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*Background and Summary of the Symposium on
“Population Ageing and Economic Productivity”,
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The symposium comprised various papers ranging from simulation studies of population ageing and economic productivity at the global and country level to empirical studies at the macro, firm and individual level.

The lectures by David Bloom and Axel Börsch-Supan dealt with global demographic change, its dimension and economic significance. **David Bloom** discussed the beneficial economic consequences of a change from high mortality and fertility to low mortality and fertility that work through increased incentives to invest in education and to save for retirement. He also stressed that the potential benefits associated with the demographic transition are dependent on the institutions and policies that prevail. **Axel Börsch-Supan** stressed the impact of global ageing on labour, product and capital markets. While ageing is global, the speed and extent of ageing varies across countries and these differences initiate trade and factor movements.

In line with the argument by Axel Börsch-Supan, **Ross Guest** presented a simulation model of population ageing in a two-good, open economy framework (as opposed to a one-good, closed economy framework often found in the literature). In particular, the effect of population ageing on aggregate labour productivity is studied that arises from shifts in demand between sectors that have different capital intensity. The authors suggest that population ageing is likely to lower the demand for capital goods relative to consumer goods and test the implications for long-run labour productivity. They conclude, however, that the sectoral shifts in demand are unlikely to have serious implications for government policy or economic welfare.

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The symposium was held within the framework of the Macro-Demographic Working Group which comprises the following four institutes: The *Institute for Future Studies* (Stockholm), The *East-West Centre* (Honolulu), the *Vienna Institute of Demography* (Vienna) and the *Harvard Centre for Population and Development Studies* (Cambridge).

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To disentangle the relation between changes in population structure and the macroeconomy, **Andrew Mason** focused his talk on age profiles of consumption and production. He challenged our knowledge of these age profiles and stressed the importance to distinguish between compositional and behavioural effects. The former measure the change in overall consumption and production that results from keeping age profiles constant but accounting for shifts in the population structure. The behavioural effect captures the change in the age profile itself when the population changes. As indicated in his talk, measuring age-structured profiles of consumption and production is a challenging task in itself and is essential if we aim to judge the broader influence of population ageing on economic productivity.

The subsequent set of papers tried to empirically test for the correlation between age structure and economic productivity. Based on cross-country regressions **James Feyrer** presented empirical evidence that changes in the age structure of the workforce are significantly correlated with changes in aggregate productivity. He concluded that almost one quarter of the persistent productivity gap between OECD and low-income nations may be related to their different demographic structures. The fact that those results are much larger as compared to microeconomic estimates of age-productivity profiles suggests that there are significant externalities to the age distribution.

Thomas Lindh and **Bo Malmberg** studied the productivity consequences of workforce ageing at the meso-level, i.e., the plant level, as compared to the macro level discussed by Feyrer. They used a panel of employer-employee matched data from Sweden covering the period 1985-1996 and focusing on the manufacturing and mining industry. Their results indicate that when plant level effects are controlled for, high shares of older adults are associated with higher productivity whereas high shares of young adults have a negative effect on productivity. Lindh and Malmberg argue in their conclusions that those findings may have a strong influence on current practice of early retirement for older people since these practices may involve a risk of depressing productivity.

The retirement decision of the elderly has been discussed in the paper by **Robert Clark**. In particular, he chose Japan as the country of his investigation. In contrast to the European pattern of declining labour force participation rates of older people, the labour force participation of the elderly in Japan (the most rapidly ageing population) has been and still remains high. The empirical evidence suggests that eliminating the employment restrictions which confront older workers and modifying the social security benefit system will raise the employment rates among the elderly.

The ageing societies of Europe together with the fact that ever more people cease work before they reach retirement age was discussed by **Ronald McQuaid**. He considered the effects of demographic change on Scotland's labour force.

Among policy options available to increase labour force participation among older workers he considered work life balance (flexible working before retirement), anti age discrimination legislation, pension legislation (raising the state pension age and removing early retirement packages/reducing pension payable on premature retirement), and training of older workers. The major issue to increase the labour force participation of elderly workers, he concluded, lay in increasing their productivity.

The low employment rates of older workers were taken up again in the talk given by **Guido Schwerdt**. He investigated whether these lower employment rates were entirely supply-driven or whether there was a problem of “hidden unemployment”. Borrowing from the evaluation literature, he estimated the effect of being old as opposed to being young on the employment status. Based on social security data for Austria from 1978 to 1998 he assigned the treatment group as those workers that were subject to firm deaths while the control group were workers who were not subject to firm deaths. Only for female white collar workers age turned out to have a negative effect on their employment status in the five years after unemployment. The general findings indicated that age matters more for women than for men and age matters more for white collar workers than for blue collar workers.

In his presentation on age and productivity, **Vegard Skirbekk** moved to the level of the individual and discussed age variation in work performance, related in particular to age variation of cognitive abilities, the role of experience and the relevance of age-specific health trends. The shape and peak of the age-productivity profile varies over time according to the changing labour market demand for abilities. If experience has a reasonably strong effect on productivity, peak productivity potential is found to occur in ages 35-44 years.

Two papers presented a historical view on mortality decline and technological change. **Ryan Edwards** argued that lengthening life may facilitate more rapid scientific discovery. Put differently, the argument brought forward by Edwards was that mortality decline may be rather an input than a product of technological change. To verify these hypothesis Edwards studied the mortality of the Royal Society of Fellows. He found that their life spans were increasing long before widespread mortality declines were achieved. Consequently, early mortality decline among elites may well have fostered the growth of knowledge that helped launch the modern era. Edwards concluded by gauging the likelihood that future ageing will continue to enhance the development of ideas.

The determinants of the English transition to modern growth were discussed by **David de la Croix**. He set up a model and presented a calibrated version to measure the impact of mortality, birth density and technological progress on school density, literacy and growth. The findings indicated that one third of the rise in literacy over the period 1530-1850 can be directly related to the effect of density, while one sixth is lined to higher longevity and one half to exogenous

total factor productivity growth. Identifying the mechanisms and factors that led to growth in historical times might help to gain more insight into today's economic effects of demographic change.

The last two papers considered workforce ageing and economic productivity in Austria. In the talk by **Alexia Prskawetz** the demand side for labour was scrutinised. In a series of simulations she studied the sensitivity of projected economic productivity (measured by output per worker) with respect to alternative projections of the quantity and quality (measured by individual productivity) of labour supply as well as with respect to alternative assumptions on the substitutability of workers at different ages. It was shown that in a pure labour economy, the assumption of imperfect substitution of workers at different ages implies an increase in relative economic productivity during the next two decades, compared to a constant or declining economic productivity in case of the commonly applied additive labour demand function. The general conclusion was that a decline in economic productivity can be attenuated if labour force participation rates are adjusted to levels like those currently observed in northern European countries.

Helmut Hofer presented a simulation study for Austria that incorporates the age-related productivity differentials suggested by Vegard Skirbekk and allows for a highly disaggregated labour supply. A long-run neoclassical growth model constituted the framework of the simulation. It was shown that under perfect substitutability of labour, the consequences of ageing to the long-run growth potential are negligible. Introducing imperfect substitutability of workers of different age created relatively small long-run effects on average productivity, real output and per-worker wages, though the influence on growth rates over the first years of the simulation is very pronounced. Similarly, varying the age-specific productivity profiles did not impair the economic performance in the long run.

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