# Population Ageing and the Swedish Welfare State[1]

**Tommy Bengtsson[2] and Kirk Scott[2]**

## Introduction

Sweden has been undergoing a process of population ageing over a period of more than one hundred-years during which time the share of elderly has more than doubled. Given existing problems regarding the organization of elderly care, as well as health care in general, the question is how Sweden will cope with the large Baby Boom generation when it leaves the workforce and enters retirement. Since the cohorts entering the labour force are smaller, there are also worries concerning how the future financing of the welfare state will be secured. This essay will primarily examine the questions of why population ageing has occurred, how it is likely to be in the future and what the potential economic consequences will be. It will also examine possible solutions to the problems associated with an ageing society, such as the viability of immigration.

## Fundamentals of population ageing

The share of the Swedish population over the age of 65 increased from eight percent to seventeen percent during the 20th century (see Table 1). This impressive increase marked a pronounced change from the stability during the previous period dating back to at least 1750, with only a slight increase visible during the late 19th century (Statistics Sweden 1999:21). Looking at a population pyramid for Sweden in 1900 (see Diagram 1) one sees the classic pattern, with a broad base made up of younger people successively tapering off with increasing age to a pointed top. This pyramid shape was common in all agricultural societies in the past and can today be found in developing countries.

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2 Centre for Economic Demography and Department of Economic History, Lund University

**Table 1. The Swedish population 1750-2000 with estimations for 2050**

| | 1750 | 1900 | 2000 | 2050 |
|---|---|---|---|---|
| Age structure | | | | |
| 0 - 19 years | 42% | 42% | 24% | 22% |
| 20 - 64 years | 52% | 50% | 59% | 54% |
| 65 + years | 6% | 8% | 17% | 24% |
| Average age | 28 years | 29 years | 39 years | 43 years |
| Life expectancy at birth: | | | | |
| Men | 35 years | 51 years | 77 years | 84 years |
| Women | 38 years | 54 years | 82 years | 86 years |
| Life expectancy at age 65: | | | | |
| Men | 10 years | 12 years | 17 years | 21 years |
| Women | 10 years | 13 years | 20 years | 23 years |
| Average age at first marriage: | | | | |
| Men | 27 years | 28 years | 33 years | |
| Women | 25 years | 26 years | 31 years | |
| Share of 40 year old women who are: | | | | |
| Unmarried | 16% | | 20% | |
| Unmarried and not cohabiting | 15% | | 10% | |
| Total fertility rate | 4.8 | 4.1 | 1.6 | |
| Total marital fertility rate | 5.7 | | ca. 1.8 | |

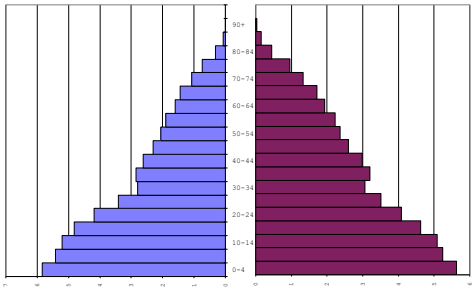
Source: BiSOS: Befolkning (Statistics Sweden 2004)

Population ageing as a 20th century phenomenon is characteristic not only of Sweden but of all industrialized countries, with the difference being that ageing began somewhat earlier in Sweden. Several industrialized countries, however, have gained on, and even passed, Sweden during recent decades. Population ageing has evolved into a global phenomenon, also affecting many newly developed and developing countries. Taken together, the share of the world's population above the age of 65 is currently increasing and is projected to rise from 6.6 percent in 2000 to 16.4 percent in 2050 (Bongaarts and Bulatao 2000:23).

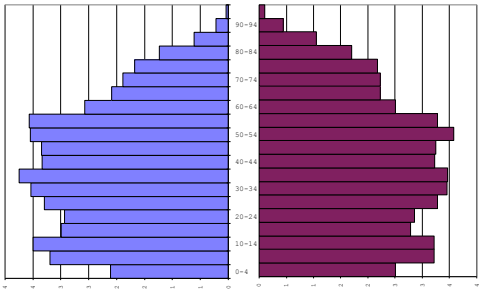
The reason why the share of elderly has increased may appear obvious: life expectancy has increased and people are living longer. Average life expectancy in Sweden has indeed risen considerably during the past century (Table 1), as in other parts of the world. The world record in average female life expectancy has, on average, increased at an almost constant rate of three months per year from 1840 until today, while slightly slower for males (Oeppen and Vaupel 2002). This development means that children live roughly nine years longer than their parents, and this has continued generation after generation. The records have been held by Norway, Australia, New Zeeland and a few other rather small countries including Sweden.

**Diagram 1. Age structure in Sweden in 2000 compared to how it would have looked if fertility/mortality had remained constant at 1900 levels throughout the 20th century. Percent of the population in each age interval**

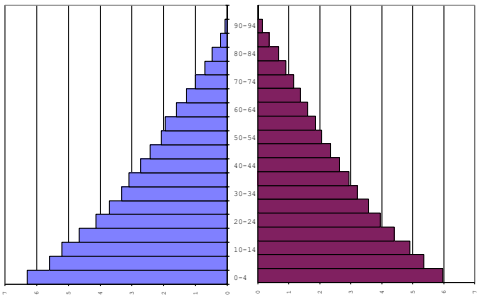
Population pyramid 1900



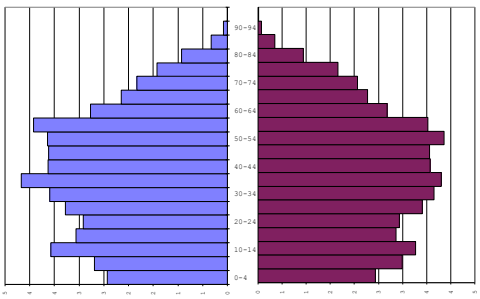
Population pyramid 2000



Constant fertility 2000



Constant mortality 2000



Source: Own calculations using yearly data on births, deaths and migration in one-year age groups from BiSOS: Befolkning (Statistics Sweden 2004).

The most recent record holder is Japan. While the improvements in life expectancy did not begin as early in recently developed countries, the development has been much more rapid. This process will almost certainly slow at some point, but there is yet no indication that we have reached that point. Children born today can expect to live for 100 years or more.

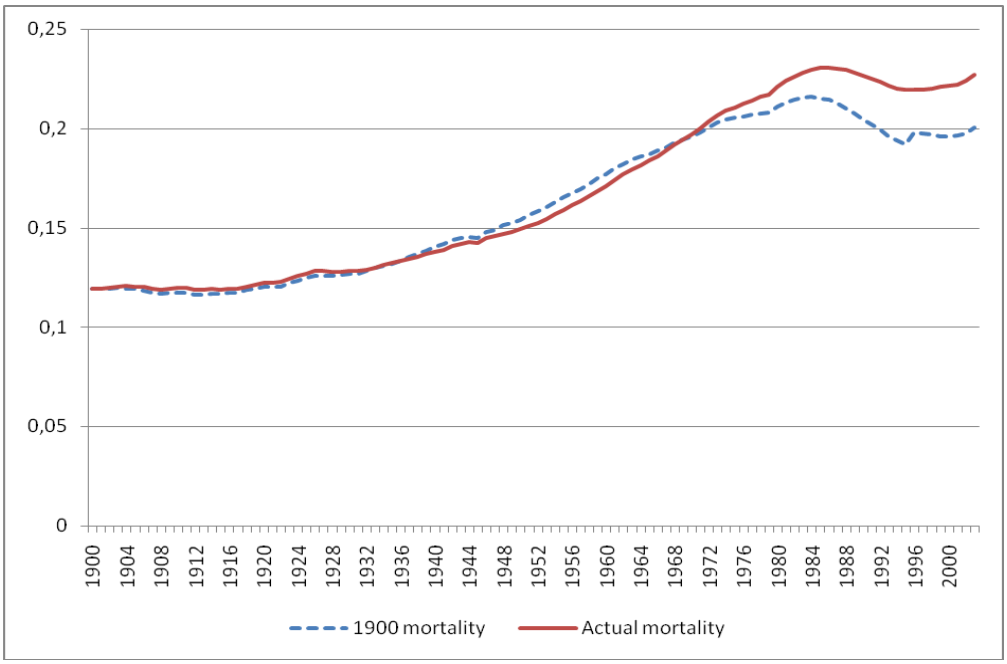
While these developments have been impressive, they have not had a significant impact on population ageing. In fact, the improvements in life expectancy initially rejuvenated the population, since the early increases in life expectancy were driven by a decline in infant and child mortality. Consequently, most of the actual years gained through these increases were below the age of 65. For Western countries, it was not until life expectancy at birth passed approximately 72 years that the increase in life expectancy was driven by a reduction in mortality among the elderly, thus contributing to population ageing (Lee 1994).

The primary cause of population ageing has historically been declining fertility. The overarching importance of fertility decline on age structure was highlighted by the American demographer Ansley Coale in 1957, with the help of Swedish data (Coale 1957). Coale showed that, had fertility rates remained unchanged, the age structure would largely have been the same in 1950 as in 1860, despite substantial increases in life expectancy during this period. When Coale held mortality constant at 1860 levels and allowed fertility to develop at historical rates, however, he found that the projected age structure was strikingly similar to the actual age structure in 1950. Coale's work therefore shows that the population ageing that occurred throughout the first half of the 20th century was almost exclusively the result of fertility decline.

In order to identify the causes of the continued population ageing through the remainder of the century, we repeated Coale's calculations using data for the entire 20th century. Diagram 1 shows the actual age structures in 1900 and in 2000 as well as the calculated age structure for the year 2000 under two counter-factual regimes: one where fertility is held constant at the 1900 level and mortality is allowed to change at historical rates, and one where mortality is held constant at the 1900 level and fertility is allowed to change at historical rates. The results are similar to those found by Coale; population ageing in Sweden was primarily driven by the decline in fertility throughout the 20th century.

Repeating the calculations for each year from 1900 to 2000, we estimate the effect of each component of population ageing, shown in Diagram 2. When mortality was held constant, the share of people over the age of 60 was 2.4 percentage points lower than the 22 percent observed in 2000. When fertility was held constant, the share of those over the age of 60 in the counter-factual was 11.6 percent, which is 0.3 percentage points lower than in 1900. This approximate level would occur regardless of whether mortality was held at the 1900 level or was allowed to develop along historical paths. Through this exercise, we show that the share of elderly in 2000 was approximately 10 percentage points higher than it would have been if family sizes had not declined during the 20th century. This implies that fertility retained its dominant position as the main determinant of age structure throughout the entire 20th century. If fertility levels stabilize over a longer period, however, other factors, such as mortality change, will increase in importance. Over the last decades of the 20th century, we have started to see mortality beginning to exert an influence on the age structure, indicating that this process has already begun, as shown in Diagram 2 (see also Preston et al. 2001).

**Diagram 2. Share of the population over the age of 60, 1900-2000. Actual development and the development as it would have been with mortality held constant at 1900 levels**




Source: Own calculations using yearly data on births, deaths and migration in one-year age groups from BiSOS: Befolkning (Statistics Sweden 2004).

Observations regarding how changes in mortality and fertility affect the age structure led in the 1920s to the development of 'stable population theory' (Lotka 1922; Dublin and Lotka 1925; Keyfitz 1968). This theory concerns the amount of time needed for a population to achieve equilibrium – with a stable age structure – after fertility and mortality either stabilize or continue to change at a more-or-less constant rate. This theory predicts a more stable, but less advantageous, population pyramid for Sweden in coming years, with fewer individuals of working age and more people in the older age groups. One major drawback of this theory, however, is that immigration is not accounted for - a point to which we will return to below.

The fact that fertility, and not mortality, has been the driving force in population ageing may seem counter-intuitive. It is easy to confuse population ageing with individual ageing, especially in light of the dramatic increase in life expectancy experienced in industrialized countries. It is nevertheless important to make this distinction, between the fact that life expectancy increases and the fact that the share of elderly in the population increases. In the same vein, we must distinguish between the share of the population surviving until the age of 65 and the share of the population over the age of 65.

It may appear contradictory that the share of the population in 1900 that survived until the age of 65 was between 58 and 65 percent, depending on gender (Statistics Sweden 1999:123-124), while only 8 percent of the population at that time was over 65 years of age (see Table 1). The explanation lies in the fact that fertility rates were high, leading to future generations always being larger than those were that came before. This phenomenon is known as *positive population momentum* (Preston et al. 2001). On the other hand, if a new generation is smaller than their parents' generation, we can expect the population to experience *negative population momentum* and the population can thus be expected to decline.

Yet another factor influencing population growth is the spacing between generations. Generational spacing is measured by the mother's age at the birth of her middle child. For Sweden, the generational span was roughly constant at 31 years from 1750 until the 1870s. It has since declined more-or-less continuously, a state that has had a positive effect on population growth. The shortest span of time between generations was in the 1960s, with a generational spacing of only 26 years. Since then the spacing has increased to today's level of roughly 30 years. Given a constant fertility rate, population growth can therefore vary based on generational spacing, with less spacing being more conducive to population growth.

## Consequences of an ageing population

Initially, population ageing was not a problem for society. The factor that caused population ageing, the decline in fertility, was also its solution. First, it had positive effects on economic growth. Population growth implies capital dilution, unless additional capital is augmented, which means that per capita consumption is held back. Consequently, the larger the decline in population growth rates, the less output needs to be allocated to investment in order to keep each worker with a given amount of capital. The slowdown of population growth therefore had positive effects on the economy. Second, the reduction in fertility during the early decades of the 20$^{th}$ century was so rapid that it more than compensated for the increased share of elderly. The dependency ratio – the share of the population either too young or too old to work – declined (Statistics Sweden 1999:21). In the longer run, however, when fertility rates stabilised at a lower level and mortality went from rejuvenating to ageing the population, the share of elderly in the population not only continued to increase, but the dependency ratio increased too.

In an influential article from 1958, the American economist Paul Samuelson discussed how consumption might be maintained throughout the life cycle (Samuelson 1958).[3] His *overlapping-generations* model divides an individual's life cycle into two periods: one as a productive worker and one as an unproductive retiree. Samuelson assumes that the fruits of a worker's labour cannot be saved, but must be consumed immediately, implying that a worker is incapable of saving for his/her own retirement. This leads to a situation where all retirees are dependent upon workers to support them. Samuelson argues that the market cannot solve this problem and provides three examples of how to solve it: (1) a family system with transfers from working children to their retired parents, (2) the creation of 'fiat money'[4] as a store of value that can be saved by the workers, or (3) a social security system in which pensions are paid for by a tax on workers. A system of transfers from worker to retired through any of these institutions will lead to an improvement in welfare for all persons in current and future generations. Since each person has an incentive to renege on a tax-based system, it needs to be supported by a "social compact".

Samuelson (1975) later used this model to explore the impact of population growth on economic welfare. He points out that population growth has a positive influence on average economic welfare because the tax base for intergenerational transfers grows faster than pension totals, the reason being that the ratio of workers to retirees increases. This increase may therefore balance the negative effects of population growth caused by capital dilution. Thus Samuelson's work helps us to understand the transfers between generations, and has served as the basis for a generalization which is even more useful, if also less known.

Arthur and McNicoll developed Samuelson's model to include the entire population and not only workers and retirees (Arthur and McNicoll 1978). This was done by including age-specific labour productivity and consumption throughout the entire life cycle. They showed that, as long as the interest rate is equal to the population growth rate, then population growth will lead to economic growth in countries where the average age of productive individuals is lower than the average age of consumers. The fundamental conclusion is the same as Samuelson's; population growth will have a positive influence on economic welfare as long as the mean age of the producer is lower than the mean age of the consumer.

3 This section is based on the excellent overview in Willis (1994).

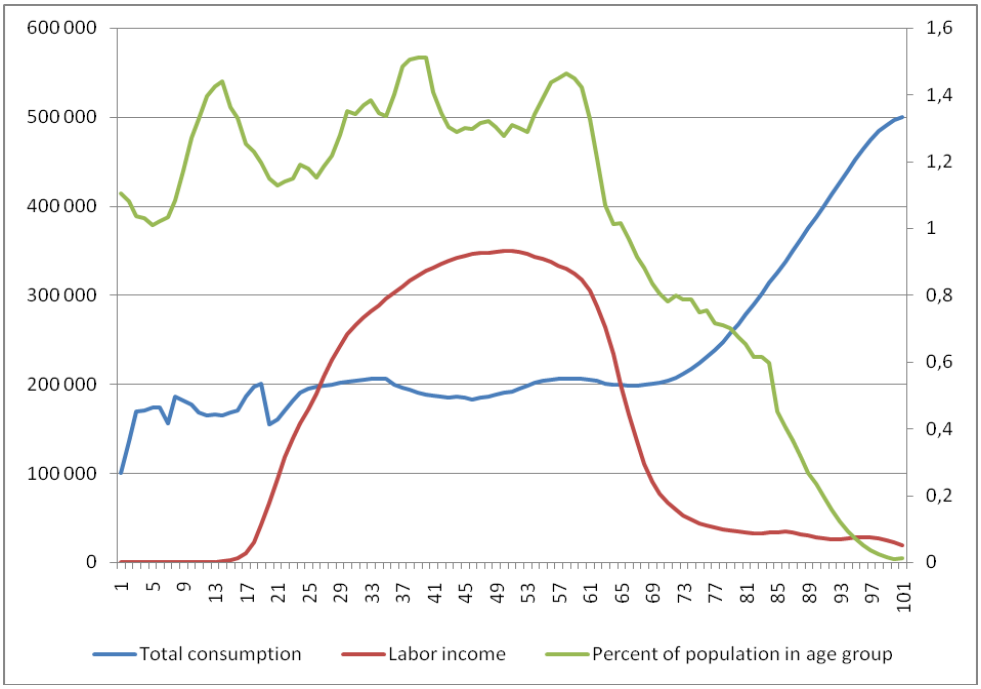
4 Fiat currency, or fiat money, is money backed by an authority, usually a government, for use in exchange of goods and services or to pay a debt.

This was exactly the situation that prevailed in Sweden at the beginning of the 20th century. The share of children declined through declining fertility, pushing up the average age of the consumer. The smaller family sizes resulting from lower birth rates enabled women to work outside of the household. Population growth at this time was still substantial, however, with each generation still larger than the preceding one, implying positive population momentum. Together with strong economic growth during the post-war period, it allowed for reforms of the pension system as well as other, more general welfare reforms. A beneficial demographic situation such as this ends when new generations of workers become smaller than those retiring and when population ageing becomes driven by the decline of mortality among the elderly.

Diagram 3 presents earnings and consumption over a life cycle in Sweden in 2003 based on Forsell et al. (2008). Here it is clear that costs increase towards the end of the life cycle. From their early 20s through 70 years old, the average Swede consumes 200 000 SEK/year in both private and public consumption. This consumption is more than offset during the productive years by labour income, and it is not until the individual reaches his/her late 60s that consumption exceeds income. At this point, consumption begins to rise in a monotonic fashion, to the point where individuals in their 90s consume between 400 000–500 000 SEK/year. These costs are largely healthcare-related, and are not offset by any significant labour income. One point not covered by this diagram, however, is capital income. As the share of elderly in a population increases, we can expect to see increased savings to cover a longer expected period of retirement. This increase in savings can be expected to provide income flows from capital, which can partially offset the lack of labour income.

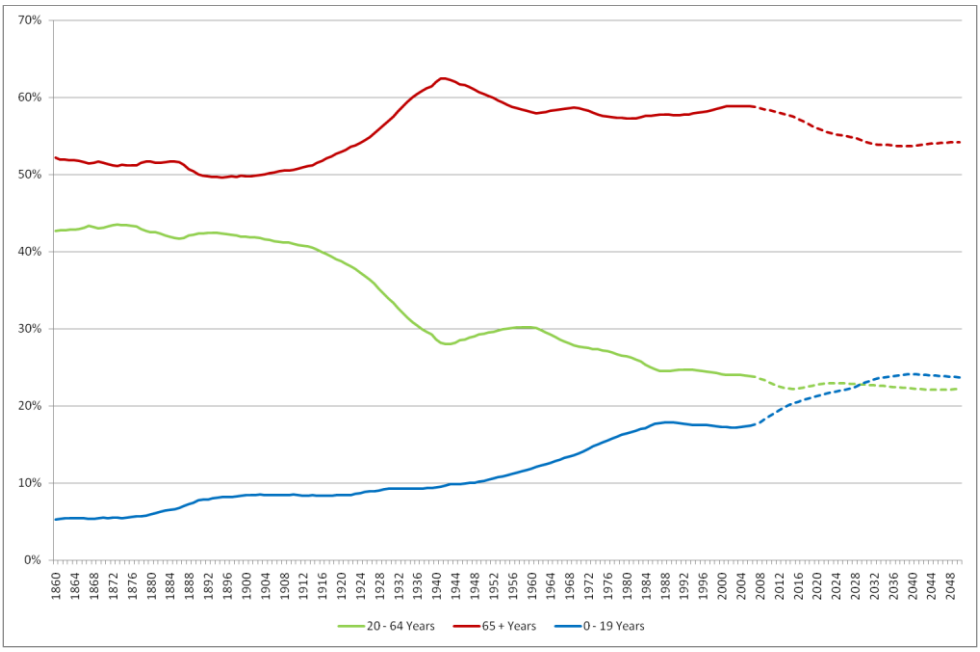
Diagram 4 shows the share of the population aged 0-19, 20-64, and 65+. In this diagram, we can see that the share of the population of working age is expected to decline continuously until 2050 due to the increase in the share of people aged 65 and higher. Given this trend towards a larger share of individuals in the upper age groups, it is no wonder that one often finds the discussion wandering towards reducing costs associated with the elderly and compensating for low growth rates through immigration.

**Diagram 3. Age-specific consumption, labour income, and size of cohorts, Sweden 2003**



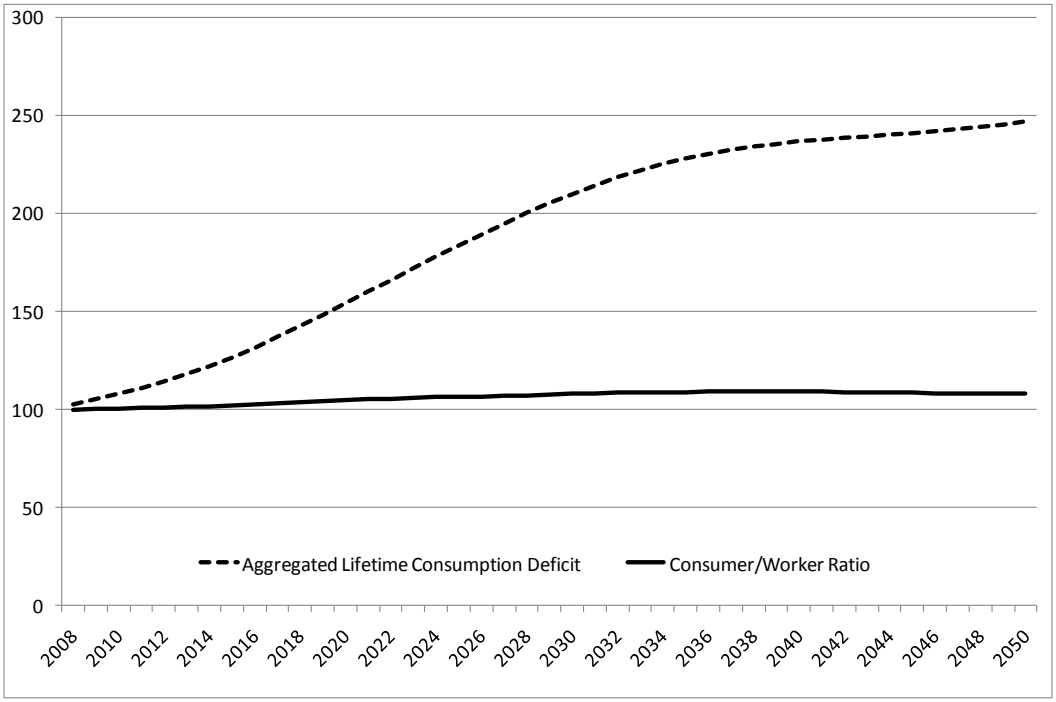

Source: Forsell et al. (2008).

**Diagram 4. Share of the population in age groups 0-19, 20-64, 65+, 1860-2050**




Source: Statistics Sweden (2004)

**Diagram 5. Projected increase of aggregated lifetime consumption deficit and consumer/worker ratios, 2008-2050. 2008=100**




Sources: Calculations based on Statistics Sweden (2004) and Forsell et al. (2008).

Diagram 5 combines the information from Diagrams 3 and 4. We have calculated future costs of consumption as well as labour incomes by single-year age groups, thereby assuming that age-specific consumption and labour income remain constant at 2003 levels, or that they change at the same rate. While the index in 2008 is set to 100, the consumption is in reality higher than labour income, with the difference being made up by the trade surplus. Thus the index reflects the increase in the net deficit of the economy due to population ageing.

While the consumer worker ratio will increase only by 8 percent up until 2050, the consumption will increase by 148 percent relative to labour income. This means that Sweden would need to achieve productivity improvements of roughly 0.3 percent per year in order to keep the age-specific consumption at a constant level. An examination of labour productivity growth in Sweden from 1970 - 2006 shows an annual yearly growth rate of 2.06, but a multi-factor productivity growth rate of merely 1.2 for the period 1985 - 2006 (OECD Stat). Thus a respectable share of productivity gains, say between one fourth and one sixth, will be used for keeping age-specific consumption at its present level, assuming that other costs remain constant. This is a very optimistic scenario, however, since per capita costs for the elderly, especially costs for healthcare, have been increasing steadily over the past several decades. The historical record from the past decades shows that Sweden faces a difficult path if

consumption increases are to be solely financed through productivity increases. While this is not an impossible productivity target, it remains unclear whether individuals will be willing to forego increased leisure time, which is the alternative use of this productivity increase.

Based on the income and consumption patterns shown in Diagram 3, we have calculated the number of extra years individuals would have to remain in employment to keep the consumption at 2008 levels. Under the assumption that it would be possible to insert an additional year of labour income and consumption at the levels seen for 50 year olds, we can find rough figures that give us an idea about how much the pension age should be increased. Rising the pension age by one year now, the aggregated lifetime consumption deficit would go down, and would not return to the 2008 level until 2017. Then, another one-year increase would keep the ratio under today's level until 2024. Another one-year increase in 2024 would hold the system over until 2031, at which time a fourth increase by one year would keep the system under control until 2050. Before accepting this potential solution, we will examine other possibilities.

## Is immigration the answer?

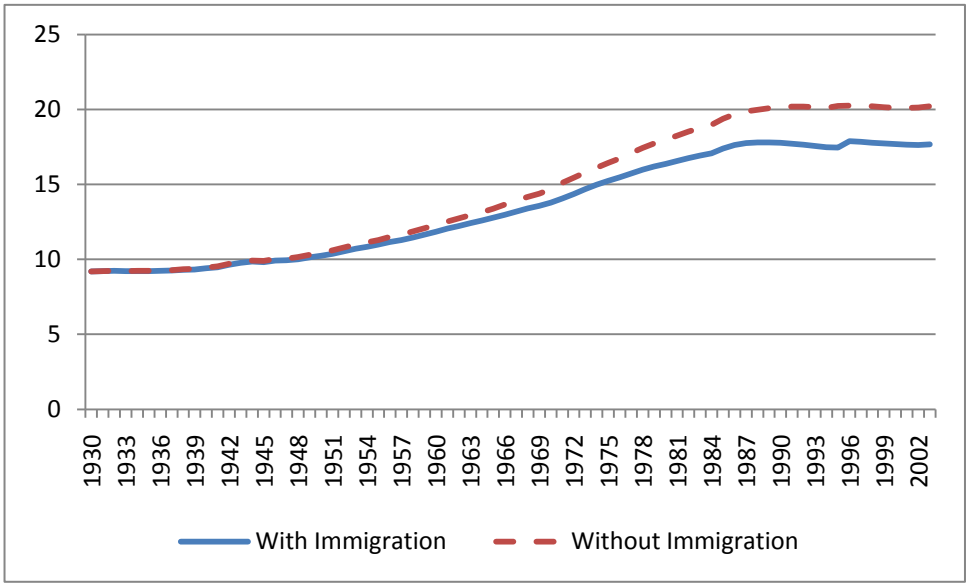
Increased fertility would, over a twenty-year period, have a negative effect on the balance between labour income and consumption. This is due to the fact that very few individuals work before the age of twenty and parents tend to reduce their supply of market labour. In the longer run, however, a period of increased fertility can meet the challenge brought on by an increasing share of elderly in the population. The question at hand is how do we arrive at such a position? One possibility is to take measures to further increase the compatibility between labour force participation and childrearing. Another possibility is to redistribute some of our consumption to childrearing. As incomes rise, a relatively smaller share of the income is spent on necessities such as food, clothing, and shelter. This should create the economic conditions to allow more children per family. One feature of the current Swedish labour market which points to the ability to increase incomes is the fact that the average number of hours per week spent in market activity, distributed evenly among all individuals of working age, only amounts to 21 hours per person (SOU 2004:11). Given these factors, it appears that the economic preconditions for increased levels of fertility indeed do exist. Nevertheless, despite this, very few scholars today believe that fertility rates will increase more than marginally in the future.

If increased fertility levels are seen as an impossible end, what else can be done to counter the effects of population ageing? One solution that is regularly put forward is increased migration. There tends to be an overrepresentation of migrants in the lower working ages, and as such, immigration would appear to be a good solution that lowers the average age of the producer without increasing the population share that is below working age. However, this intuitive understanding is not quite as straightforward as it may appear.

Sweden has been a country of net immigration since the 1930s (Lundh and Ohlsson 1999; Statistics Sweden 1999:130). Roughly 20 percent of the Swedish population today was either born abroad or has at least one parent who was born abroad. This raises the question of how the age structure would have looked in the absence of migration. Diagram 6 shows the share of the population over the age of 65 in two separate scenarios − one depicting the actual development, and one showing a counterfactual development in which no immigration takes place. We can see that immigration has had a restraining effect on the share of elderly in the population, but this effect has not been very dramatic. If Sweden had not experienced any immigration, the share of the population above the age of 65 would be only 2.5 percentage points higher than it actually is, or 20.2 percent instead of 17.7 percent. These calculations not only take into account immigration, but also the effects of immigrant fertility. These results indicate that population ageing can be offset by immigration, but only to a limited extent. Another factor that must be considered is that immigrants also become older, which means that immigration must increase at an increasing rate if it is to compensate for population ageing.

A further argument for immigration helping to "correct" the shifting age structure is that immigrants tend to arrive during their childbearing years and generally have more children per family than native Swedes. While these statements are true, the latter should not be exaggerated. Foreign-born individuals comprise roughly ten percent of the Swedish population, yet account for approximately twenty percent of all children born (Statistics Sweden 2004:200). This high figure, however, can largely be explained by the fact that the foreign-born are overrepresented in the childbearing ages and are more likely to be married or cohabiting than native Swedes. An examination of birth rates within marriage shows that foreign-born women tend to have *fewer* children than Swedish women of the same age. While fertility patterns do vary widely among women of different national origin, there is evidence to suggest that even women from cultures with high fertility rates adapt quickly to Swedish fertility patterns (Andersson 2004).

**Diagram 6. Share of the population above the age of 65, 1930-2003. Actual development and the development as it would have been without any immigration**




Source: Own calculations using yearly data on births, deaths and migration in one-year age groups from BiSOS: Befolkning (Statistics Sweden).

*Stable population theory* has been expanded in recent decades to include the effects of migration. Empirical studies show that the effects of immigration on the age structure of the receiving society can vary widely depending on the fertility of the migrants. Thomas Espenshade (1994) calculated the effects of immigration on the American age structure, and found only a marginal effect under the assumption that immigrants adjusted their fertility to American levels. Stefan Jonsson and Michael Rendell (2004) came to the opposite conclusion under the assumption that immigrants retain home-country fertility levels instead. These results make it clear that the potential impact of immigration is dependent upon the assumptions made regarding post-migration fertility. As mentioned above, there is evidence that migrants that come to Sweden adjust to Swedish levels, leading to the conclusion that immigration will not result in the large shifts in age structure needed to reverse population ageing.

A controversial report from the United Nations in 2001 estimated the number of migrants required to meet certain population demands during the period 2000-2050 (United Nations 2001). Among the scenarios drawn up there were two with the goal of maintaining the Potential Support Ratio (PSR), which is the ratio of all individuals aged 15-65, to those aged 65 and above. One scenario aimed at maintaining the PSR at a level no lower than three,

while the other aimed at maintaining a constant PSR at the highest levels projected after 1995 in a zero-migration projection. Keeping the PSR above three between year 2000 and 2050 would require immigration levels to the "old" EU-15 of approximately three million immigrants per year, or a total of almost 154 million immigrants during the period. The aim of maintaining a constant PSR at the maximum level, on the other hand, would require upwards of 13 million immigrants per year on average, or a total of 674 million new migrants to the EU-15.

If immigration is to alleviate the problems associated with population ageing there must be more than simply an increase in the number of people in fertile ages or below. The primary problem associated with population ageing is the increased costs linked to health care and pensions, in the face of a decreasing workforce. For immigration to work as an effective brake on population ageing there is a precondition that immigrants become well-integrated into the Swedish labour force. This is not a particularly realistic expectation, given Sweden's experiences with immigration over the past two decades. Immigrant integration in Sweden has been a failure since the 1970s. Unemployment among foreign-born men was seven percentage points higher than for native males in 2001 (Bennich-Björkman et al. 2002), but this is only part of the problem. Unemployment figures are based on those in the labour force, making the problem look less severe than it actually is. Only 78 percent of all foreign-born men were in the labour force in 2001, compared to 86 percent for Swedish born men. Thus, 22 percent of all foreign born men aged 20-59 were either in labour market retraining programs or completely outside of the labour force in 2001. This gives us an actual unemployment rate (redefined as those without employment/all those aged 20-59) of roughly 30 percent for immigrants and only around 18 percent for natives. The failure to integrate those immigrants in Sweden today must be seen as a warning sign for future integration.

This argument has been partially refuted by claims that new immigrants will be recruited for existing jobs, and as such will avoid the integration issues faced by refugees and others arriving without a job offer in hand. This argument sounds reasonable, but also here we can find historical reasons which cast doubt on its long-term validity. Swedish migration from the 1950s through the early 1970s was dominated by exactly this type of labour migration. Moving the clock forward 40 years we can see that the labour migrants from that period experience higher unemployment rates than natives today, have higher rates of sickness absence, and are over-represented among those with disability pensions (Bengtsson and Scott 2006).

Even if it is possible to successfully navigate all potential integration problems there remains one final problem regarding immigration as a solution for population ageing, namely whether the Swedish economy will be able to absorb this massive increase in the labour force necessary to offset population ageing. The recent phenomenon of "jobless growth" in Sweden points to a further obstacle to this massive import of labour. It is possible to continue financing the Swedish welfare state through the same means as today, but this possibility is intrinsically related to the creation of new employment.

## Conclusions

The rapid increase in life expectancy over the past century has had a relatively small impact on the increasing share of elderly during the 20th century. The true culprit has been the declining fertility rate, which has led to fewer being born into the base of the population pyramid. The extensive immigration experienced since the 1950s has not had much effect on slowing population ageing, and cannot be expected to play a major role in the future. If fertility rates stabilize, as is projected, then we will see a new situation where increasing life expectancy will become the primary factor influencing population ageing.

We can expect the Swedish population pyramid to become increasingly rectangular, and possibly even demonstrate a shrinking base. This will lead to increasing challenges in terms of financing pensions, social care and healthcare, as well as supplying the economy with labour. These problems will continue for at least the next twenty years with no demographic solution available. Immigration is not likely to offset population ageing much, and even dramatic increases in fertility rates would take several decades to have an impact on the size of the labour force. One possible solution lies in mobilizing the potential workforce so that a greater share of those of working age actually work, while another solution can be found in productivity growth. Yet another solution is pushing up the retirement age in response to longer life expectancy. The pension problem appears particularly daunting, with an increasing share of the population spending a longer period of time in retirement. This is the case with the current "pay-as-you-go" system of financing the pension system, but the problem could be alleviated through a change in the system to one where individuals are made aware of the life-cycle aspect of pension systems. Pensions could be kept at the same level as before by increasing the age at retirement. Another way to think about it is to keep the share of retired stable despite population ageing. This means that the age of retirement has to increase to about 70.5 years in 2050 to keep the share of retired the same as today. This way the living

standards for retired people will be able to follow the same development as for the rest of the population without increasing its share of total resources. Taking the age specific consumptions and labour income patterns into account is pointing to the same development. The age of retirement have to increase successively to about 70 years by 2050 to keep the ratio of consumption and labour income stable. Keeping age of retirement the same as today requires a productivity growth of 0.3 percent per year to keep consumption from falling. It is, however, very unlikely that we will see any of this scenarios develop but rather a combination thereof, the main reason being that we can assume that we are not satisfied by keeping consumption at the same levels at today but to increase it.

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