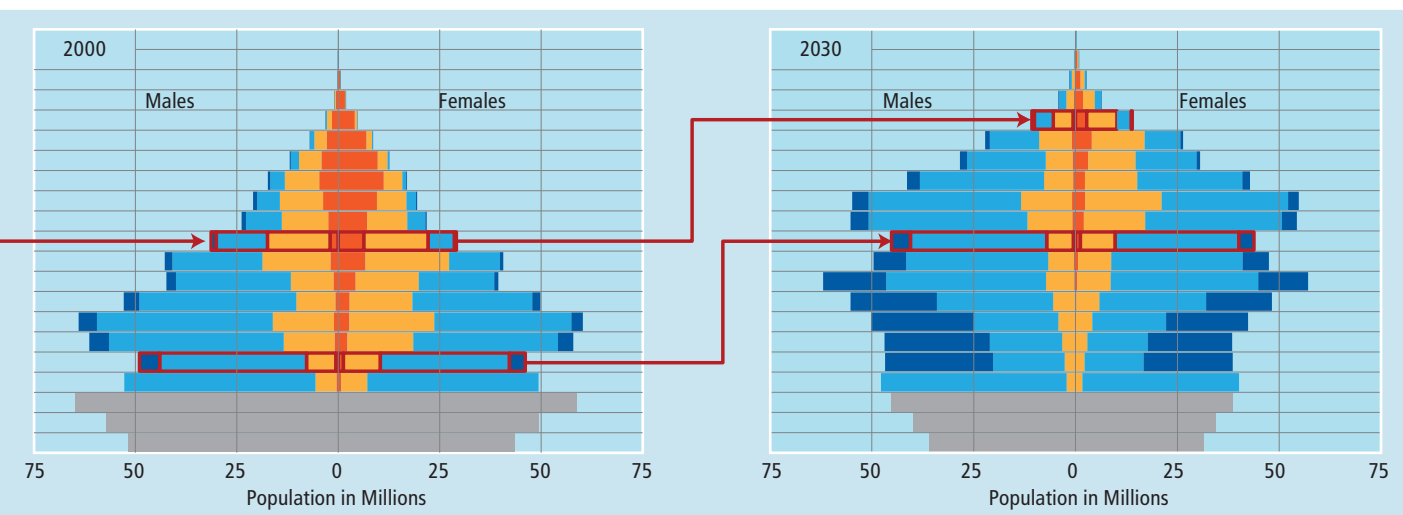
To address this shortcoming, IASA has developed age- and sex-specific reconstructions and projections of human capital in a unified multistate framework that also takes account of educational mortality and fertility differentials. Studies of this new data by five-year age groups for 120 countries since 1970 show conclusively that educational attainment is indeed the key driver of economic growth [*Science* 319(5866):1047–1048 (22 February 2008); see page 29].

How do multistate methods work? As the figure above shows, applying multistate methods for projecting backwards (reconstruction) or forwards (into the future) requires that at least one data point be available for the size and structure of the population by age, sex and level of educational attainment. Using the example of China, the analysis presented in the figure begins with the age and education pyramid for 2000. From that point it is relatively straightforward to reconstruct the educational structure for 1970 as well as forecast forwards to 2030.

China is not only the world's most populous country but has also experienced one of the most rapid fertility declines together with a phenomenal education expansion. Interestingly, as the figure illustrates, much of the future improvement in the educational attainment of China's adult population is already embedded in today's education structure. But for the younger ones it depends on near-term policies.

Centre scientists translated these assumptions into future scenarios which, in addition to a most likely medium scenario, include alternative scenarios that correspond to the storylines of the new Intergovernmental Panel on Climate Change (IPCC) set of Shared Socioeconomic Pathways (SSPs). These SSPs will be the quantitative basis for much of the modelling of mitigation and adaptation challenges of the coming decades. The results show future population sizes and structures by age, sex and six levels of educational attainment for more than 170 countries, which together include more than 97 per cent of the world's population.

The forthcoming book consists of six substantive core chapters—high fertility, low fertility, high mortality, low mortality, migration and education—summarising the scientific evidence and how it has been translated into specific sets of assumptions. Following the IPCC example, these chapters have lead authors and large numbers of contributing authors. The results section is structured into three main chapters describing the effects of alternative education scenarios on population outcomes, focusing on the process of global ageing and providing the demographic content (the human core) of the SSP scenarios. Together, these two parts of the book provide a comprehensive summary of what is known today about the drivers of demographic change and of the range of likely and possible world population and human capital trends for the 21st century.



Demography-Based Market Forecasting Tools

Alongside the FutureSociety Project, the ERC has awarded a €150,000 Proof of Concept Grant that should help bring methods developed under this Advanced ERC Grant to commercial use. The project is being done in collaboration with WU marketing professor Thomas Reutterer.

This project will apply the demographic approach called Age–Period–Cohort (APC) analysis: Age effects are patterns that change with age and affect all individuals (such as grey hair). Cohort effects are patterns that change from one generation, or cohort, to another or are acquired at a young age and then persist throughout a lifetime (such as educational attainment).

The project will estimate such age and cohort effects for the past and project them into the future in combination with expert assessments about future period trends. This can lead to forecasts of the future market potential of specific goods and services. Since detecting future trends in customer preferences is a key element of commercial success, this approach has potential as a new market forecasting tool.

Wolfgang Lutz
Demographer
Proof of
Concept Grant
WU



The Changing Roles of Ageing, Cognition and Religion

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ERC GRANTS

Vegard Skirbekk
Economist

Starting Grant
IIASA

"I want to create a global database on religion, values and religious futures. And I want to change people's perceptions of old age and the belief that Western Countries are old and Eastern Countries are young, which in important respects is not true."

— Vegard Skirbekk

The Age and Cohort Change (ACC) Project, led by economist Vegard Skirbekk, encompasses two research themes: one focusing on how demographic behaviour affects attitudes and religious affiliations in changing populations, the other analysing how health and lifestyle variations influence the cognitive abilities and productivity of older workers. The broad-based project is funded by the European Research Council and the Pew Charitable Trust, with grants totalling about €1.7 million

Attitudes and Beliefs

In a 2010 paper in the *Journal for the Scientific Study of Religion*, Skirbekk noted that while sociologists of religion typically focus on the attractiveness of denominations in the religious marketplace, "the main source of religious recruits is the children of the communicants." Religious populations can be analysed demographically, he wrote, and it is important to do that analysis because religious beliefs are highly related to important demographic behaviour such as marriage, divorce, childbearing and migration.

The Attitudes and Beliefs section of the ACC Project focuses on how demographic behaviour affects the distribution of religion and the intensity of religious beliefs (religiosity) in different populations. (The study includes Christians, Muslims, Hindus, Buddhists, Jews and those who claim no religion or a folk religion.) These attributes of religion are important because they influence people's attitudes on a host of issues—individualisation, economic and cultural changes that lead to postponement of family formation, increases in cohabitation, extramarital childbearing and divorce—all of which are driving forces of social change. Indeed, these forces are credited by many experts with causing the fall of fertility to below replacement levels in Europe. Accordingly, Skirbekk's team is studying how fertility differs based on religious attitudes and how religious values are passed from older to younger generations.

After three years of work, Skirbekk said, he has nearly completed the initial study of attitudes and beliefs in Europe, and now, thanks to a new grant from the Pew Charitable Trust, is expanding that work to develop a database of religious affiliations that covers the entire world. This future work will concentrate on the links between religiosity and education. "Now religion is usually characterised just by a person's age and sex," he said. "But there is a strong, inverse relationship between education and religiosity and a strong link with fertility."

Work with IIASA's Marcin Stonawski and collaborators at PEW has been covered in media across the globe and attracted international attention, including coverage on CNN and in *The Economist* magazine. The results were first presented at a conference organised by the International Union for the Scientific Study of Populations in Marrakech, Morocco, in 2009, and then at other venues, including a Plenary Session of The Pontifical Academy of Social Sciences in the Vatican in 2012. Together with Stonawski and VID's Michaela Potančoková, as well as Brian Grim and Conrad Hackett from PEW, Skirbekk was awarded a best poster award for their study, "Religious demography of emerging economies," at the 2012 European Population Conference in Stockholm.

Human Capital, Skills and Work Performance

As populations across much of the developed world age, the very definition of “old age” is changing. A 60-year-old man in 1900 was typically nearing the end of his life and likely not in good health. A 60-year-old man today can easily have 15 to 20 healthy, productive years ahead of him. The same is true for women. Determining the cognitive ability of ageing populations—an ability that varies significantly from country to country—is critical to understanding the skills and capacities of older workers and what their role in the future workplace will be.

In a 2012 paper based on much of the ACC human capital analysis, Skirbekk and Centre colleagues Elke Loichinger and Daniela Weber proposed an indicator based on age variation in cognitive functioning that would add a new dimension to the current measurements of population ageing. They concluded that by shifting the focus of demographic studies from chronological age distributions to actual cognitive functioning at older ages, researchers can compare cognitive ageing across countries. “This shift in perspective is crucial,” they wrote, “because it changes focus from predictable changes in demographic age structure toward the importance of improving and maintaining cognitive abilities.”

Skirbekk said that due to the ACC research, “we can compare memory by age and sex across the majority of the world’s population, which means we can compare how well people function at given ages.”

The conventional OADR method (old-age dependency ratio) determines a country’s “age” ranking by comparing the number of 65+-year-olds with the number of 15–64-year-olds in a population. The new, alternative CADR measure (cognitively adjusted dependency ratio) is based on the functional level of individuals, where measured cognitive functioning determines who is dependent. For this measure, the denominator is composed of 15–49-year-olds and 50+-year-olds with good cognitive functioning, measured by those who are able to recall at least half the words in a memory test. The numerator consists of the number of 50+-year-olds who recall fewer than half the words in the test (see table).

DIFFERENT MEASURES FOR THE BURDEN OF AGEING

Country group	CADR	OADR*
United States of America	1 (0.10)	4 (0.19)
Northern Europe (Denmark, England, Ireland, Sweden)	2 (0.12)	5 (0.24)
India	3 (0.14)	1 (0.07)
Mexico	3 (0.14)	2 (0.09)
China	5 (0.15)	3 (0.12)
Continental Europe (Austria, Belgium, Czech Republic, France, Germany, Netherlands, Poland, Switzerland)	6 (0.18)	6 (0.25)
Southern Europe (Greece, Italy, Spain)	7 (0.32)	7 (0.27)

*OADR (old age dependency ratio) is the ratio of 65+-year-olds to 15–64-year-olds; CADR (cognitively adjusted dependency ratio) is the ratio of 50+-year-olds who recall less than half the words in a harmonised memory test to 15–49-year-olds and 50+-year-olds who recall at least half the words. *Source:* Population data for the year 2005 from UN (2009) and for England for the year 2005 from the Office for National Statistics (2010); survey data from HRS, SAGE and SHARE.

Policymakers from several European countries have asked Skirbekk and his team for advice on how to manage a workforce that contains increasing numbers of older workers who remain productive. Their concerns focus on how to maintain productivity and competitiveness in the workforce as it becomes greyer, how to determine an appropriate retirement age and how to calculate the future cost of health care.

For individual ageing workers who want to stay on the job, Skirbekk notes, “you may have to be willing to go down in position, or status, and money if you want to work to your mid-70s. You have to realise your deficiencies in several work tasks. Ageing workers have to accept that they may be less productive at older ages and go a bit down in social status and do work that is not as prestigious as what they were doing earlier.”



The Male-Female Health Mortality Paradox

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ERC GRANTS

Marc Luy
Demographer
Starting Grant
VID

"In monasteries we have a group of women and men who live in insular communities with very similar lifestyles and environments. The homogeneity of their lives and risk factors make them an ideal experimental group for studying the determinants of health and mortality, and finding the keys for longer and healthier lives."

— Marc Luy

For more than 15 years, Wittgenstein Centre demographer Marc Luy has worked in monasteries across Austria and Germany, gathering data from cloister archives, sharing meals with the nuns and monks, even sleeping in their guest rooms. His in-depth studies of the mortality of these insulated monastic populations have laid the foundation for his current five year, €1 million European Research Council project, The Male-Female Health Mortality Paradox (HEMOX).

As the title notes, the project is based on a seeming paradox, summed up by Finnish public health researcher Eero Lahelma as, "women are sicker, but men die quicker." A key goal of HEMOX is to demonstrate, using the "natural experiment" of insular monastic communities, that this counter-intuitive relationship between sex on the one side and health and mortality on the other is not as paradoxical as it seems.

The study design is based on two factors that Luy believes underlie the seeming contradiction. First, the overall reversal in sex morbidity and mortality differentials occurs because the conditions important in morbidity are not important in mortality, and vice versa. "I follow the idea that the types and severity of illnesses and disabilities are different among men and women," Luy said. "Men suffer illnesses that lead to earlier death. Women suffer more often from chronic diseases. So, one cause of the paradox is that men live shorter life spans with their diseases because they die of them."

The second factor is the relationship between ill health and longevity. Luy expects that longevity is related to the absolute number of years spent in ill health. Hence, women show higher morbidity rates not because they are female, but because they are the sex with the higher life expectancy.

Luy's team spent the first months of the second project year sending out detailed questionnaires to almost 1,700 nuns and monks from 16 different orders in Austria and Germany, including 165 religious communities and 132 brothers and sisters who live on their own. The questionnaires, which take as much as an hour to complete, ask not only about a monk or nun's health history, but about grades in school, childhood family life, work experience and a host of other items on health-related personal characteristics as well as why, at some point in their lives, they decided to go into a monastery.

Because monks and nuns of the older cohorts were screened for health issues before they were allowed to join a religious community, they provide Luy with a selected group of men and women who started at a similar level of health. "There still could be differences in their childhood, so we ask them to evaluate their health in childhood, how happy they were with their environment, their family and their school," he said. "We also ask about the education of their parents and the age of death of their fathers and mothers." The latter might provide indirect information about genetic influences on health and longevity.

Luy expects to receive about 1,100 completed questionnaires, evenly divided between nuns and monks, in the first round of data collection, with the goal of repeating the survey process in two years and, if possible, at two year intervals until most of the study respondents are no longer living.

Using demographic, epidemiologic and psychological methods, the study analyses the differences in health and mortality between nuns and women in the general society;

monks and men in the general society; and the differences between nuns and monks in comparison to the differences found between men and women in the general population. "So these are our first steps," Luy said. "We analyse each sex separately and then study the differences between the two [monastic and general] societies."

Data from the first round of questionnaires should provide cross-sectional insights into the health conditions of order members and how those conditions differ between the sexes and in comparison to the general population. The second round of questionnaires, planned for the months July to December, 2014, should provide insights into health transitions and their determinants and include information about first deaths among the first round participants. The results from the HEMOX surveys will be compared with German and Austrian health, ageing and life expectancy data for the general population.

Luy notes that when he talks with other scientists about his research, their first impression is often that there is a difference between women and men who enter monasteries and those who don't, in essence a "selection effect." He doesn't believe there is such an effect. "I think it [the monastic community] is like a random sample of society," he said. "For 15 years I've dealt with those communities. I've stayed there taking data from archives. I've slept in the monasteries, eaten meals there, and given presentations of my data. I've had a lot of contact and, it's just an observation, but I've seen the same characteristics and the same personalities as anywhere else. I don't expect there to be differences, but personal impression is not a good scientific background, so it is necessary to study this."

Therefore, a second focus of the project is keyed to identify how those who choose a monastic life are different from, or similar to, the rest of the population. "We want to know to what extent men and women who live in monasteries are representative of the total population," Luy said. "Or, are there in fact specific characteristics they have that we must be aware of and take into account to understand whether there are differences, or no differences, in health and mortality between them and the general population."





Fertility, Reproduction and Population Change in 21st Century Europe

14

ERC GRANTS

Tomáš Sobotka
Demographer
Starting Grant
VID

"The project examines fertility trends and their determinants in low-fertility societies. We analyse data through the education dimension, looking at how cohort fertility rates, family size and fertility intentions are structured by level of education."

— Tomáš Sobotka

Combining detailed databases with surveys and theoretical perspectives, the five-year Fertility, Reproduction and Population Change in 21st Century Europe Project (EURREP) is analysing key issues related to fertility and reproduction and their implications. The project began in February 2012, with a €1.3 million Starting Independent Researcher Grant awarded by the European Research Council to Wittgenstein Centre demographer Tomáš Sobotka.

EURREP is initially focusing on Europe, but will also examine other countries with low fertility rates, including the United States, Japan and Korea. The research might then analyse Brazil and other new arrivals to the low fertility club, Sobotka said.

The project consists of four interrelated themes. The first, Advancing Fertility Research in Contemporary Europe: Theories, Patterns and Reversals, is most extensive.

European fertility and reproductive "regimes" are being compared to those in other high-income regions, with Sobotka's team conducting critical examinations of several leading contemporary fertility theories to see which are the most relevant for explaining fertility trends and differences among countries, regions and social groups in Europe and other regions of the developed world. The work should help determine why the overall fertility rate in Europe, while low across the European Union, still varies significantly from country to country. Key to that determination, Sobotka said, is to better understand the relationship between education and fertility.

"Countries vary enormously in their education and fertility relationships," he said. "You have societies with almost no difference in the fertility rate among women with different education levels, such as the Nordic countries and Belgium. Then you have countries like Romania, which have reached very low fertility rates for a long time, but have extreme differences in the fertility rates between low and highly educated women. The US is also a country with a huge difference."

The researchers are also studying the data on men, where the relationship between education and fertility typically shows little correlation, but when one is found it is often the opposite of what it is for women. "We don't know as much about male fertility as we know about women, but it seems that in a number of countries, the higher the education of men, the more children they have," Sobotka said. "When you combine these different stories, it becomes very interesting as you try to explain the education and fertility rate differences between countries."

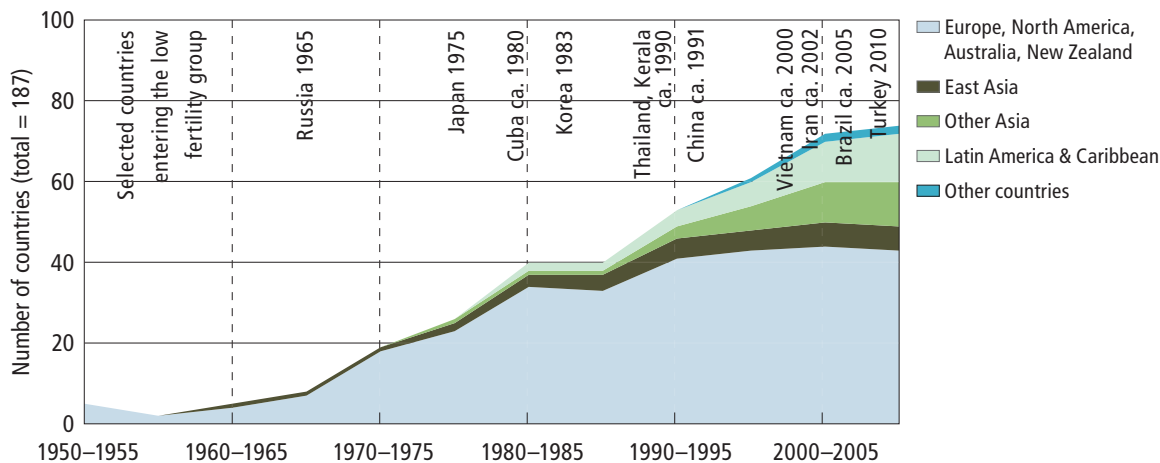
Researchers understand that fertility rates have been low throughout Europe since the early 1980s because of dramatic improvements in higher education, especially for women, and a large increase in female labour force participation. Those events, linked with the availability of the birth control pill starting in the 1960s, and a significant shift in values and attitudes about traditional life styles, made it easier and more acceptable for women not to marry early in life, or at all, and to be childless.

But the issue researchers are still working to understand, Sobotka said, is why there are significantly different fertility rates in different European regions. Factors as diverse as welfare regimes, public child care provision, gender equality, income, unemployment, unplanned births, or an acceptance of new family forms and the ease of divorce have been proposed to explain some of these contrasts in fertility rates. At present, the European fertility trends are negatively affected by the ongoing economic recession, which adds yet another layer to different "stories" of European fertility.

The second theme aims to provide a systematic analysis of fertility intentions and their relevance for understanding contemporary fertility. Given that most births are intended and childbearing is usually planned behaviour, understanding intentions is paramount for interpreting contemporary fertility. The key issue is whether and why a systematic disagreement between intended and realised fertility exists at the country level and whether it can be partly explained by institutional conditions such as welfare policies and labour markets.

The third theme links fertility with migration and population changes, with the goal of advancing methodology and proposing new indicators. "Traditionally the indicators of population replacement, or intergenerational replacement, are based on the idea that a population is closed to migration, so fertility and mortality are the only forces that matter," Sobotka said. "But this doesn't take into account migration, which has been a major determinant of population changes in many of the developed countries."

The fourth theme focuses on developing the Human Fertility Database (see next section, below) and a complementary data collection, the Human Fertility Collection (HFC), based on less standardised and vetted information from a variety of sources.



A GLOBAL SPREAD OF LOW FERTILITY The number of countries with low fertility rates (TFR below 2.1).
Source: Data based on the UN database, *World Population Prospects: The 2010 Revision*.

The Human Fertility Database (In Collaboration with the Max Planck Society)

To improve the availability of standardised, detailed and comparable fertility data that enables state of the art research on contemporary fertility, the Vienna Institute of Demography (VID) worked with the German Max Planck Institute for Demographic Research in 2009 to create the Human Fertility Database (HFD).

The HFD, now part of the EURREP Project, brings both historic and current data into one platform. The database provides researchers information on period and cohort fertility, including births, fertility rates and summary indicators, from 18 European countries and the United States. The initial data are comprised of officially registered birth counts by calendar year, mother's age (and/or cohort) and biological birth order. The database is kept up to date by VID and Max Planck researchers.

The unique value of the HFD comes from its high level of detail and the comparability of data across populations through the use of uniform methods. The data are presented on an open-access website, providing a user-friendly gateway for fertility based research.

The HFD will grow horizontally by providing data from a larger number of countries, particularly beyond Europe, and vertically by expanding the variety and detail of included data.

The Human Fertility Database can be accessed at: www.humanfertility.org



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ERC GRANTS

Sergei Scherbov
Demographer
Advanced Grant
IIASA

Redefining Age

“The whole notion of who is old and who is young is relative to life expectancy. Two hundred years ago a man at age 60 was considered very old and few men survived until that age. Today, in developed countries, more than 90 per cent of men survive until this age.”

— Sergei Scherbov

As life expectancies in most countries of the world have increased over recent decades, the traditional measures of ageing used by economists, policymakers and even demographers have not changed in step with this new reality. Wittgenstein Centre Demographer Sergei Scherbov and his long-time colleague Warren Sanderson, from the State University of New York at Stony Brook and IIASA, recognised several years ago that chronological age since birth might be an insufficient measure for setting retirement age, estimating future demands on health systems and just about everything in between.

Scherbov’s proposal to develop new approaches to the study of age and ageing that recognise the changing dimensions—both physical and mental—of how people grow old, has earned him a €2.25 million Advanced Grant from the European Research Council. Under the five-year grant, Scherbov and Centre colleagues will develop a suite of new measures and methods for the analysis of ageing that will include factors such as remaining life expectancy, health, disability, cognition and the ability to work.

A key to this new approach is the development of new indicators that complement the traditional measure, chronological age. The recently introduced concept of “prospective age” is an example of such an indicator. It adjusts traditional age using information on further life expectancy, which means looking not just at how long a person has lived, but taking into account how much longer a person is expected to live. “We think about people as simultaneously having two ages,” Scherbov said. Chronological age, or “retrospective age,” is a measure of how many years a person has already lived since birth. Under this definition everyone of the same age has lived the same number of years. In contrast, “prospective age” is concerned with the future. Everyone with the same prospective age has the same expected remaining years of life. Such new measures more accurately reflect the reality of population ageing in the 21st century.

Indeed, in research papers published in the journals *Nature* and *Science* proposing and discussing the idea of prospective age, Scherbov and Warren Sanderson used remaining life expectancies at different ages from life tables as well as indicators of age-specific health status to determine the changing threshold of being old.

Another aspect of the ageing project will redefine indicators used to determine dependency ratios in a society. The traditional approach classifies those 65 and older as old and dependent, and then compares their number with the number of people of working age, that is, between ages 20 and 64. That resulting ratio is widely used for assessing future ageing-related challenges from social security to health care needs.

But with 65 becoming less and less accurate as a hallmark of either old age or dependency on others, Scherbov and Sanderson have developed a more realistic adult disability dependency ratio (ADDR) as an example of how ageing can be reassessed based on health status.

“Many people over the age of 65 are not disabled and in need of the care of others,” Scherbov said. “On the contrary, many are capable of providing care to others. And some people below the age of 65 are disabled and in need of care.” He noted that when ageing is forecast based on the ratio of those who need care to those who can provide it, “the speed of ageing is reduced by four-fifths compared to the conventional old-age dependency ratio.”

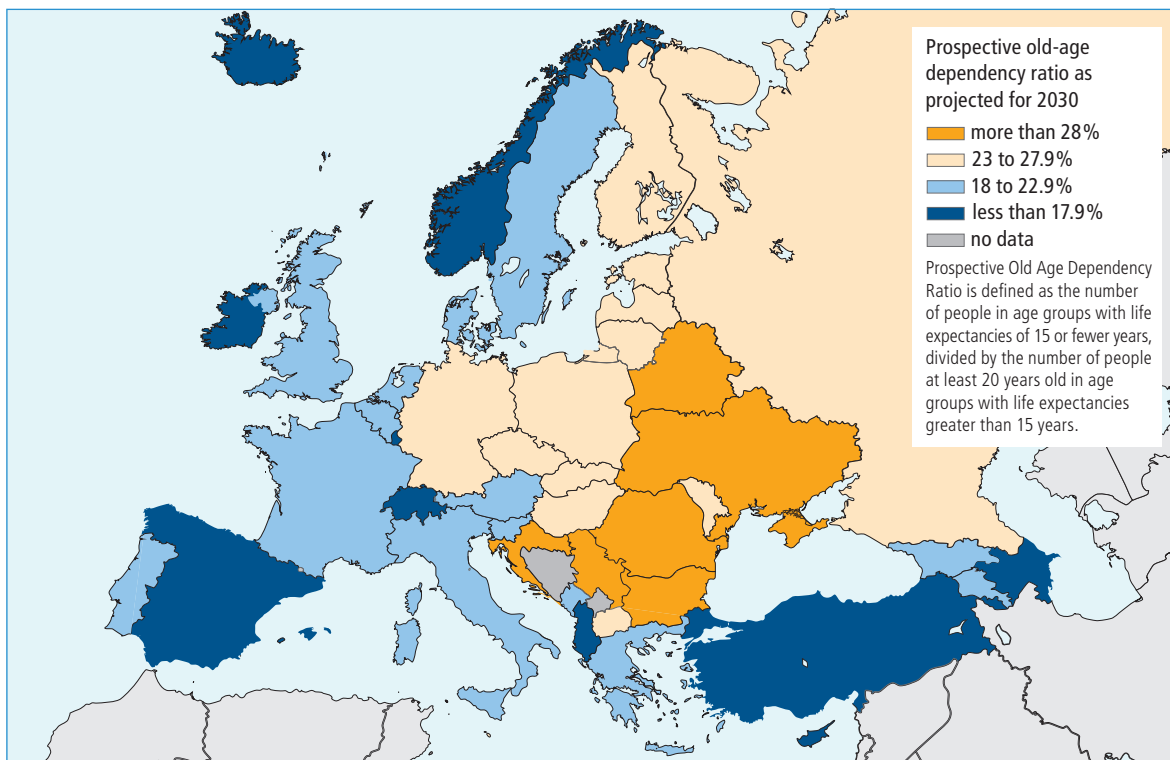
The potential impacts of new measures of age and ageing and more realistic dependency ratios on public policies are significant. It clearly is a very relevant topic for pension reform, as Scherbov states: "If you have a country where the age of retirement was set at 65 back in the 1960s, that may have been reasonable when we considered that someone who was 65 had about 15 years life expectancy left. Now a person has 15 years life expectancy left when they reach 73, which is eight more years. The 65-year-old then and the 73-year-old now have the same number of years ahead. So you can split the additional years between work and retirement and set the new retirement age at 68. But health conditions should be also taken into account."

The result, he said, might be used as a scientific justification for adjustments in the age of retirement.

The project is beginning with an analysis of important time varying, age-specific characteristics of people. The resulting new measures of ageing will enable a better understanding of different population characteristics within the EU, both now and into the future as the current populations grow older.

The researchers will then use their new measures to investigate the links to other important life course events and transitions. The project will focus initially on Europe, Scherbov said, but will also look at other developed and developing countries with good population data.

Centre Director Wolfgang Lutz said he expects the research will "make a major contribution to the global demographic discourse and prepare the way for socially acceptable policy strategies for adjusting to demographic change."



PROSPECTIVE OLD-AGE DEPENDENCY RATIO as projected for 2030.

Source: European Demographic Data Sheet 2012 (see page 24).

Nikola Sander
Population
Geographer
and
Guy Abel
Social Statistician
VID

Migration

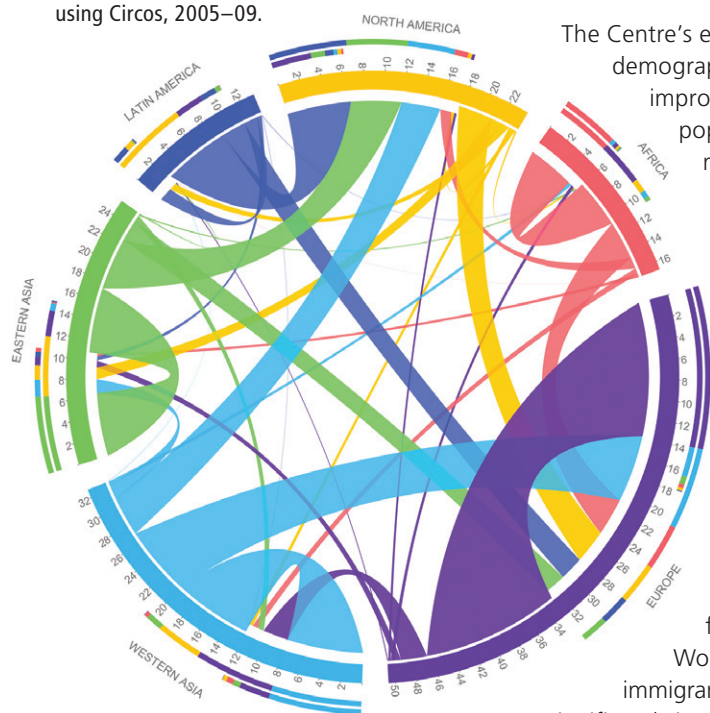
A critical component of demographic forecasting is understanding the complex factors involved in international migration, ranging from climate change and education to economic growth and population ageing. Although the importance of migration to demographic research is widely acknowledged, especially in the context of human capital formation, it has lagged behind other areas of population studies partly because of a lack of adequate data.

Migration research is gaining a higher profile, however, due to new Wittgenstein Centre projections based on estimates of migration flows between individual countries. Using harmonised data that cover a 50-year period, Centre researchers Nikola Sander and Guy Abel have created a model that for the first time shows the global flow of people moving over a five-year period between 195 countries.

Estimating global migration flows begins with sets of successive place-of-residence by place-of-birth tables. Using these sequential population stock tables starting with the 1960 round of national censuses, the researchers have been able to estimate migration flows over five-year periods. Modelling the age structure of these migration flows is based on migration schedules developed by demographer Andrei Rogers at IIASA's Population Program in the late 1970s.

MIGRATION VISUALISATION

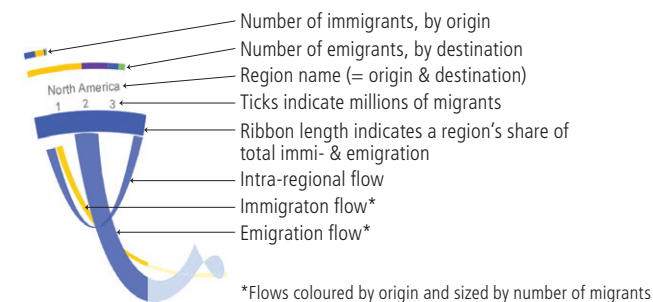
The flow of people within and between world regions, using Circos, 2005–09.



Sources:

- Abel GJ (2013). Estimating global migration flow tables using place of birth data. *Demographic Research* (forthcoming).
Krzywinski M et al. (2009). Circos: An information aesthetic for comparative genomics. *Genome Research* 19:1639–1645.

The Centre's emphasis on the importance of education by attainment level in demographic projections is reflected in the migration data, significantly improving past modelling that assumed the makeup of the migrant population was static or random. In many instances, Sander said, migrants are better educated than the general populations in both the origin and destination countries.



Education differentials in country-to-country migration flows are estimated by linking migration flow estimates with a World Bank/OECD database on educational attainment levels among immigrants. Estimating the current education composition of migrants significantly improves the accuracy of multistate projections.

The influences of education on migration are several and important. More highly educated migrants are more likely to move over longer distances to take advantage of higher incomes and better opportunities in destination countries. Considering the trend toward low population growth rates in many countries, international migration is also an increasingly important determinant of whether a country's human capital increases or decreases. And rising global inequality in wage levels and career prospects means that skilled migration is growing both in numbers and consequences.

These new migration flow data are included in the Intergovernmental Panel on Climate Change (IPCC) Shared Socioeconomic Pathways (SSPs) projections of future interactions between human socioeconomic development and climate change. As part of the SSP work, a set of "what-if?" migration scenarios was developed based on likely shifts in economic, demographic and social trends.

Education Policy and Planning

Understanding the effects of education on populations, societies, economies and even democracy, is a central theme of much of the Wittgenstein Centre's research, but the work of scientist Bilal Barakat is aimed at expanding the research to create a new field of educational demography. Beyond gathering data on educational attainment levels, Barakat and his colleagues are uniquely concerned with the inputs, pathways and processes that lead to schooling and education.

"Education is all about people and cohorts of children and is an intrinsically long-term process," Barakat said. "You have life course events that result from education, but at the formal level of educational research, there is very little focus on the demographic understanding of what drives education."

Through the application of demographic insights and techniques to the field of international and comparative educational research, the Centre's interdisciplinary group of education researchers aims to inject a long-term population and life-cycle perspective into education policy.

The researchers have contributed to the Centre's flagship world population projections project by formulating projections of future educational attainment. These projections are based on a combination of statistical modelling of past trends and qualitative expert assessments of such extrapolations. The work builds on the results of the large-scale expert survey for fertility, mortality and migration that is part of the projections book (see page 8).

One of the foundations of educational attainment projections is a careful analysis of historical patterns of educational expansion. In particular, based on a comprehensive review of existing historical time-series of educational expansion, the researchers are investigating consistent patterns of timing and sequencing of "education transitions," in analogy with "demographic transitions." The goal is to establish to what extent feedback mechanisms such as intergenerational transmission of human capital or declines in inequality due to increased opportunity may explain the education patterns.

Eventually, Barakat and his colleagues would like to examine in-depth the issues involved in intergenerational education dynamics, higher education economics from a life-cycle perspective and models of educational participation and inequity. But given the lack of even basic demographic considerations in most educational research, the Centre's early focus is applying basic demographic principles and techniques to understanding education statistics.

For example, Centre researchers have applied enrolment-rate age corrections for 6–12-year-olds in primary education. "It makes a difference if you have many more 6-year-olds than 12-year-olds," Barakat said. "If a system is deteriorating, the younger years will have higher enrolment than the older years, so you can have two systems with the exact same performance in terms of retaining students, but if the age profiles are different, then you must weight your analysis by the size of the cohorts, or else the apparent performance will be misleading."

From a demographic point of view, such analysis is routine and straightforward, but in educational statistics it hasn't been done.

Another challenge faced by Centre scientists is the lack of a tradition in educational research of producing projections or developing models. Beyond policy work conducted within international agencies on costing school systems and determining how many teachers will be needed over the next three to ten years, there is very little future scenario work.

Education isn't being projected in the same way demographers project such things as fertility, Barakat said. "Demographers are happy to tell you: we'll make assumptions about the fertility rate over the next 40 years, and here is a reasonable trajectory based on what we know. But with educationalists, it is much harder to get to that point because there is much less understanding of what projections are about and how they can be useful even in the face of uncertainty."

Samir KC
Demographer
IIASA

Producing the Human Core of the IPCC-SSPs

In the wake of the completion of the four Representative Concentration Pathways (RCPs) for the Intergovernmental Panel on Climate Change (IPCC), scientists at IIASA and elsewhere developed new projections, called Shared Socioeconomic Pathways (SSPs), to analyse the interactions between human socioeconomic development and climate change through the use of narrative storylines.

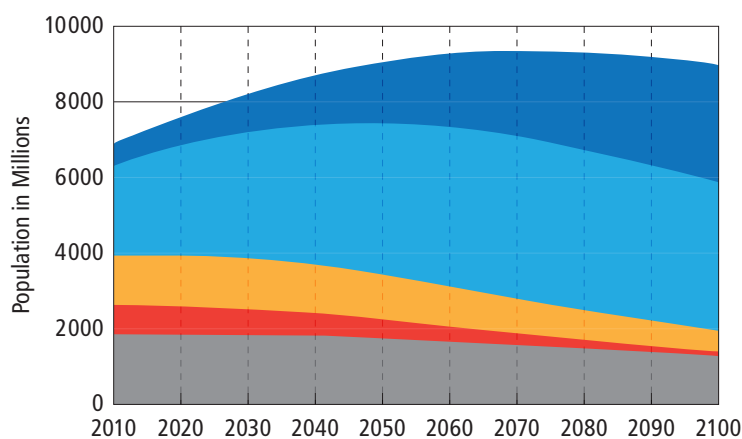
The SSPs define five possible paths that human societies could follow over the next century, and are part of a new research framework expected to improve interdisciplinary analysis and assessment of climate change, its impacts and the options societies have for mitigation and adaptation.

Critical to the new framework is the demographic model underlying many of the SSP projections: a model first developed by IIASA demographers Samir KC, Anne Goujon and Wolfgang Lutz in 2008. The model, enhanced significantly over the past four years, has become the central part of the SSPs that cover the human resource base for sustainable development. That base is then linked to economic, energy and environmental dimensions of the SSPs. The model produces detailed projections based on sex, age and educational attainment for more than 170 countries, and projections on sex and age, with an approximation of education levels, for another 24 countries.

What is unique about the model is the inclusion of the comprehensive human capital data by level of educational attainment. This results in a much more sophisticated model of social development than traditional population projections offer. The new model covers the human core of this new set of scenarios in a much richer and more useful way than the previous generation of scenarios, which only had total population size as the single demographic variable.

WORLD POPULATION TREND
by level of education under
SSP2, which represents
a middle-of-the-road
scenario.

Children 0–14
No education
Primary
Secondary
Tertiary



“The world needs to do better than just look at total population size and GDP,” said Wittgenstein Centre Director Wolfgang Lutz. Instead of basing a model and projection on just one population number, “you also must cover the gender dimension, differences between age groups and education as a key indicator of empowerment.”

The education data is critical because, by knowing the age and education breakdown

of a particular population, researchers and policymakers can see details about such things as future productivity and how one generation might replace another. “Gender is another overriding social concern,” Lutz said, “and the model, for the first time, makes explicit the gender dimension in IPCC-related modelling. We have education, migration and death rates, all by age and gender.”

The population data provided by Lutz, KC and others in the population program is being used by all of the researchers involved in the SSP project. “Since we are the only ones doing such projections by education, they are also the basis for everyone when it comes to the translation of these alternative trends into economic growth and other variables for the SSPs,” Lutz said.

KC continues to upgrade the model with country-based components involving such issues as HIV/AIDS status and disability distributions based on work by other Centre researchers.

Population Ageing and Labour Markets

21

RESEARCH TOPICS

Michael Kuhn
and
Alexia
Fürnkranz-Prskawetz
Economists
VID

Many countries around the globe face population ageing caused by decreasing fertility and increasing survival to older ages, a condition coming on more quickly in the developed countries as the baby boom generation ages. This phenomenon of longer lives and eventually fewer people implies a pronounced change in the age and educational composition of the workforce, as well as increasing pressures on both health care and social security systems.

Wittgenstein Centre researchers from several disciplines are addressing multiple issues related to population ageing, labour markets and the public policy measures that connect them. For example, the imperfect substitutability of workers at different ages and across different educational groups, together with an increasing demand for educated workers, are creating challenges for educational and labour market policies that Centre scientists are studying.

In approaching a topic as complex as the evolving structure of a population and the labour market, Centre scientists are asking such questions as:

- How do decreasing fertility rates influence the profile and rate of ageing of a population?
- What are the labour market consequences, both positive and negative, of an ageing population?
- What role does education play in defining the human capital, or skill levels, of a population and what does that mean for economic productivity?

To address these and other questions, Centre scientists are engaged in the following areas of research:

Longevity, Retirement, Education and Health

An increasing share of elderly, dependent people is relying for support on a declining and ageing workforce in most European countries. To sustain social welfare an adjustment of pension systems will be necessary. Demographers still lack in-depth understanding about how retirement decisions are connected to longevity, education and health at the individual level, within the institutional framework of existing social security systems. To find out, Centre researchers are formulating and analysing life-cycle models that allow for endogenous retirement decisions in parallel with endogenous decisions on health and educational investment. The resulting knowledge may improve understanding of whether recent and proposed pension reforms will induce people to adapt their retirement behaviour appropriately.

Optimal Dynamic Labour Demand and Human Capital Investment

To understand the demand for quantity and quality of labour it is important to understand how individual businesses will react in their hiring and firing strategies to the expected change in labour supply caused by demographic change. To understand this process, Centre scientists are extending labour demand models to allow for imperfect substitutability across the age and education structure of employees in the production process.

Productivity, Wages and Training in Ageing Societies

To preserve economic growth and hence the sustainability of welfare systems, productivity growth must be sustained. Because the age structure of the workforce has an important impact on economic productivity, the question arises as to whether an ageing workforce might hamper economic productivity and therefore increase the “demographic burden” (the support relationship between retired and working persons) even further. To disentangle these relationships between the age structure of the workforce and economic productivity, Centre researchers are employing matched employer–employee data for Austria to investigate how a higher share of older workers affects firm-level productivity, whether this changing productivity profile is reflected in wages and whether it can be shaped by training activities.

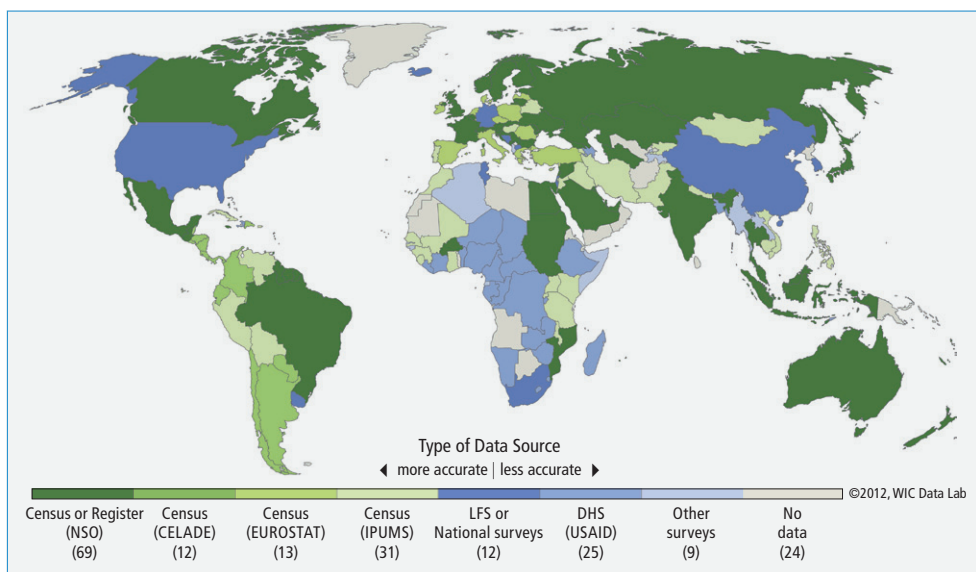
Anne Goujon
Demographer
VID/IASA

Human Capital Data Lab

Demography is driven by numbers. The Wittgenstein Centre Human Capital Data Lab provides these numbers by collecting, validating and harmonising statistical data for populations across the globe by sex, age and, most critically, levels of educational attainment. The education data, the hallmark of the Centre's work, allows researchers to go beyond traditional demographic analysis and quantify the human capital, or knowledge and skills, possessed by societies.

This education component is essential for developing projections for economic growth, labour market changes and even a population's ability to cope with the increasingly extreme events that are forecast to result from climate change. The data gathered and harmonised by the Data Lab support a wide range of current demographic projections and scenarios, including the Intergovernmental Panel on Climate Change (IPCC) Shared Socioeconomic Pathways (SSPs).

"We don't do projections," said Anne Goujon, who leads the Data Lab Project. "What we do is assemble the big puzzle by gathering and measuring education level data. There are many surveys and census data that include education information, but it's very hard to get just one measure that is consistent over time and across countries."



Goujon and Centre researchers Ramon Bauer and Michaela Potančoková have categorised the populations of more than 170 countries by age, sex and six levels of education. The education data have been obtained from national censuses, CELADE, UNESCO and an array of surveys that cover everything from health indicators to labour force statistics. The six levels of education attainment captured in the data are:

- no education,
- incomplete primary education,
- complete primary education,
- lower secondary complete,
- upper secondary complete,
- post secondary.

WIC DATA SOURCES: EDUCATIONAL ATTAINMENT

"There are information systems at the international level that have some data on most of the countries in the world," Goujon said. "So there exists some mapping of the education systems." But arranging the data so that the numbers are comparable from one system to the next, and thus useful for forecasting, is difficult. "There are different systems, and even the systems change over time," she said.

Despite these difficulties, the first stage of the work is finished and other Centre demographers are using the results to do projections based on assumptions about future patterns of migration, education, fertility levels and economic development.

"This work (harmonising education data) is completed, but we don't let this die," Goujon said. "We keep it updated with new data. The 2010 and 2011 census data are coming out now and we will put the information in the model."

The next stage for the Data Lab demographers is developing a historical reconstruction of global past levels of enrolment, literacy and education attainment for the 20th century. The "backcasting" project will apply the combined methods of multidimensional back-projections and validation to data from the *UN Demographic Yearbooks* and other partial reconstruction exercises.

4D Population Futures

Generating a sound scientific foundation for understanding societies' demographic and economic developments and projecting likely changes in the future is the key goal of the Centre's 4D Population Futures Project, which cross-classifies population by age, sex, education and labour force participation. The Austria Monitor, funded by the Federation of Austrian Industries and the Austrian Red Cross, analyses and projects Austria's population according to these four dimensions.

"The more you know about a population—more than just age and sex and the total number of people—then the more you can say about the future of productivity and economic growth, the environment, overall health and many other things," said researcher Elke Loichinger.

The Monitor model projects educational attainment up to 2050, making use of scenarios showing which education policies can best continue the 30-year trend of increasing educational attainment in Austria. Understanding educational trends relates directly to determining what is likely to happen in the economy.

Immigration influences the population structure of Austria, so the Monitor looks at the number of migrants coming into the country, and the consequences of migration flows and balances for the future composition of the country's population. Of concern is not only the number of migrants who move to Austria, but their education and skill level. Monitor projections analyse several issues related to migration and education, including what demographic shifts could occur if there were an increase in better educated migrants entering the Austrian workforce.

In addition to the four core dimensions of the 4D Population Futures approach, namely age, sex, education and labour force status, the Austria Monitor exploits the existence of health survey data for Austria. Education is closely linked to health, with research showing that higher education is generally associated with better health and greater longevity. By combining education-specific rates with other scenario data, the Monitor can estimate the number of people who will suffer from significant disabilities in the future.

The first stage of the Monitor has generated different scenarios in the areas of education, employment, migration and health for the whole of Austria. New work by Loichinger and other Centre researchers is looking specifically at Vienna, which has a different demographic structure than the rest of Austria. But this prototype four-dimensional population model could potentially be applied to any country or city in the world for which relevant data exist.

Geburtenbarometer

Geburtenbarometer Austria and Geburtenbarometer Vienna (launched in May 2010) are interconnected projects of the Vienna Institute of Demography, aiming to provide continuous monitoring of statistically most sophisticated period fertility rates in Austria and in Vienna. They have three main objectives: (1) Monitoring recent fertility trends in Austria and Vienna on a quarterly and monthly (for Austria only) basis; (2) Providing a set of parity-specific fertility indicators that are less affected by the ongoing change in fertility timing than the commonly used period total fertility rates; and (3) Providing detailed data on annual fertility developments.

Monthly and quarterly monitoring of fertility, based on records supplied by Statistics Austria, allows the evaluation of most recent fertility trends in conjunction with the relevant information on changes in family policies and various socioeconomic indicators.

Provided the availability of sufficiently detailed data, this method holds promise for many other countries.

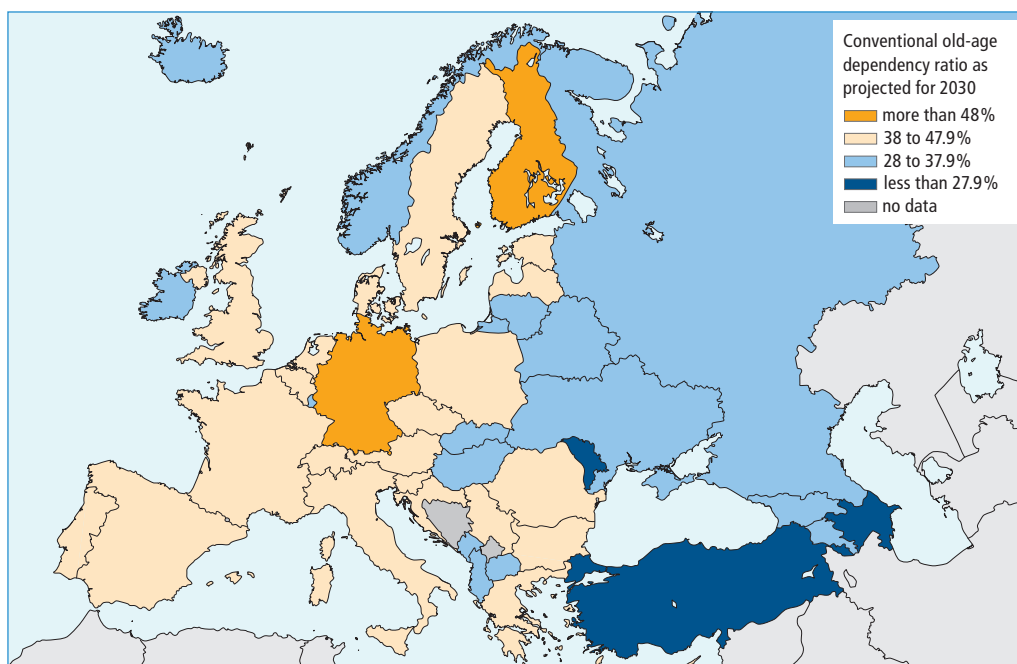
Demographic Data Sheets

Wittgenstein Centre demographers have produced wall charts presenting summary information about recent demographic trends, current statistics and projections in regular intervals since 2006. The 2012 Data Sheets presented here focus on new indicators of population ageing for Europe, and on the closing gender gap in educational attainment for Asia.

European Data Sheet 2012

The European Demographic Data Sheets present a rich and unique source of information for 49 countries of Europe with comparisons to the US and Japan. The Data Sheets—which provide the only consistent set of estimates of tempo-adjusted TFRs for most European countries—are updated every two years and serve a broad community of users who have an interest in knowing more about demographic trends in different parts of Europe. The reverse side of the Data Sheet provides in-depth analyses and rankings of countries by different indicators.

In addition to these regularly produced indicators, every Data Sheet highlights a special topic. In 2010 the focus was on population growth and the fact that the population size of the EU27 reached 500 million; in 2012 the focus was on new indicators of age and ageing. The conventional demographic indicator for measuring the financial burden the elderly place on a country's working population is the old-age dependency ratio (OADR)—the ratio of the number of people aged 65+ compared to the number of people aged 20–64. The definition of ageing is changing, however, with the elderly now living longer and leading significantly



RE-MEASURING AGEING IN EUROPE This European map shows the conventional old-age dependency ratio (OADR) as projected for 2030. The percentages reflect the number of people 65 and older as compared to the population of those 20 to 64. This projection indicates that Western Europe will face more ageing issues than Eastern Europe. The smaller map on page 25, based on the prospective old-age dependency ratio (POADR), shows an ageing profile that is diametrically opposed to the conventional map due to shorter life spans in Eastern Europe.

Asian Data Sheet 2012

The Asian Data Sheet is produced by the Wittgenstein Centre in collaboration with the Asian MetaCentre for Population and Sustainable Development Analysis, which is a collaboration between the Asia Research Institute (ARI) of the National University of Singapore and the College of Population Studies (CPS) of Chulalongkorn University in Bangkok.

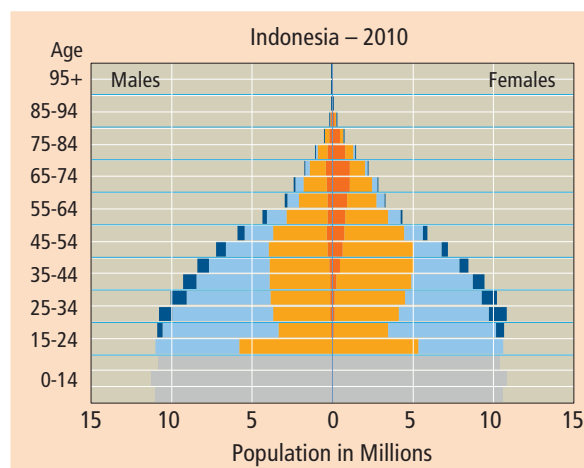
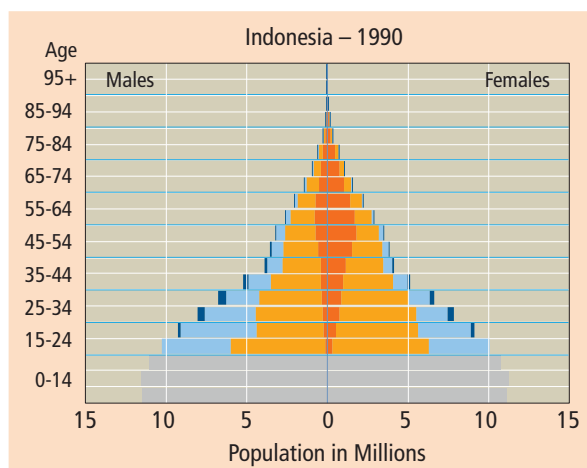
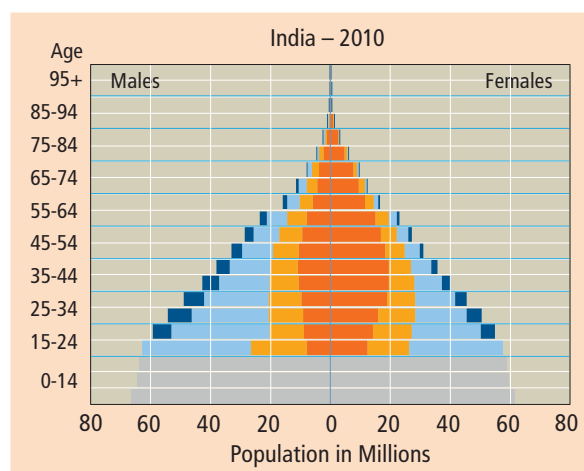
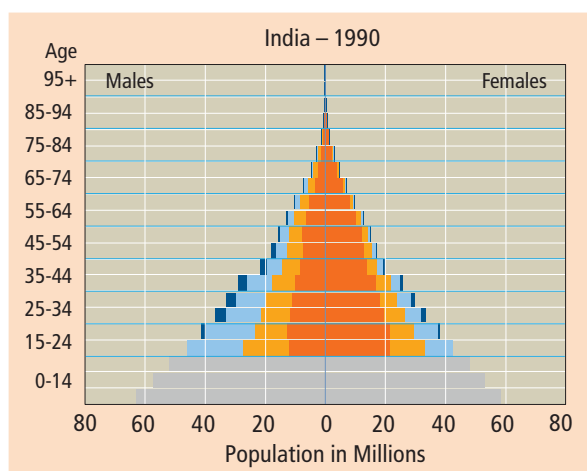
Asia is experiencing dramatic increases in the educational attainment of younger cohorts of men and women. For this reason, the Asian Data Sheet does not just focus on demographic indicators but systematically adds education as a third demographic dimension. This is shown to be an important aspect in understanding and forecasting the future of societies and their economic development.

The Data Sheet illustrates the massive increase in the education of young Asians and points at significant differences among countries. The projections show that virtually all of the Asian countries analysed can expect continuing significant increases in their human capital, which is a major component of the wealth of those nations. This is especially true for younger women who, according to the data, are likely to become more educated than men in the majority of Asian countries.

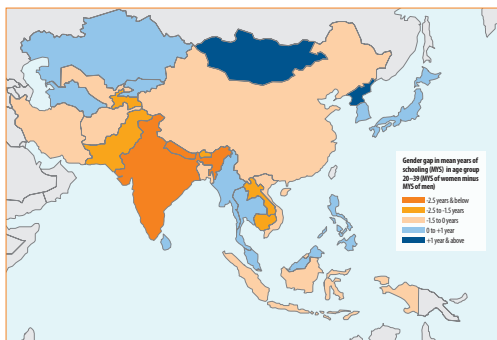
The complete Asian Data Sheet 2012 can be found at: www.populationasia.org

POPULATION BY AGE, SEX AND LEVEL OF EDUCATION

- Children 0–14
- No education
- Primary
- Secondary
- Tertiary



Asian Demographic and Human Capital Data Sheet 2012

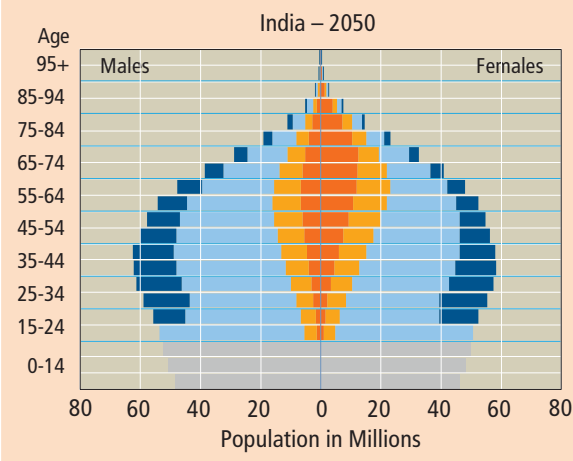


Gender gap in mean years of schooling (MYS) by age group 20-29 MYS of women minus MYS of men

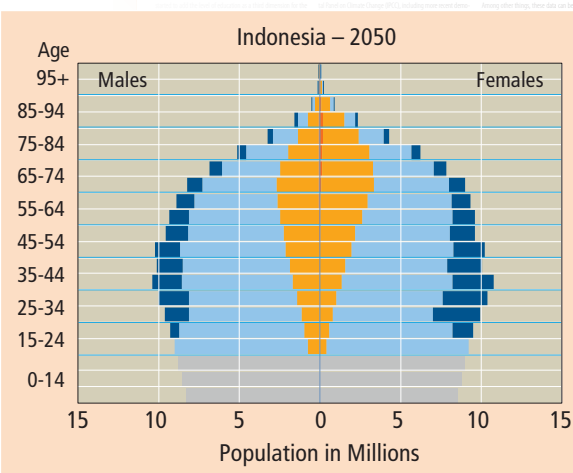
Closing the gender gap in education in Asia

Asian MetaCentre: www.populationasia.org

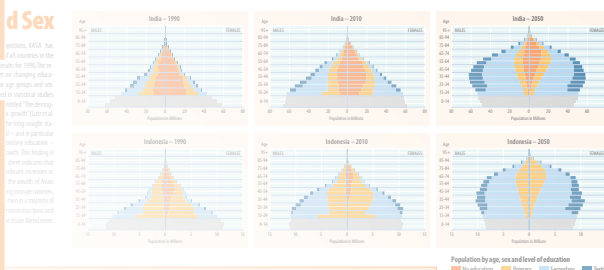
Table with 28 columns: Country/Region, Year, Population size, Average annual population change, Total fertility rate, etc. Rows include Eastern Asia, China, Japan, Korea, etc.



India - 2050. Population in Millions. Males, Females.



Indonesia - 2050. Population in Millions. Males, Females.



India - Education by age, sex and level of education. Population by age, sex and level of education.

These population pyramids for India and Indonesia show the significant increases in education among both males and females between 1990 and 2010, and forecast even more dramatic impacts by 2050.

Featured Publications

Wittgenstein Centre researchers regularly publish in leading scientific journals, including *Science*, *Nature*, *PNAS* (*Proceedings of the National Academy of Sciences of the United States of America*), *Philosophical Transactions of the Royal Society* and major peer-reviewed demographic journals. A selection of significant articles from Centre scientists are summarised over the next eight pages.



The Coming Acceleration of Global Population Ageing *Wolfgang Lutz, Warren Sanderson, Sergei Scherbov*

Conventional measures of ageing are based on chronological age and assume that a 60-year-old person in 1900 was just as old as a 60-year-old in 2000. But here the researchers measure ageing using procedures that take changes in longevity for the world and 13 major regions into account. To capture the important impact of increasing life expectancy on populations, and to reevaluate the definitions of what is age and what is old, the researchers introduce and quantify three new indicators of age that explicitly take changes in remaining life expectancy into account. Both traditional and new indicators of ageing show that over the coming decades, in virtually all parts of the world, the speed of population ageing will likely accelerate.

Nature 451(7179):716-719 (7 February 2008)

[DOI: [10.1038/nature06516](https://doi.org/10.1038/nature06516)]



Variation in Cognitive Functioning as a Refined Approach to Comparing Aging across Countries *Vegard Skirbekk, Elke Loichinger, Daniela Weber*

Comparing the burdens caused by ageing populations in different countries depends on having valid and comparable indicators, and researchers with the Wittgenstein Centre are proposing an indicator based not just on a population's chronological age, but its cognitive function. Using new data from standardised tests of seniors' cognitive ability for countries around the world, the indicator should help describe how well older workers in individual countries can handle new technology and procedures on the job. The data show that several countries with older populations have better cognitive performances by people aged 50+ than countries with chronologically younger populations. Those with higher cognitive function may have had better nutrition and schooling when young, been more physically and socially active and experienced less exposure to disease.

PNAS 109(3):770-774 (17 January 2012)

[DOI: [10.1073/pnas.1112173109](https://doi.org/10.1073/pnas.1112173109)]



Global Human Capital: Integrating Education and Population *Wolfgang Lutz, Samir KC*

Future trends in global population growth will depend heavily on improvements in both the quality and quantity of education, particularly for young women. By using a novel multistate population model that includes education levels along with age and sex, the researchers produce scenarios that link education levels with fertility rates. The highest and lowest education scenarios result in world population sizes of 8.9 and 10 billion by 2050, respectively. Education plays an important role in almost every aspect of progress in human development, including health, economic growth, democracy and population. Projections that do not explicitly include education are inadequate for many purposes.

Science 333(6042):587-592 (29 July 2011)

[DOI: [10.1126/science.1206964](https://doi.org/10.1126/science.1206964)]



Remeasuring Aging *Warren C. Sanderson, Sergei Scherbov*

As the number of elderly increases and number of youth declines across the globe, the economic and social challenges of population ageing are becoming more immediate. The conventional method of measuring ageing is based on fixed chronological ages, but as life expectancies increase and people remain healthier longer, measures based solely on chronology can be misleading. The authors published ageing forecasts for all countries that account for changes in longevity. This paper includes a new measure—adult disability dependency ratio (ADDR)—that adjusts forecasts to account not only for longer life spans, but for healthier ones that make fewer demands on health and social service systems.

Science 329(5997):1287-1288 (10 September 2010)

[DOI: [10.1126/science.1193647](https://doi.org/10.1126/science.1193647)]



The Demography of Educational Attainment and Economic Growth *Wolfgang Lutz, Jesús Crespo Cuaresma, Warren Sanderson*

Using the demographic method of multistate back projection, researchers at IIASA and VID completed a full reconstruction of educational attainment distributions by age and sex for 120 countries for the years 1970–2000. These new data allow the authors to analyse the education levels of different age groups as a potential determinant of economic growth, and the results show consistently positive, statistically significant education effects on economic growth. This finding differs from earlier studies that did not find such consistent results because they did not differentiate education by age cohorts and hence could not adequately capture the effect of rapid educational expansion among younger adults.

Science 319(5866):1047-1048 (22 February 2008)

[DOI: [10.1126/science.1151753](https://doi.org/10.1126/science.1151753)]



A Demographic Explanation for the Recent Rise in European Fertility

John Bongaarts, Tomáš Sobotka

Between 1998 and 2008, fertility rose in the large majority of European countries—an unexpected reversal from the historically unprecedented low fertility levels reached by most countries in the 1990s and early 2000s. The turnaround has been especially rapid in populations with the lowest period fertility and was due in part to the end of a downward distortion (the “tempo effect”) as the increase in mean age at childbirth slowed (see figure, page 25).

Population and Development Review 38(1):83-120 (March 2012)
[DOI: 10.1111/j.1728-4457.2012.00473.x]

The Uncertain Timing of Reaching 8 Billion, Peak World Population, and Other Demographic Milestones

Sergei Scherbov, Wolfgang Lutz, Warren Sanderson

Trends in populations throughout the world are often characterised by the dates at which they reach certain demographic milestones. But due to uncertainties about current demographic conditions in regions with unreliable statistical information, as well as the inherent uncertainty about future rates of fertility, mortality and migration, the timing of such milestones is often not clear, even when they are near at hand. Probabilistic forecasts offer a better approach because they incorporate all of the uncertainties and are more informative than conventional probability-free projections. Probabilistic forecasts provide quantitative uncertainty distributions for important demographic variables.

Population and Development Review 37(3):571-578 (September 2011)
[DOI: 10.1111/j.1728-4457.2011.00435.x]

Economic Recession and Fertility in the Developed World

Tomáš Sobotka, Vegard Skirbekk, Dimiter Philipov

Research on past economic recessions shows they can affect the dynamics of family formation, fertility, divorce, mortality and migration. This review discusses research findings on how recessions affect fertility as well as family formation and dissolution, insofar as they influence fertility trends. It also provides simple empirical illustrations of the association between economic downturns and period fertility in developed countries with low fertility.

Population and Development Review 37(2):267-306 (June 2011)
[DOI: 10.1111/j.1728-4457.2011.00411.x]

Demography, Education, and Democracy: Global Trends and the Case of Iran *Wolfgang Lutz, Jesús Crespo Cuaresma, Mohammad Jalal Abbasi-Shavazi*

Together with a remarkably rapid increase in education, the Islamic Republic of Iran has recently experienced the most rapid fertility decline in recorded human history. Thus, it is a prime candidate for applying the general considerations about the relationships between education, age-structural changes and democracy. This paper applies the empirically estimated relationships between human capital and democracy—as assessed for time series of 120 countries—to Iran, a country at the centre of international interest and disputes about its likely political future.

Population and Development Review 36(2):253-281 (June 2010)
[DOI: 10.1111/j.1728-4457.2010.00329.x]

The Demography of Future Global Population Aging: Indicators, Uncertainty, and Educational Composition *Wolfgang Lutz*

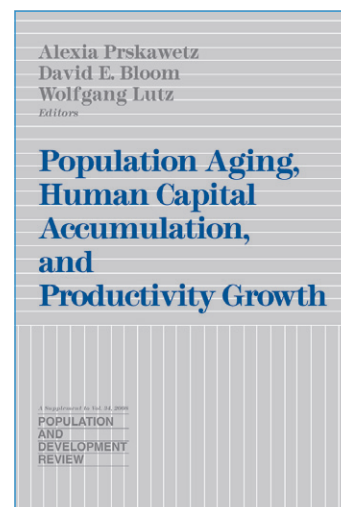
The paper on demographic dynamics of population ageing addresses innovative ways of measuring age, of modelling the uncertainty of future population ageing and of capturing the changing composition of the elderly population with respect to the level of educational attainment. The analysis is based on applications that provide a better understanding of the implications of global population ageing.

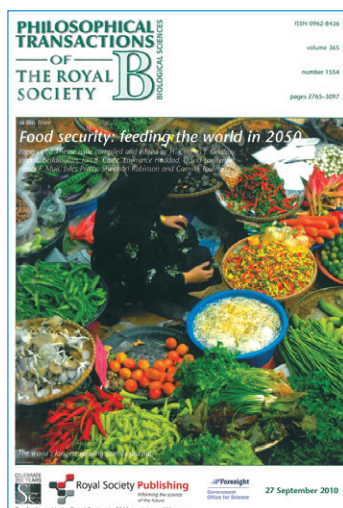
Population and Development Review 35(2):357-365 (June 2009)
[DOI: 10.1111/j.1728-4457.2009.00282.x]

Age and Productivity Potential: A New Approach Based on Ability Levels and Industry-Wide Task Demand *Vegard Skirbekk*

The article proposes a framework to estimate the relation between age and productivity potential, which is defined as a work performance measurement based on cognitive and non-cognitive skills and the importance the labour market places on these skills. The framework is intended to show that the age-productivity curve is not static and can vary with changing labour market requirements.

Population and Development Review 34(Suppl.):191-207 (2008)
[Available at: popcouncil.org/publications/books/2008_PDRSupPopAging.asp]





Dimensions of Global Population Projections: What Do We Know about Future Population Trends and Structures? Wolfgang Lutz, Samir KC

The total size of the world population is likely to increase from its current 7 billion to 8–10 billion by 2050. The uncertainty is due to unknown future fertility and mortality trends in different parts of the world. The young age of the current population and high fertility in Africa and Western Asia make an increase of at least one billion almost certain. And virtually all of the increase will happen in the developing world. The paper provides a detailed discussion of different dimensions of population projections.

Philosophical Transactions of the Royal Society B: Biological Sciences 365(1554):2779-2791 (27 September 2010)
[DOI: 10.1098/rstb.2010.0133]



Sola schola et sanitate: Human Capital as the Root Cause and Priority for International Development? Wolfgang Lutz

This paper summarises new scientific evidence supporting the hypothesis that, among the many factors contributing to international development, the combination of education and health stands out as a root cause on which other dimensions of development depend. Much of the analysis is based on new reconstructions and projections of populations by age, sex and four levels of educational attainment for more than 120 countries.

Philosophical Transactions of the Royal Society B: Biological Sciences 364(1532):3031-3047 (27 October 2009)
[DOI: 10.1098/rstb.2009.0156]

American Political Affiliation, 2003–43: A Cohort Component Projection Eric Kaufmann, Anne Goujon, Vegard Skirbekk

Differing fertility rates could play a role in deciding America's long-term political future. In the first study of its kind, IIASA researchers applied demographic projection techniques to political party preference in America. Findings suggest the effects of migration, fertility and age structure on the make-up of electorates have been greatly neglected. Based on US survey and census data, researchers projected possible changes in party allegiance between America's Republican and Democratic parties to 2043. Projections suggest that the Democrats will gain two to three per cent more support than the Republicans by 2043, mainly through immigration. But the higher fertility of Republicans may eventually offset that advantage.

Population Studies 66(1):53-67 (March 2012)
[DOI: 10.1080/00324728.2011.628047]

On the Reproductive Value and the Spectrum of a Population Projection Matrix with Implications for Dynamic Population Models Dalkhat M. Ediev

The paper's analytical results provide new tools for studying the stability of population change and show the limitations of some proposed population models.

Theoretical Population Biology 78(2):67-70 (September 2010)
[DOI: 10.1016/j.tpb.2010.06.006]

Estimating Mortality Differences in Developed Countries from Survey Information on Maternal and Paternal Orphanhood *Marc Luy*

Although the political and societal importance of understanding mortality in a population are clear, many countries—both developed and developing—cannot estimate the extent and trends of mortality differentials because they lack sufficiently detailed statistical data. To improve the availability of such information where no official data are available, the author modifies and extends the so-called “orphanhood method” for indirect estimation of adult mortality. The approach permits the application of indirect estimation to populations of developed countries.

Demography 49(2):607-627 (May 2012)

[DOI: 10.1007/s13524-012-0101-4]

Transition to Parenthood: The Role of Social Interaction and Endogenous Networks *Belinda Aparicio Diaz, Thomas Fent, Alexia Prskawetz, Laura Bernardi*

Empirical studies indicate that the transition to parenthood is influenced by an individual's peer group, and this paper presents an agent-based model that focuses on the role of social interaction in the formation of a social network. Calibrating the analysis to Austrian data, the model captures the observed changes in the timing and quantum of fertility over the past three decades. Numerical simulations that account for social interactions can explain the shift of first-birth probability in Austria from 1984 to 2004, and can forecast age-specific fertility rates up to 2016.

Demography 48(2):559-579 (May 2011)

[DOI: 10.1007/s13524-011-0023-6]

Articles in  **DEMOGRAPHIC RESEARCH**
A peer-reviewed, open-access journal of population sciences

The Reproductive Value as Part of the Shadow Price of Population
Gustav Feichtinger, Michael Kuhn, Alexia Prskawetz, Stefan Wrzaczek
24(28):709-718 (10 May 2011) [DOI: 10.4054/DemRes.2011.24.28]

**Significance of Life Table Estimates for Small Populations:
Simulation-Based Study of Estimation Errors**
Sergei Scherbov, Dalkhat Ediev
24(22):527-550 (31 March 2011) [DOI: 10.4054/DemRes.2011.24.22]

**Projection of Populations by Level of Educational Attainment,
Age, and Sex for 120 Countries for 2005-2050**
*Samir KC, Bilal Barakat, Anne Goujon, Vegard Skirbekk,
Warren C. Sanderson, Wolfgang Lutz*
22(15):383-472 (16 March 2010) [DOI: 10.4054/DemRes.2010.22.15]

**Overview Chapter 6: The Diverse Faces of the
Second Demographic Transition in Europe**
Tomáš Sobotka
19(8):171-224 (01 July 2008) [DOI: 10.4054/DemRes.2008.19.8]

**Overview Chapter 4: Changing Family and Partnership Behaviour:
Common Trends and Persistent Diversity across Europe**
Tomáš Sobotka, Laurent Toulemon
19(6):85-138 (01 July 2008) [DOI: 10.4054/DemRes.2008.19.6]

Demographic Research is a free, open access, expedited,
peer-reviewed journal of the population sciences published
by the Max Planck Institute for Demographic Research.

Vienna Yearbook of Population Research

The *Vienna Yearbook of Population Research* features peer-reviewed research articles that examine various aspects of population trends as well as theoretical and methodological contributions related to population studies. The Yearbook aims to contribute substantial work to the international scientific community.

Demographic data and trends are included in the Yearbook, as are debates featuring invited contributions on topics related to the ongoing scientific discussions in population research.

The Yearbook is edited by Wittgenstein Centre Director Wolfgang Lutz. The current managing editor is Bilal Barakat; the previous managing editor was Tomáš Sobotka.

The Yearbook, an open access publication produced annually since 2003 by the Vienna Institute of Demography of the Austrian Academy of Sciences, is available at: www.oeaw.ac.at/vid/yearbook

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PUBLICATIONS

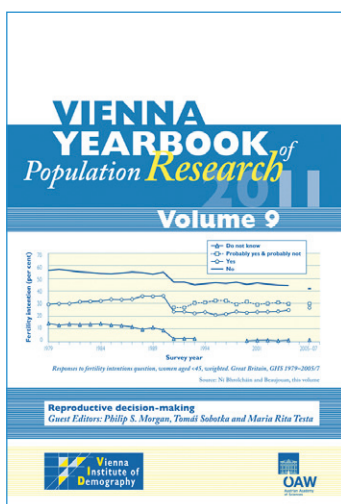


Vienna Yearbook of Population Research 2012

Guest Editors: K.S. James, Vegard Skirbekk and Jan Van Bavel

The 2012 issue presents a series of studies from a conference held in Vienna, Austria, in November, 2011, entitled “Examining the global fertility transition in the light of educational change.” The articles focus on changes in basic and more advanced school attainment and the implications for the timing and outcome of fertility. Several key channels through which education growth affects fertility are investigated, ranging from its effects on female financial autonomy to its effects for marriage markets characterised by high levels of educational homogamy. The articles address a wide range of fertility transitions from the early stages of fertility limitation in poorer countries to fertility differentials in developed countries. The conference was sponsored by the Vienna Institute of Demography of the Austrian Academy of Sciences.

Volume 10: Special Issue on “Education and the Global Fertility Transition”
[DOI: 10.1553/populationyearbook2012]



Vienna Yearbook of Population Research 2011

Guest Editors: S. Philip Morgan, Tomáš Sobotka and Maria Rita Testa

The 2011 issue features contributions presented at a December, 2010, conference in Vienna, Austria, entitled “From intentions to behaviour: Reproductive decision-making in a macro-micro perspective.” The conference, sponsored by the Vienna Institute of Demography of the Austrian Academy of Sciences, included a presentation of the findings of the multidisciplinary research project REPRO (Reproductive decision-making in a macro–micro approach) on the antecedents and outcomes of fertility intentions. The Theory of Planned Behaviour (TPB) and its usefulness in understanding reproductive decisions has a prominent role in this volume of the Yearbook. Many contributions make explicit reference to the TPB and the debate section is developed and organised around the appropriateness and utility of this theoretical framework for the study of reproductive decision-making.

Volume 9: Special Issue on “Reproductive Decision-Making”
[DOI: 10.1553/populationyearbook2011]



Vienna Yearbook of Population Research 2010

Guest Editors: *Bilal Barakat and Hans-Peter Blossfeld*

The interrelations between demography and education take many forms, a fact that is reflected in the diversity of the contributions to this special issue. The theme is based on the assumption that good simplifications can only be achieved after first having gone through a stage of “complexification.” That may seem daunting, but it encourages demographers and educational researchers to take the demography of education into account in their future work. This issue features contributions from a conference on “Education and demography” held in Vienna, Austria, on 30 November–1 December 2009. The conference was sponsored by the Vienna Institute of Demography of the Austrian Academy of Sciences.

Volume 8: Special Issue on “Education and Demography”
[DOI: 10.1553/populationyearbook2010]

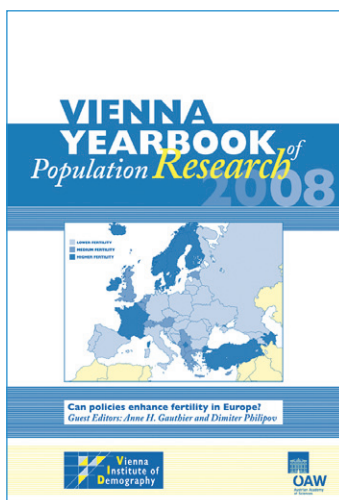


Vienna Yearbook of Population Research 2009

Guest Editors: *David Coleman and Dalkhat Ediev*

This Yearbook is devoted to the effects of migration on demographic change and population composition in Europe. The presented papers offer new insights and data on a variety of processes and effects, such as the impact of the 2008/2009 recession on flows; how the fertility of immigrants responds in a new environment; the effects of migration on economy, workforce and population ageing; and how immigration is expanding regional disparities. The issue features contributions from a conference on the “Effects of migration on population structures in Europe,” held in Vienna, Austria, in December 2008. The conference was sponsored by the Vienna Institute of Demography of the Austrian Academy of Sciences.

Volume 7: Special Issue on “Impact of Migration on Demographic Change and Composition in Europe”
[DOI: 10.1553/populationyearbook2009]



Vienna Yearbook of Population Research 2008

Guest Editors: *Anne H. Gauthier and Dimiter Philipov*

The set of papers included in this volume shed further light on the question of whether or not policies can enhance fertility. By reflecting on the experience of some countries, by examining the role of policies in relation to other fertility determinants and by analysing various indicators of fertility, the Yearbook contributes to this highly relevant and politically charged subject. This issue features contributions from a conference held in Vienna, Austria, in December, 2007. The conference was sponsored by the Vienna Institute of Demography of the Austrian Academy of Sciences.

Volume 6: Special Issue on “Can Policies Enhance Fertility in Europe?”
[DOI: 10.1553/populationyearbook2008]

Opening Symposium

The inaugural Wittgenstein Centre Symposium, involving several hundred scientists, policy advisors and academics from the developed and the developing world, was held in the National Assembly Hall of the Austrian Parliament on 29 September 2011. The topic was “Demography, Education and Democracy”

with a focus on empowering the “Demos” through education. In her opening speech, Barbara Prammer, President of the Austrian Parliament, stressed the importance of broad-based education for a functioning democracy.

Wolfgang Lutz told the gathering that priority should be given to empowering the “Global Demos” through universal secondary education: “There is strong rationale for refocusing international development policies away from mere financial transfers and investments in large infrastructure projects toward investments into people, into their health and basic education, which will then allow them to take the development of their countries into their own hands.”



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The Laxenburg Declaration

After the Opening Symposium, the Wittgenstein Centre, with support from the United Nations Population Fund (UNFPA), hosted a high level international scientific panel that included many of the members of the Centre’s International Scientific Advisory Board (see page 39). The purpose of the meeting was to produce an authoritative science policy statement as input to the Rio+20 Conference. Part of this statement—which has come to be known as *The Laxenburg Declaration*—was published as a Letter in *Science* (Volume 335, 24 February 2012):

Demography’s Role in Sustainable Development

In preparing for the RIO+20 Earth Summit, the world community must acknowledge that population trends interact strongly with economic development and environmental change at local and global levels. The International Institute for Applied Systems Analysis (IIASA) recently convened leading experts to consider how demographic factors promote or impede sustainable development. The panel concluded that human beings—their numbers, distribution, and characteristics—are at the center of concern for sustainable development. The evidence is clear that demographic differences fundamentally affect people’s contribution to environmental burdens, their ability to participate in sustainable development, and their adaptability to a changing environment. The developmental challenges are by far the most significant where population growth and poverty are the highest, education is the lowest, and vulnerabilities to environmental change are the greatest. Within families, women and children are most vulnerable.

As members of this panel, we put forward five action implications: (i) Recognize that the numbers, characteristics, and behaviors of people are at the heart of sustainable development challenges and of their solutions. (ii) Identify subpopulations that contribute most to environmental degradation and those that are most vulnerable to its consequences. In poor countries especially, these subpopulations are readily identifiable according to age, gender, level of education, place of residence, and standard of living. (iii) Devise sustainable development policies to treat these subpopulations differently and appropriately, according to their demographic and behavioral characteristics. (iv) Facilitate the inevitable trend of increasing urbanization in ways that ensure that environmental hazards and vulnerabilities are under control. (v) Invest in human capital—people’s education and health, including reproductive health—to slow population growth, accelerate the transition to green technologies, and improve people’s adaptive capacity to environmental change.

Science on the Danube

Centre scientists have created an interactive exhibit that invites students to step inside a demographer's computer and explore how current human behaviour can impact future generations. The exhibit was one of several that travelled in 2012 on board the MS Wissenschaft, an old cargo ship converted into a floating science centre. Visitors to the population exhibit could explore questions based on the Shared Socioeconomic Pathways (SSPs) developed for the Intergovernmental Panel on Climate Change (IPCC). How many people will live on future Earths? What will be the gender and age of different populations? Is there a relationship between their education level, their health and their ability to cope with climate change? The exhibit was created in partnership with the Austrian Science Fund (FWF) and may sail again on the MS Wissenschaft in 2013 and beyond.



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As of January 2013

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Sir Partha Dasgupta
Chair, ISAB

The Wittgenstein Centre International Scientific Advisory Board (ISAB)

“The Wittgenstein Centre has a very bright future. It is supported by a great staff and is engaged in one of the most important social programmes of our time.”

— Sir Partha Dasgupta

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