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FERTILITY, DEPENDENCY AND SOCIAL SECURITY

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ABSTRACT

A subject of considerable policy concern is the problem presented by declining fertility rates for social security systems in general and Pay-As-You-Go pension schemes in particular. Solutions proposed range from complete privatisation of the pensions system, through supplementary private tax-advantaged savings schemes, to "parametric reform" of the existing schemes, involving increases in contribution rates and retirement ages, and reductions in the real value of benefit levels. This paper argues that the sense of crisis generated by looking only at the Aged Dependency Ratio is exaggerated. Moreover, we should look at what appears to be the root cause of the problem, the apparently inverse relationship between female labour force participation and fertility. A solution to the problem can be found in policies that allow an increase in female labour supply and fertility simultaneously.

1 Introduction

Dramatically falling fertility rates have been a feature of the demographic development of a large number of countries, both developed and developing, over the past few decades. The precise causes of this are not yet fully understood, but the consequences for those developed countries with Pay-As-You-Go (PAYG) pension schemes have been the subject of considerable recent research and debate.¹ Particular concern has arisen in those countries in which public PAYG schemes play a large role in their pension systems. This group includes Canada, France, Germany, Italy and Japan. Though subject to similar demographic developments, the problem is seen as less severe in countries in which PAYG systems cover a smaller proportion of the retired population, such as Australia, the UK and the USA. In this paper we consider the issues that are discussed in this debate, focusing particularly on the experience of Germany and Australia.

The first step in the discussion is to consider the implications of declining fertility for the population structure of a country. One implication, naturally, is that the ratio of retired to working-age households, the so-called aged dependency ratio (ADR), is set to increase sharply in the next few decades.² In Germany, where this increase is particularly marked, the resulting implications for the financing of pensions to the retired, through payroll taxes on the working population, has been presented as a problem of crisis proportions.³ Though this is without doubt an exaggeration, it has elicited a recent policy response in Germany, in the form of a reduction in benefits, an increase in the contribution rate, an increase in the contribution period, and the introduction of a privatised, funded component.⁴ Calculations by Sinn (1999a) suggest that if indeed all participants in the state pension scheme take advantage of the private pension opportunity, contribution rates in the public pension system can be held roughly constant.

¹ See for example Borsch-Supan (1998), Chand and Jaeger (1996), Disney (2000), Feldstein and Samwick (1998), Kotlikoff, Smetters and Walliser (1998), Miles (1999), Orszag and Stiglitz (1999), Siebert (1998), Sinn (1999a), (1999b), (2000), World Bank (1994).

² A contributory factor here is the increase in average life expectancy, but it is clear that declining fertility is a major cause.

³ Witness the titles of the papers by Borsch-Supan (1998) and Sinn (1999a), (1999b).

To the extent that this is not the case, further policy measures (perhaps making the private saving component compulsory) may be necessary in the future. Clearly, making the contribution to the private scheme (popularly known as the "Riester-Rente", after the minister who introduced it) compulsory simply represents an increase in the contribution rate. Since this is done without raising the current pension, indeed while reducing it, this implies the introduction of an element of funding in the pension scheme. The argument Sinn advances for having this funded component managed by the private rather than the public sector (it is always possible to incorporate a funded element in a state pension scheme), is that the government could not be trusted to keep its hands off the resulting fund when it is short of cash.

In the case of Australia, projections of a sharp increase in the ADR led, in 1986, to the introduction of a compulsory superannuation scheme, based on individually funded retirement accounts, as a partial replacement of the non-contributory, income-tested PAYG aged pension system.⁵ At that time the latter provided around 60 per cent of total retirement income. Support for the scheme was based on the argument that there would be a fiscal crisis, with the aged pension imposing an unsustainably high tax burden on future working populations, unless there was a switch to a privatised funded scheme.

No consideration however seems to have been paid to the counterarguments, in particular to the issue of the transactions costs of the private scheme, as well as to the problem of risk.⁶ The former are considerable, the latter have become far more apparent since the recent dramatic end to the long stock market boom. In fact the important question of the alternative risk characteristics of PAYG and private funded schemes is a relatively under-

⁴ In future, participants in the public pension system may pay up to 4 per cent of their gross earnings into pension funds managed by banks and finance companies. For details of the German pension reform, see *The Economist*, May 12th, 2001, p53.

⁵ The Australian Bureau of Statistics produced population projections at the time that indicated an increase in the population aged 65 years from 9.75 per cent in 1981 to 18.85 per cent in 2031. The ABS also predicted that the mean age would rise from 32.8 years to 41.0 years over the same period. For an analysis of policy based on these projections, see Apps (1991).

⁶ It has long been recognised in the international literature that an important justification for a public system is the problem of adverse selection that limits the capacity of the private sector to offer efficient insurance contracts to cover the risk of longevity. This is an issue that has been almost entirely ignored in public discussion in Australia.

researched subject, that also seems to be neglected in public discussion.⁷ The issue of the switch from PAYG to a funded pension system, either wholly or in part, has on the other hand generated quite a large literature, although it has not been given prominence in the discussion of policy reforms in Australia.

In this paper, we first provide, in Section 2, an outline of this debate, which establishes that switching from a PAYG to a fully funded scheme cannot achieve a Pareto improvement. In section 3 we show that a rising ADR does not imply an increasing financial burden for the working population in the future, because it is accompanied by a fall in the total cost of dependency, defined to include the cost of children. In Section 4 we discuss the kinds of policies that are needed to avoid the creation of an ageing crisis, while simultaneously achieving an increase in fertility. A concluding comment is contained in Section 5.

2 PAYG vs Funded System

The switch from PAYG to a funded pension system has been shown in the work of Breyer (1989) and Geanakoplos, Mitchell and Zeldes (1998), among others, not to be a solution to the problems raised by declining fertility and increasing ADRs.⁸ Breyer shows that such a switch cannot be Pareto improving *per se*, but can only represent a redistribution of the burden of funding pensions across generations. The basic argument is very simple, and in fact is already clear in Samuelson's (1958) classic paper on overlapping generations economies.

Consider an overlapping generations economy of infinite duration in which individuals live for two periods. In the first period they work, generate income and consume, in the second they just consume. Suppose that output from the working generation will always be 100 in each period. At the first time period, two generations are alive, the working and the retired, and there is no pension system. We then introduce an implicit

⁷ For a recent paper addressing the issue, see Miles and Cerny (2001).

⁸ See also Orszag and Stiglitz (1999) and Chand and Jaeger (1996) on this point.

intergenerational contract: the working generation is to give 20 units of its output to the retired generation, in exchange for which it will receive 20 units in its retirement from the then working generation, who in turn will receive 20 when they retire, and so on *ad infinitum*. Implicitly there is a permanent pension debt of 20 units of output, resulting from the fact that the first beneficiaries, the retired generation at time 1, had made no contribution to their pensions. Suppose now that at some point in time, it is decided to switch to a funded system, in which each generation has to put aside the output it will consume one period later when it retires. Then at this point in time, either the currently retired generation must receive nothing, or the currently working generation must reduce its consumption by a further 20 units, to 60, in order to pay the current pensions and save for its own future pensions. A differently phased introduction of the "privatised" scheme may change the incidence of the consumption reductions across generations, but some reduction is inescapable, because of the implicit debt incurred by the gift to the initial retired generation. This essential point remains unchanged even if the model is made more complicated by assuming the existence of a private capital market, population change and productivity growth. Introduction of an unfunded PAYG system with an immediate gift to the already retired leaves it with an implicit debt forever, and therefore an inescapable repayment if a switch is made to a funded system.⁹

The fact that the rate of return obtainable on investment in the capital market is apparently much higher than that earned on contributions to the PAYG system, as strongly emphasised by Feldstein in his advocacy of a switch to a fully funded system in the USA, can be explained by the implicit debt accumulated in the early stages of PAYG systems, when pensioners receive payments well in excess of their past contributions.¹⁰ These early pensioners in fact receive very high rates of return on their contributions but,

⁹ The shift to a privatised funded system in Australia has been accompanied by fundamental changes in the tax and welfare systems which have meant that the debt burden has been shifted to some but not all members of the working generation. Simulation results in Apps (1991) show the reforms shift the burden to low and middle income families, and particularly towards those in which both parents work.

¹⁰ Of course stock market returns were also much higher than the implicit returns on PAYG pension schemes because of risk, and it is not at all clear that pension holders would be compensated for the increase in risk by the increase in expected return resulting from a switch to a fully funded system. Currently that seems much less likely to be the case than appeared to be the case, say in the mid 1990's.

in a mature system, this will be paid for by lower rates of return to all later generations.¹¹ A switch to a funded system makes this implicit debt explicit, but the debt must continue to be serviced, and no Pareto improvement is possible, unless in some way the switch to a funded system results in a permanently higher growth path of output for the economy as a whole. Although on the face of it one could argue for such a possibility, it usually turns out that the effects could be achieved by changing the design of the PAYG system, without having to switch to a privatised fully funded system.¹²

If privatisation and funding are not a solution to the problem of financing PAYG pension systems presented by an increasing aged dependency ratio, is "parametric reform", i.e. simply changing the parameters of the PAYG system, such as contribution and benefit rates, retirement age and indexing provisions, the only solution? The remainder of this paper argues that there may well be a better solution, one that requires a broader approach than simply looking at the ADR and the parameters of the pension system. The approach is outlined, drawing on theoretical work contained in a companion paper¹³ and empirical evidence based on unit record data for Australia and Germany.

3 A Dependency Paradox

There is a misapprehension created by focussing discussion on the ADR alone, as the Australian and German debates have done. If we look at things in the more fundamental terms of the underlying resource allocation, the working population generates outputs which are consumed not only by themselves and the retired, but also by their children. An ageing population is associated with an increasing ADR, but it will also be associated with a declining child dependency ratio (CDR), when the root cause of population ageing is declining fertility. It does not then necessarily follow that the net effect of the fertility decline must be a reduction in the share of aggregate output consumed by the working population. In public finance terms, this means that although an increasing contribution

¹¹ For example, in the simple overlapping generations economy presented above, the first generation of pensioners receives an infinite rate of return, every succeeding generation a zero rate of return.

¹² Chand and Jaeger (1996), Orszag and Stiglitz (1999) and Sinn (2001) discuss this point at some length.

¹³ See Apps and Rees (2002b).

rate or tax rate more generally may, or may not,¹⁴ be required to finance pensions, this could be at least compensated for by falling public and private costs resulting from declining child dependency. The challenge for policy is to bring about the required resource reallocations.

To fix ideas, consider the following simple approach.¹⁵ Take an overlapping generations economy in which each individual lives for 3 periods. In the first, she is a child supported by her parents, in the second, a working adult, caring for her children, and in the third, retired. Let the number of 2-parent households in a given period t in this economy be N_t , and assume that we are in a steady state in which each household has n pairs of children, so that $N_{t+1}/N_t = n$. The population growth rate is $n-1$, the ADR is $1/n$ and the CDR is n , and the total dependency ratio (TDR) is $n+1/n$, which is a U-shaped function with a minimum at $n=1$, the point of zero population growth. A decline in fertility (n) therefore does not necessarily increase the TDR, though of course it always increases the ADR.

However, even under an approach that focuses on dependency ratios, what should matter are the total resource costs to the working generation of supporting the individuals in the first and third phases of their lifetimes. Let $C_Y(\cdot)$ and $C_R(\cdot)$ be differentiable, convex increasing cost functions which show the aggregate resource costs to the working generation of supporting respectively the young pre-working generation and the retired. Since in the steady state there are nN_t (pairs) of the former and N_t/n (pairs) of the latter, the value of n that minimises total dependency costs $C_Y(nN_t) + C_R(N_t/n)$ satisfies

$$n^* = \sqrt{\frac{C'_R(N_t/n^*)}{C'_Y(n^*N_t)}}$$

¹⁴ Micro simulations to the year 2031 in Apps (1991) show that a tax rate increase will not be required in Australia, unless there is a switch to policies that inhibit female labour supply, and therefore the expansion of the tax base, as the demand for domestic labour falls with declining fertility. The same policies also inhibit household saving. See Apps and Rees (2001).

¹⁵ This is certainly not a satisfactory model with which to analyse the overall problem, but simply a way of clarifying the deficiencies of an approach which just focuses on the ADR. The reasoning here, though simplistic, is rather less so than that contained in the usual paper pointing out the dramatic and dire consequences of an increase in the number of elderly persons who have to be supported by the working population. It is advanced as a corrective to the sense of crisis such papers seek to generate.

Then clearly, if at $n = n^*$ the marginal cost of children is greater than that of the retired, the cost-minimising population growth rate is negative, and a fall in a positive population growth rate would always be associated with a reduction in total dependency costs. Thus, if we think of the burden on the working generation not in crude terms of their contribution rates to a PAYG pension system, but in terms of their share in aggregate output, there is no reason to regard declining fertility rates as necessarily signalling a crisis.

In calculating the dependency cost of children it is important to take account of their *full* cost on the population of working age. This requires the computation of the cost of their consumption of output from household production as well as from market production. In fact, as we show in Apps and Rees (2002a), and will illustrate below, the cost of the former can represent the largest component of the dependency cost of children. This is particularly evident in the case of households that choose the traditional division of labour, in which the mother provides full time child care at home, as a substitute for market work and bought-in child care. Some studies, such as the work by Cutler, Poterba, Sheiner and Summers (1990),¹⁶ omit parental time costs yet still find that a decline in fertility is associated with a reduction in the overall costs of dependency. The results of these studies would be strongly reinforced if such costs were included.

To show that the total cost of dependency can be expected to fall quite dramatically with a decline in fertility, we compare the average dependency cost of a child with that of a retired person, based on unit record data for Australia. The analysis uses Australian Bureau of Statistics (ABS) data for household expenditure, labour supply and domestic work over the life cycle. The cost of a child is defined as that of its *full* consumption.¹⁷ This is calculated as the sum of expenditures for the child on market goods and services by parents, on education and other services by government and, most importantly, on parental time allocated to child care and related work at home. Information on these

¹⁶ Costs of dependency are defined as private non-medical expenses, public education expenses, and medical care.

¹⁷ For the definition of the costs of children in terms of *full* consumption, see Apps and Rees (2002a).

variables is obtained by merging data from matching samples of *couple income units* (referred to hereafter as households) selected from three ABS files: the 1993 Household Expenditure Survey (HES), the 1994 Income Distribution Survey (IDS) and the 1992 Time Use Survey (TUS).¹⁸ The cost of a fully retired person is computed as that of her full consumption less the cost of domestic output that she herself produces.¹⁹

For the purpose of the analysis we find it most useful to define the life cycle in terms of six phases that capture the major transitions in a household's lifetime. These are:

- Phase 1: household members are of working age and do not yet have children;
- Phase 2: the household has children of pre-school age;
- Phase 3: the children are of primary school age;
- Phase 4: the children are of high school age or have left school;
- Phase 5: the adults are still of working age but the children have left home;
- Phase 6: the adults are retired.

Table 1 reports data means for expenditure on market goods (row 1), government expenditure on indirect benefits (row 2)²⁰, and the implicit expenditure on domestic production (row 3)²¹ per annum (pa) in each of these six phases at the level of the household. The means are calculated for a HES sample, containing 5062 couple income unit records, augmented with information from the IDS and TUS. The life cycle expenditure profiles show that phases 2 to 4, those in which children are present, are associated with the highest full consumption spending per household.

Table 2 gives the data means for expenditures per household that can be assigned to the children. There are two: indirect government benefits comprising outlays on schooling, pre-school and child care and the cost of parental time allocated to domestic child care. The figures show that the time cost of home child care is by far the largest component of the cost of a child. The table also reports, in row 3, the average number of children in each phase, and row 4 gives an estimate of the average cost of a child in each phase. The

¹⁸ For details of the selection criteria and data matching procedure, see Apps and Rees (2001).

¹⁹ In a developing economy, earnings from child labour and the implicit value of domestic work by children would need to be subtracted from their full consumption cost, as in the case of the retired or semi-retired.

²⁰ Major components of government indirect benefits are outlays on education and health. For details of how indirect benefits are calculated, see ABS (1996).

²¹ This is calculated as the opportunity cost of domestic time. See Apps and Rees (2001) for details.

estimate is obtained by using an intra-household *sharing rule* to assign to family members those consumptions that are unassigned.²² Weighting the cost in each phase by the average number of years that a child spends in that phase, gives an overall average cost per child of \$18,274 p.a.

Table 1: Life cycle consumption expenditure, Australia, 1993 \$ p.a.

Life cycle phase	1	2	3	4	5	6
<u>Expenditure per household \$ p.a.</u>						
1. Market goods	31,486	28,699	32,669	37,735	29,691	18,052
2. Government indirect benefits	2,941	7,369	13,850	12,775	4,123	8,941
3. Domestic work and child care	18,995	54,193	44,468	33,808	31,368	35,681

Table 2: Consumption expenditure of children, Australia, 1993 \$ p.a.

Life cycle phase	1	2	3	4	5	6
<u>Expenditure per household \$ p.a.</u>						
1. Government indirect benefits	0	2,709	8,328	6,497	0	0
2. Domestic child care	0	26,647	17,036	4,922	0	0
3. No of children per household	0	1.90	2.66	1.75	0	0
4. Total cost per child \$ p.a.	0	22,511	17,189	15,148	0	0

The estimated average cost of a retired person in phase 6 is \$13,479 p.a. (i.e., half the sum of the costs in rows 1 and 2). Thus, the average cost of a child is over a third higher than that of a retired person. These figures do not factor in a number of effects considered, for example, in the analysis of Cutler et al. (1990), such as an increase in average productivity with the age of the workforce, which would make the difference even greater. These results suggest that it makes no sense to argue that declining fertility necessarily signals a crisis in terms of the burden on the working populations of future generations. However, this does not mean that the issue can be ignored. The economy may fail to realise the resource reallocations that would in fact reduce the burden on the working generation. That is, the real problem may be one of public policy outside the narrow field of pension reform.

²² The rule chosen is based on results of a model of child costs in Apps and Rees (2002a). Market consumption (including indirect government benefits) is assumed to be shared equally, on average, between parents and children while the latter are present in phases 2 to 4. The share of domestic production (excluding child care) allocated to children is set at 42 per cent.

4 Fertility, participation and labour supply

If the consequence of fertility decline is a reduction in child dependency and an increase in aged dependency, with no *necessary* decrease in the shares of consumption of either the working population or of the elderly, then the problem for policy is to achieve the reallocation of resources that permits this outcome. The issue of financing a PAYG system is only one aspect of this problem. More generally, the design of the overall tax/transfer system is a crucial determinant of the resource reallocations that take place as a result of declining fertility. An associated effect of declining fertility is a fall in the demand for domestic work and child care, and a concomitant increase in female labour supply, unless there are policies in place with disincentive effects that prevent it. Such disincentive effects are created, for example, by tax and welfare systems based on joint family income. Under these systems, where the marginal tax rate increases with joint income, the labour supply of both members of households in which the secondary earner, typically the female, has a higher number of hours of market work is, *ceteris paribus*, taxed at a higher rate.²³ In Germany both the tax system and the system of social security contributions are based on joint incomes, and therefore have strong disincentives to female labour supply. They thus inhibit the reallocation of time from domestic work and child care to market labour supply that could result from a decline in fertility. The same disincentives are a feature of the income tax and family benefit system in Australia. While Australia has, nominally, a system of individual income taxation, its Family Tax Benefit system results in almost prohibitive effective tax rates on female labour supply over significant ranges of family income.²⁴

Other aspects of the situation, fully amenable to policy influence, are also of course relevant, such as the cost and availability of care for pre-school children, and simple

²³ Under a system of taxation based on joint income, both partners face the same marginal tax rate. However, what is often missed in the literature is that two couples with identical wage rates, non-labor incomes and demographics, and with the same preferences, face very different marginal tax rates if there is a large difference in the labor supply of the secondary earner. Couples in which the female partner works typically face much higher marginal tax rates under a system of joint taxation.

things such as the time the children get home from school. In both Germany and Australia, again these aspects put obstacles in the way of female labour supply. Thus the significant declines in fertility in recent decades have not been associated with an equally significant shift of resources out of domestic child care, which would provide the increase in output required to maintain the consumption levels of the working generation in the face of increasing aged dependency. Moreover, those policies that have prevented this shift in resources can also be seen as a factor contributing simultaneously to the decline in fertility.

It is usual to associate fertility decline, at least in the developed economies, with increasing female labour force participation rates and rising wage rates for women. In that case, one might argue that there is no scope for further increases in female labour supply to compensate for fertility declines, in generating additional output and increasing the tax base from which pensions can be financed. However, this view is mistaken on at least three counts.

First, the idea that an increase in female labour supply, in response to an increase in the female wage, is *necessarily* associated with a decline in fertility can be rejected as a result derived from an empirically implausible model of fertility. The model assumes a production function for children in which the only input is female time.²⁵ As we show in Apps and Rees (2002b), in a more general model that takes account of bought-in child care as a substitute for domestic time, female labour supply and fertility can increase simultaneously. It is quite plausible that, had appropriate policies been in place in recent decades, fertility might have remained constant. A crucial consequence of an increase in female participation is an increase in the demand for bought-in child care, as a substitute for domestic time. However, the response of governments in most OECD countries to rising female participation has been to raise taxes on married women as second earners, and to maintain policies that inhibit the development of an efficient, affordable and high quality child care sector. The former, as we have noted, have strong disincentive effects

²⁴ Effective tax rates faced by married mothers with young children can be in the order of 60 to 80 cents in the dollar over significant ranges of their earnings.

²⁵ See, for example, Galor and Weil (1996).

on female labour supply and the latter, disincentive effects on both female labour supply and fertility.²⁶

Second, female labour force participation rates are a very imperfect measure of actual female labour supply, since of course what matters to the latter are the hours women actually work. A participation rate of 100 per cent could be consistent with a very small aggregate labour supply, if each woman worked an hour a week. More careful examination of hours worked using cross section unit record data, particularly time use survey data, suggests that female labour supply has not increased to the extent that might be inferred from reported participation rates.

Thirdly, when we consider the evidence across countries, we see that there is in fact a positive correlation between female labour supply and fertility. For example Germany, the Netherlands, Italy and Spain, which have the lowest fertility rates in Europe, also have the lowest female participation rates. This suggests that fertility and female labour supply are endogenously chosen in the light of a set of parameters determined by the existing tax and social welfare systems, and by the conditions determining the cost and availability of child care. As we show in Apps and Rees (2002b), these parameters can be such that both low fertility and low female labour supply are the chosen outcome, as, we would argue, is the case in Germany and Australia.²⁷ It follows that policy reform can, by appropriately changing these parameters, increase both fertility and labour supply. Thus we have a two-fold solution to the pensions problem: on the one hand the tax base expands in response to less gender biased policies, thus facilitating the financing of the increasing degree of aged dependency.²⁸ On the other hand the decline in fertility, which is at the root of the rising ADR problem, is at least to some extent reversed.

²⁶ See Apps (1991) for estimates of the disincentive effects of these kinds of policies on female labour supply, based on ABS unit record data.

²⁷ Labour market conditions are also important. In countries that experience a sharp increase in the rate of unemployment, fertility is also likely to decline, even though there may be policies in place that allow female labour supply and fertility to rise simultaneously. An example is Sweden, where a decline in the fertility rate during the 1990s tracked a dramatic increase in the rate of unemployment.

²⁸ This is demonstrated empirically in Apps (1991). The paper shows that, provided the Australian Government does not raise tax rates on working married women, an increase in female labour supply can be expected to achieve the growth in the tax base required for funding the aged pension without raising taxes on the working population in future years. See also Apps (2001).

To substantiate these statements Table 3 and 4 provides some across-country evidence on participation and fertility rates. Table 3 lists male and female participation rates (columns 1 and 2) and fertility rates (column 3) for 15 OECD countries in 1997.²⁹ The figures suggest that female participation rates are in general about three-quarters of the male

Table 3: Participation and total fertility rates, 1997

Country	Male % Participation* 1	Female % Participation* 2	Fertility Rate 3
Germany	80.4	62.6	1.36
Australia	83.8	63.7	1.78
United Kingdom	83.2	67.1	1.71
Ireland	77.8	50.3	1.92
United States	85.7	71.4	2.06
Canada	81.5	68.0	1.66
Netherlands	82.1	61.8	1.54
Sweden	79.6	75.0	1.52
Norway	85.4	75.3	1.85
Finland	76.6	69.6	1.75
Denmark	85.2	75.2	1.75
France	74.4	60.1	1.71
Portugal	81.3	65.1	1.46
Italy	74.9	44.1	1.22
Spain	74.6	47.1	1.15

*% of population aged 15-64 years

Table 4: Fertility, participation and employment rates, 1970-1997

Year	1970	1980	1990	1997
<u>Germany</u>				
1 Fertility rate	2.03	1.56	1.45	1.36
2 Female participation rate* %	48.1	52.8	56.7	62.6
3 Female employment rate* %	45.4	48.5	50.9	52.0
4 Female FT employment rate* %	**	**	35.7	35.6
<u>Australia</u>				
1 Fertility rate	2.86	1.90	1.91	1.78
2 Female participation rate* %	46.5	52.7	62.1	63.7
3 Female employment rate* %	45.4	45.2	55.0	55.6
4 Female FT employment rate* %	**	29.4	33.8	32.8

*% of population aged 15-64 years

** Data not available

rates. This is however a misleading indication of the real relationship between male and female labour supplies, because it conceals large difference in hours actually worked.

The participation rates in Table 3 fail to provide a reliable measure of female labour supply because, in the first instance, they can incorporate a high rate of unemployment. They can also include a high rate of part time work. The problem is illustrated in Table 4. The table presents female labour force participation, employment and fertility rates for Germany and Australia across ten year intervals, from 1970 to 1990, and for 1997. For each country, row 1 gives the total fertility rate and rows 2 to 4, female participation, employment and full time (FT) employment rates, respectively.

While Table 3 reports 1997 female participation rates of 62.6 per cent for Germany and 63.7 for Australia, female employment rates are only 52.0 per cent and 55.6 per cent, respectively, due to female unemployment rates of 10.6 per cent for Germany and of 8.1 per cent for Australia. In Germany, 31.4 per cent of female participants are employed part time and, in Australia, 44.0 per cent are employed part time. (Note that the corresponding percentages for males are much lower, at 4.1 per cent for Germany and 14.6 per cent for Australia.) Thus, rates of full time female employment are quite low, at 35.6 per cent for Germany and 32.8 per cent for Australia. Moreover, if we look at full time rates from 1980 for Australia, we see that there has been very little change over this period.

These figures suggest that increases in female labour supply in recent decades have been far less remarkable than participation rates would seem to suggest. But even these more detailed figures still fail to reflect adequately the size of the gap between male and female labour supplies that still exists. For more reliable information we need to look at time use survey data, decomposed by average hours over the life cycle phases defined above. These data not only indicate a large gap between female and male market hours of work, but they also show that there are large differences in average hours worked by females according to phase of the life cycle.

²⁹ Source: Labour Force Statistics, OECD, 2000.

Tables 5 and 6 present data means for male and female hours of market work and domestic work for Germany and Australia, by phase in life cycle. The results for Australia are derived from the ABS data samples used to construct the life cycle profiles in Table 1. The figures for Germany are based on data for a sample of households containing two adults, selected from the 1995 German Socio-Economic Panel (GSOEP) wave twelve. The selection criteria match closely those described for the selection of couple income units from the ABS files. The GSOEP sample contains 1606 household records, and is split into life cycle phases on criteria similar to those described previously for the ABS samples.³⁰

Table 5: Mean hours of work p.a., Germany, 1995

Life cycle phase	Male hours of work			Female hours of work		
	Market 1	Domestic 2	Total 3	Market 4	Domestic 5	Total 6
1	2135	613	2748	1836	979	2815
2	2203	1501	3704	503	4477	4981
3	2163	1232	3395	665	3668	4334
4	2017	652	2669	970	2048	3018
5	1701	555	2256	655	1813	2468
6	0	740	740	136	1577	1713

Table 6: Mean hours of work p.a., Australia, 1993

Life cycle phase	Male hours of work			Female hours of work		
	Market 1	Domestic 2	Total 3	Market 4	Domestic 5	Total 6
1	1733	805	2538	1481	1244	2725
2	1734	1503	3237	507	3838	4345
3	1809	1317	3126	737	3149	3886
4	1733	928	2661	1023	2150	3173
5	1505	910	2415	773	1830	2603
6	0	1479	1479	148	2027	2175

The tables give data means for market and domestic hours of work p.a. for males (columns 1 and 2) and for females (columns 4 to 5) in each of the six life cycle phases.

³⁰ In the case of some records in the GSOEP sample the time allocations have been weighted to ensure that the time constraint is not exceeded. No record in the ABS TUS sample exceeds the time constraint.

Columns 3 and 6 give male and female total hours of work p.a. While the life cycle profile of male hours is relatively flat in both countries, this is not the case for the profiles of female hours in either country. In contrast to the results for males, female market hours show a peak at the pre-child stage, a substantial fall when young children are present, followed by a steady increase as the children grow up, with a second, but smaller peak when the children are teenaged.

The most striking feature of the hours profiles is the dramatic substitution of domestic for market work by females when pre-school children are present in the household. Though this substitution is very marked for Australia, it is even more so for Germany. We would attribute this switch primarily to a lack of access to market child care, as a substitute for domestic child care. In Australia, child care is costly, due to market failures (including liquidity constraints on borrowing) that are inherent in privatised provision of education and child care, together with inadequate government support. The latter is evident from the life cycle profile of Government indirect benefits in Table 2. As noted, these benefits comprise government spending on schooling, pre-school and child care. By far the lowest per capita spending on children occurs in phase 2, yet this is the time when the cost of a child to parents is greatest.³¹ While the Government now offers a Child Care Rebate, most employed mothers do not earn a sufficiently high net-of tax income to be able to afford the fees in government approved care, which is the only way they can access the Rebate. Moreover, by working with a child under 5 they now also lose a substantial government transfer in the form of Family Tax Benefit Part B. A low female participation rate, and correspondingly lower average hours of work, in the pre-school phase is an obvious outcome of these policies. A likely explanation for the more marked effect in Germany is school hours (in Germany schools typically close at midday), together with limited access to affordable after-school care.

³¹ In fact, the figure of \$2,709 for phase 2 in Table 2 largely reflects the cost of the few children aged between 4 and 5 who are just old enough to start school. The average indirect child care benefit for a child under five, who is not school or preschool, is only \$308. Of the average 1.90 children per household in phase 2, 0.33 are at school. For a more detailed breakdown of government benefits by phase in life cycle, together with life cycle taxes, see Apps (2001).

It is worth noting that total hours worked by both parents show a large peak when pre school children are in the household. An explanation for this is capital market constraints, which prevent parents borrowing at a reasonable interest rate to buy in child care that substitutes for their own time. These constraints arise from the uncertainties surrounding the future income of the child. There is also an agency problem.³²

It is important to emphasise that these average figures conceal wide variation both in female employment and labour supply across households at each phase of the life cycle. Table 7 shows the female employment rate for each country (columns 1 and 4) and the average number of children (columns 2 and 5), in phases 1 to 5. Columns 3 and 6 give the average number of children in families in which the female partner is employed. The female employment rate in Germany is below the Australian rate, and the average number of children is also lower, in each phase. Thus we observe both lower participation rates and lower family size. These data support our general argument that policy variables influence female labour supply after controlling for demographics. Note also that the number of children in families in which the mother is employed is only slightly lower than in families in which she stays home. To the extent that this reflects a forced trade-off between children and female labour supply under current tax and child care policies, the result could well be reversed by the introduction of less distortionary policies.

Table 7: Female employment and family size

Life cycle Phase	Germany, 1995			Australia, 1993		
	Emp	#kids	#kids	Emp	#kids	#kids
	%	All	Emp	%	All	Emp
	1	2	3	4	5	6
1	83.2	0	0	83.5	0	0
2	33.3	1.83	1.64	54.2	1.90	1.76
3	60.3	2.02	1.92	64.5	2.66	2.36
4	65.7	1.52	1.55	72.4	1.75	1.77
5	47.6	0	0	63.7	0	0

³² For further discussion of these points see Apps and Rees (2002a).

There has been very little serious discussion, at a political level, of policies to increase fertility in Australia. However, this is not the case in Germany, where there has been a very extensive debate on policies toward family support to increase fertility, as well as on pensions. The debates on both provide a good example of the way in which issues, that are in reality interrelated, are compartmentalised and discussed separately, with counter-productive results.

There are two alternative family policy proposals directed at attempting to reverse the fertility decline in Germany. The right-of-centre CDU/CSU party proposes a substantial increase in child grants, without, however, specifying how they would be financed. The left-of-centre SPD/Greens coalition proposes a group of measures designed to make it more feasible for women to combine having children with working outside the home. This includes improving the quality and availability of pre-school child care, reducing its cost and substantially widening the availability of all-day schooling. Associated with this is the proposal to end joint taxation for higher-earning households, as a means of financing the proposals, at least in part.

As the analysis in Apps and Rees (2002b) shows, the key difference between the impacts of the two types of policy is in the effect on female labour supply. Given that the increases in child grants would be funded by tax increases, their main effect is to reduce female market labour supply. To the extent that fertility is increased, since there is no change in the relative costs of child care within and outside the home, there is a switch of female labour supply out of the market and into the home. In addition net wage rates fall, thus reinforcing this switch. This represents a fall in the tax base, and therefore makes it harder to finance a PAYG pension scheme, as well as raising the marginal tax cost of this policy.

On the other hand, reducing the cost of market substitutes for domestic child care reduces the costs of children in a way that leads to an increase in female market labour supply, since the relative price of bought in child care falls. Thus an increase in fertility is associated with an increase in the tax base, so increasing the ability to fund the pension

scheme and reducing the marginal tax cost of family support. It can therefore be shown that a balanced budget increase in expenditure on child care outside the home and reduction in the child grant actually increase both fertility and female labour supply. This has beneficial effects on the ability to finance the pension scheme in both the long run and the short. These effects are reinforced if there is also a departure from joint taxation. Given the stylised fact that female labour supply elasticities are significantly higher than male, the reduction in marginal tax rates on female and increase in tax rates on male labour supplies lead to a net expansion of aggregate gross income³³ and the tax base.

5 Concluding comment

In this paper we have shown that an increasing ADR does not necessarily signal a crisis in terms of the burden on the working populations of future generations, and that it only appears to do so if there is a mistaken emphasis on the ADR alone. The paper has examined the problem in the more fundamental terms of the underlying resource allocation, taking account of the fact that the working population generates outputs that are consumed not only by themselves and the retired, but also by their children.

Population ageing due to declining fertility is associated simultaneously with an increasing ADR and a falling child dependency ratio (CDR). In an empirical analysis we have shown that the average cost of child is greater than that of a retired person, from which it follows that the total costs of dependency, both of the old and of the young, must fall with a decline in fertility. Thus, there should be an increase in the share of aggregate output consumed by the working population in the future, at least until any possible rise in the fertility rate. The challenge for policy is, on the one hand, to bring about the reallocation of resources required to achieve this outcome while fertility declines and, on the other, to lay the foundation for an economy that will, in the future, be able to afford an increase in fertility. This will mean policy reforms that permit female labour supply and fertility to increase simultaneously, in place of those that presently inhibit both.

³³ For further analysis of this see Apps and Rees (1999a).

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