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Abstract

Coping with aging populations is a challenge for most developed countries. The support of non-working adults can create an unsustainable burden on those working. One way of dealing with this is to raise the normal pension age, but this has proven to be unpopular. A complementary approach is to raise the average labor force participation rate. These policies are generally more politically palatable. We conceptualized and estimated, for the first time, the tradeoff between pension age and labor force participation rate policies and show that, in most European countries, a difference in policies that results in an increase in labor force participation rates by an additional one to two percentage points by 2050 can substitute for a one year increase in the normal pension age.

Acknowledgments

About the Authors

Sergei Scherbov is Research Group Leader at the Vienna Institute of Demography, Austrian Academy of Sciences and Senior Research Scholar at the International Institute for Applied Systems Analysis.

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Quantifying Policy Tradeoffs to Support Aging Populations

Sergei Scherbov, Warren C. Sanderson and Marija Mamolo

1 Introduction

Most developed countries face a demographic challenge – population aging will reduce the portion of the adult population who participate in the labor force given current age-specific participation rates (United Nations 2010; Lutz, Sanderson and Scherbov 2008).

Non-working adults will have their consumption financed largely by those who are working and the burden of these transfers can become unsustainable (Kotlikof and Burns 2004; European Commission 2010). One way of dealing with this challenge is to decrease pension costs, most visibly by increasing normal pension ages (OECD 2011). Governments can always save money by increasing normal pension ages. But if budgetary considerations are the sole rationale for raising the pension age, it is unclear why alternative expenditure reductions or revenue increases are not equally satisfactory. Another rationale for raising pension ages is that pensioners are living longer. According to this argument, it is unfair to younger generations to have to pay for the older generations' longevity gains. Older generations enjoying those gains should help pay for them by retiring later. But retiring later is not the only way for generations enjoying longevity gains to help finance their retirement years. Higher labor force participation rates during their working ages would also contribute. In this article, we address the tradeoffs between pension ages and labor force participation rates in affecting the burden on younger generations of supporting nonworking adults as life expectancies increase and populations age.

It is easy to imagine that an intergenerationally equitable policy would be to increase normal pension ages one year for every year of life expectancy increase at the pension age, but this is not generally the case. Raising the pension age *pari passu* with the life expectancy at the pension age guarantees that each generation receives a pension for the same average number of years, but that the pension is received later after people have worked, on average, longer. A rough rule of thumb is that other things being equal an intergenerationally equitable policy would be one that raised the normal pension age by half a year for every year of additional life expectancy at the pension age.

But everything else need not be equal. A complementary approach to reducing the burden on the working population is to implement policies aimed at increasing labor force participation rates. The political dialogue, however, has not generally recognized that there exists a potential tradeoff between normal pension ages and labor force participation rates that can be translated into policy with good effect.

We have conceptualized and estimated these tradeoffs for the first time for all EU countries. We show the mix of pension age policies and labor force participation rate policies that would keep the burden on workers of supporting nonworking adults at

selected levels relative to 2009. As part of this analysis, we demonstrate that, in most European countries, a difference in policies that results in an increase in labor force participation rates by an additional one to two percentage points by 2050 can substitute for a one year increase in the normal pension age.

2 Results

In each year we compute the average support provided to adults out of the labor force as a percentage of the average income of people in the labor force. We call the ratio of this average in 2050 to that in 2009 the "relative burden". This ratio depends on the normal retirement age, the average labor force participation rate[1] and on the age structure of the country[2] (see Appendix Section 1).
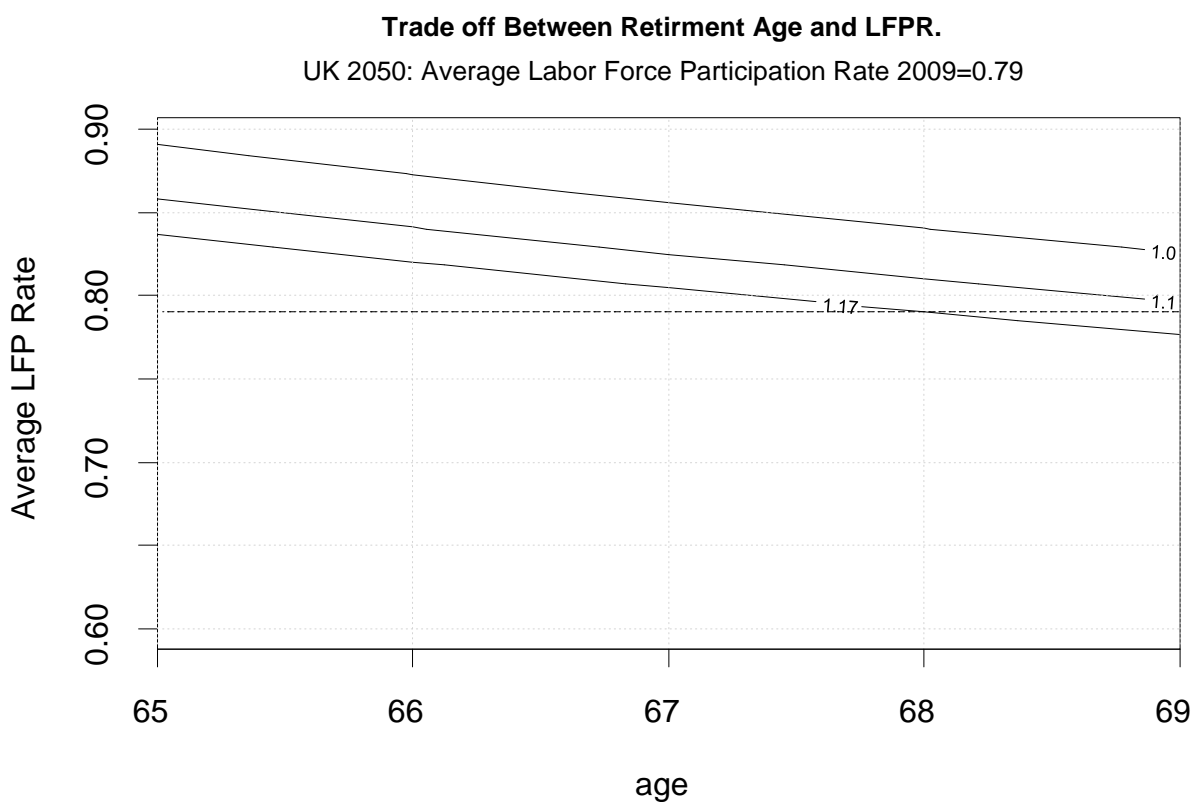

Figure 1. Tradeoff between pension age and labor force participation in the UK in 2050.

Note: Average labor force participation rate is computed as an unweighted average of the age specific labor force participation rates over the age groups 20-24 to 60-64. Three levels of the relative burden are shown. The line labeled 1.17 is consistent with a normal pension age of 68 and the 2009 average labor force participation rate (0.79).

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[1] We define the average labor force participation rate as the unweighted average of the labor force participation rates over nine five year intervals from age 20-24 to 60-64. We take the average only up to age group 60-64 so as to keep the averages consistent as normal pension ages change.
[2] The age structures that we use here are derived from a new set of population forecasts for all EU countries (Vienna Institute of Demography 2010).

In Figure 1, we illustrate the tradeoff between pension ages and labor force participation rates using an example from the UK in 2050. The graph has three lines each representing a different level of the relative burden. The top line shows the tradeoffs between normal pension ages and average labor force participation rates that would keep the burden of supporting adults not in the labor force at its 2009 level. The middle of these iso-burden lines shows the tradeoffs in the case where the burden in 2050 is 10 percent higher than it was in 2009. Current legislation in the UK raises the normal pension age from 65 currently to 68 by 2046 (UK Department of Work and Pensions 2006), although this schedule may be shortened somewhat because of current budgetary difficulties (Guardian 2009). As can be seen from the lowest line in Figure 1, keeping the average labor force participation rate constant at its 2009 level and raising the normal pension age to 68, would result in a relative burden in 2050 which is around 17 percent higher than in 2009. The Figure shows an array of policy options available to UK policy-makers. One option is to set the retirement age at 68 and raise the average labor force participation rate from its 2009 level of 0.79 to 0.85. This mix would keep the relative burden at its 2009 level. An alternative policy with the retirement age at 68 would be to increase the average labor force participation rate to 0.82 instead of 0.85. In this case, the relative burden would be 10 percent higher in 2050 than in 2009. If the UK wanted to keep the relative burden at its 2009 level it could increase the normal pension age to 69 and increase the average labor force participation rate to 0.83 or keep the normal pension age at 65 and raise the average labor force participation rate to 0.89.

Not all countries have as wide a range of options as the UK. Spain has recently enacted a pension reform to increase the normal pension age from 65 to 67 by 2027. We can see from the Figure for Spain in Appendix Section 2 that if the relative burden in 2050 is to be less than 20 percent higher than its 2009 level, an even greater increase in the pension age would be necessary. The 20 percent higher figure could be attained with a normal pension age of 69 and an average labor force participation rate of 0.88, up from 0.75 in 2009. The difference between the relatively accommodating situation of the UK and that of Spain is due to their difference recent demographic histories. Spain had a rapid fertility decline in the 1980's to a level considerably below that of the UK. The speed and extent of the Spanish fertility decline relative to that in the UK makes aging there more rapid and causes the support of nonworking adults to be more challenging.

Italy had a recent demographic history similar to that of Spain, but in 2009 had one of the lowest average labor force participation rates in the EU, which means that each working adult had to support more nonworking adults. A recent pension reform in Italy raises the normal pension age to 68 years and 4 months by 2050. In the Figure for Italy in Appendix, Section 2, we can see that with that pension age and an increase in the average labor force participation rate from 0.65 in 2009 to 0.74 in 2050, the relative burden would increase by 20 percent. In order for the relative burden in 2050 to remain at its 2009 level, the average labor force participation rate would have to increase to 0.81.

In Appendix Section 2, we present similar tradeoff plots for all EU-27 countries. In most EU countries, keeping the relative burden at its 2009 level in 2050 with a pension age of 68 would require increases in the average labor force participation rates. In some countries, there are no feasible average labor force participation rates which would allow the average burden to remain at its 2009 level.

Our tradeoff graphs quantify the effects on normal pension ages of increasing average labor force participation rates. The near linearity of the iso-burden curves means that their slopes are good approximations of tradeoffs between changes in the normal pension age and changes in average labor force participation rates. We show the slopes of the tradeoff lines for EU-27 countries in Table 1. Generally by 2050, it would take an additional increase in the average labor force participation rate of between 1 and 2 percentage points to substitute for a one year increase in the normal pension age.

Table 1: Additional Percentage Point Changes in Average Labor Force Participation Rate Needed to Substitute for a One Year Increase in Pension Age for 3 Levels of Relative Burden (RB) in 2050, The Same as 2009 (RB = 1.00), 10 Percent More than 2009 (RB = 1.10), and 20 Percent More than 2009 (RB = 1.20), EU-27 Countries.

Country	No Change in Relative Burden	Relative Burden Increases by 10%	Relative Burden Increases by 20%
Austria	1.7	1.7	1.7
Belgium	1.6	1.4	1.3
Bulgaria	2.2	2.1	2.0
Cyprus	1.7	1.7	1.7
Czech Rep.	1.9	2.0	2.0
Denmark	1.6	1.7	1.7
Estonia	2.0	2.0	2.0
Finland	1.8	1.8	1.8
France	1.6	1.5	1.5
Germany	NA	1.9	1.9
Greece	2.0	1.9	1.8
Hungary	1.6	1.5	1.4
Ireland	1.9	1.9	1.8
Italy	1.8	1.6	1.5
Latvia	2.0	2.1	2.1
Lithuania	1.9	1.9	1.8
Luxembourg	1.6	1.5	1.3
Malta	1.7	1.6	1.5
Netherland	NA	1.6	1.6
Poland	2.0	2.0	1.9
Portugal	1.9	1.9	1.9
Romania	2.0	1.8	1.7
Slovakia	2.0	2.0	2.0
Slovenia	NA	1.9	1.9
Spain	NA	NA	2.1
Sweden	NA	1.7	1.8
UK	1.6	1.6	1.5

Note: Slopes are computed as the absolute value of the average change over the ages that appear in the Appendix Figures Section 2.

Average labor force participation rates in the EU in 2009 varied from a low of 0.63 in Malta and to a high of 0.84 in the Sweden. In France, the average was 0.75 and in the UK it was 0.79 or 4 percentage points higher than in France. An additional increase in the French average labor force participation rate of 4 percentage points by 2050 would almost completely substitute for a 3 year increase in the normal pension age. Italy had a relatively low average labor force participation rate in 2009, 0.65, ten percentage points lower than France's. An additional 5 percentage point increase in the average labor force participation rate in Italy in 2050, half the difference to France's level in 2009, would substitute for a 3 year increase in the normal pension age. In developed countries, labor force participation rates in the ages prior to the normal pension age differ widely. For example, in 2009, the labor force participation rate among 55-59 year olds in Denmark was 84.6 percent, 62.5 percent in France, while in Malta it was 48.5 percent (see Appendix Section 3 for the labor force participation rates of all EU-27 countries). These differences in labor force participation rates are uncorrelated with rates of disability (Sanderson and Scherbov 2010) (see Appendix Section 4), and are likely to be influenced by policy differences (European Commission 2010; Burniaux, Duval and Jaumotte 2004).

3 Discussion

Increasing the normal pension age besides being unpopular (BBC News Europe 2010; Guardian 2011; Euronews 2010) takes decades to implement, as the British example shows. Labor force participation policies, typically can be implemented much more rapidly, in part because they are likely to be more popular, and so can contribute to solving the fiscal problems associated with aging sooner, but both will be required to reduce the increase in the relative burden on working adults of supporting those who are not working. This makes it crucial not to neglect the role of labor market policies in discussions of pension age reforms.

Labor force participation rate policies can be divided into those that primarily affect the supply of labor and those that primarily affect the demand for labor. Two groups are most frequently targeted by these policies, women and older workers. For women, three supply-side policies are particularly relevant. They are more flexible working hours, support for families with young children, and equal tax treatment for married and single women. Empirical studies have shown that these policies can result in an increase in female labor force participation (Jaumotte 2003; Del Boca 2002; Euwals 2001; Smith et al. 2003; Lefebvre, Merrigan and Verstraete 2009; Kornstad and Thoresen 2006). The demand-side policy of enforcing anti-sex discrimination laws could also help.

Flexibility in hours of work, working conditions, and wages can provide an environment in which older people can continue to work. When wages are rigidly tied to seniority, older workers could have their positions terminated when their productivity falls. A phased retirement approach, could keep them working, perhaps with fewer hours and at a lower wage (Hutchens 2003). Education and training programs for older workers could also keep them interested in continuing to work and employers interested in continuing to hire them (Jones et al. 2009; Lechner, Miquel and Wunsh 2008; Crépon, Ferracci and Fougère 2007).

Tax and pension policies also affect the incentives for remaining in the labor force. In some countries, these policies produce high implicit tax rates on continued work. Evidence shows that removing financial incentives to retire prior to the normal pension age and making pension systems more actuarially fair would have a substantial effect on the labor force participation rates of older workers (Gruber and Wise 1998, 1999, 2004; Blöndal and Scarpetta 1999; Duval 2003; Börsch-Supan 2000).

Disability pensions are sometimes abused and become a vehicle to finance early retirement. (Gruber 2000; Euwals, van Vuuren and Wolthoff 2010; Whiteford 2006). For the majority of the working population, abuses of the disability system are often regarded as something negative. Reforming such systems is likely to be politically popular. A nuanced approach to disability where partially disabled people are encouraged to work up to their potential can also keep people in the labor force (Yin 2008). Anti-age discrimination policies can also be used.

While in the medium-term, policies to increase labor force participation rates can reduce the pressure for increases in the pension age, there is a limit to the ability to increase labor force participation rates. Because of this, and anticipated increases in life expectancies and improvements in health, some increases in the normal pension age are appropriate in the long-run (Sanderson and Scherbov 2005, 2010), in order to keep intergenerational balance.

While the public widely perceives increases in the normal pension age as a negative thing, many labor force participation policies are viewed positively, because they eliminate distortions, provide people with more opportunities, and reduce the fraudulent use of disability pensions. Because of anticipated increases in life expectancies and health at older ages as well as because of financial necessity, some mix of increases in pension ages and in labor force participation rates will be needed. The best mix is more likely to be found where the tradeoffs between the two are clearly articulated.

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Appendix Section 1

Computation of the Relative Burden. The average proportion of their income transferred to adults out of the labor force from people in the labor force in year *t* can be written:

$$TR_t = \frac{\tau_t \sum_{i=20}^{\omega} P_{i,t}(1 - lfpr_{i,t})}{\varphi_t \sum_{i=20}^{\rho_t} P_{i,t} \, lfpr_{i,t}} \, , \tag{1}$$

where TR_t is the average proportion of the income of people in the labor force transferred to adults out of the labor force in year *t* (relative transfer), τ_t is the average amount received by people out of the labor force in period *t* from those who are in the labor force, ω is the highest age at which these amounts are received (100 in our computation), $P_{i,t}$ is the population of people at age *i* in year *t*, $lfpr_{i,t}$ is the labor force participation rate at age *i* in year *t*, φ_t is the average incomes of people in the labor market in year *t*, and ρ_t is the normal pension age in year *t*.

The quantity $\frac{\sum_{i=20}^{\omega} P_{i,t}(1 - lfpr_{i,t})}{\sum_{i=20}^{\rho_t} P_{i,t} \, lfpr_{i,t}}$ is known at the economic dependency ratio, EDR_t.

In our computations, we hold $\frac{\tau_t}{\varphi_t}$ constant. Therefore,

$$\frac{TR_{2050}}{TR_{2009}} = RB_{2050} = \frac{EDR_{2050}}{EDR_{2009}} \, , \tag{2}$$

where RB_{2050} is the relative burden in 2050.

The population age structures in2009 are known Vienna Institute of Demography 2010). as are the labor force participation rates in that year (Table S1 and its source). The age structures of populations in 2050 are derived from the population projections in (Vienna Institute of Demography 2010). Therefore, everything on the right-hand side of equation (2) except for the labor force participation rates and the normal pension age in 2050. Earlier forecasts of economic dependency ratios for the United States can be found in (Toosi 2009). Forecasts for all EU countries appear in (Economic Policy Committee 2005). Past economic dependency ratios for EU countries were computed (apparently independently) in (Whiteford 2006).

We parameterize future labor force participation rates as follows:

$$lfpr_{i,t}\{\lambda\} = \lambda \max(lfpr_{i,2009}) + (1 - \lambda)lfpr_{i,2009} \, , \tag{3}$$

where the maximum in equation (3) is taken over all EU countries in 2009 supplemented by Iceland, Norway, and Switzerland. These maximum labor force participation rates are shown in SI.

In Table S1 and Figures S1-S27, we specify three different values of the ratio on the left-hand side of equation (2), 1.0, 1.1, and 1.2. Given one of these values and a value of the normal pension age allows us to solve equation (2) for *λ*. As *λ* increases from zero toward one, labor force participation rates approach their maximum values. Nevertheless, *λ* has the disadvantage that the same level in different countries could be associated with different labor force participation rates because of differences in the 2009 rates. To provide a measure that is comparable across countries, we compute the average labor force participation rates by taking the unweighted average of the age-specific labor force participation rates:

$$ALFPR_t\{\lambda\} = \frac{1}{9}\sum_{i=20-24}^{60-64} lfpr_{i,t}\{\lambda\} \, . \tag{4}$$

The results would be only slightly different if we had used a standard age structure to compute the $ALFPR_t\{\lambda\}$. We take the average only up to age group 60-64 so as to keep the averages consistent as normal pension ages (all age 65 or over in our examples) are changed.
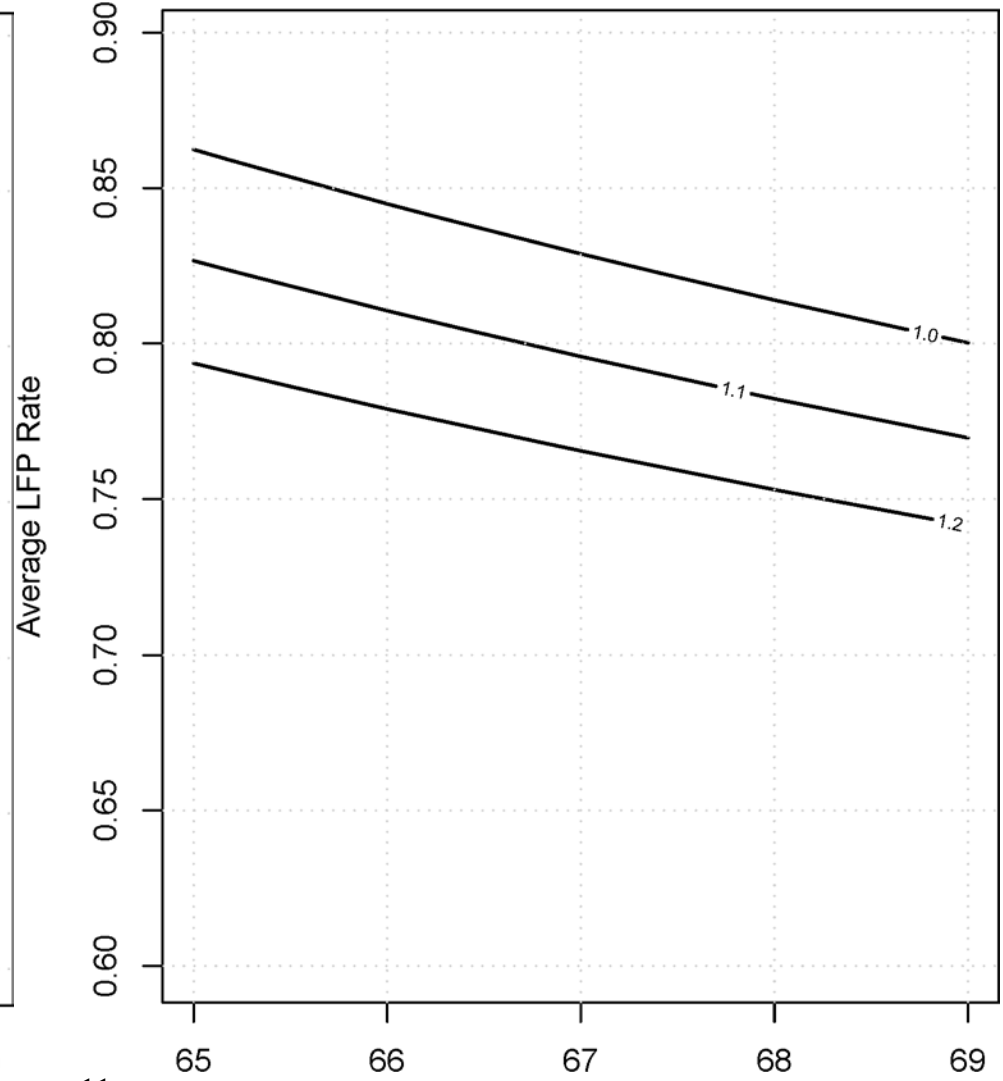
Appendix Section 2

Tradeoff Between Retirement Age and LFPR.
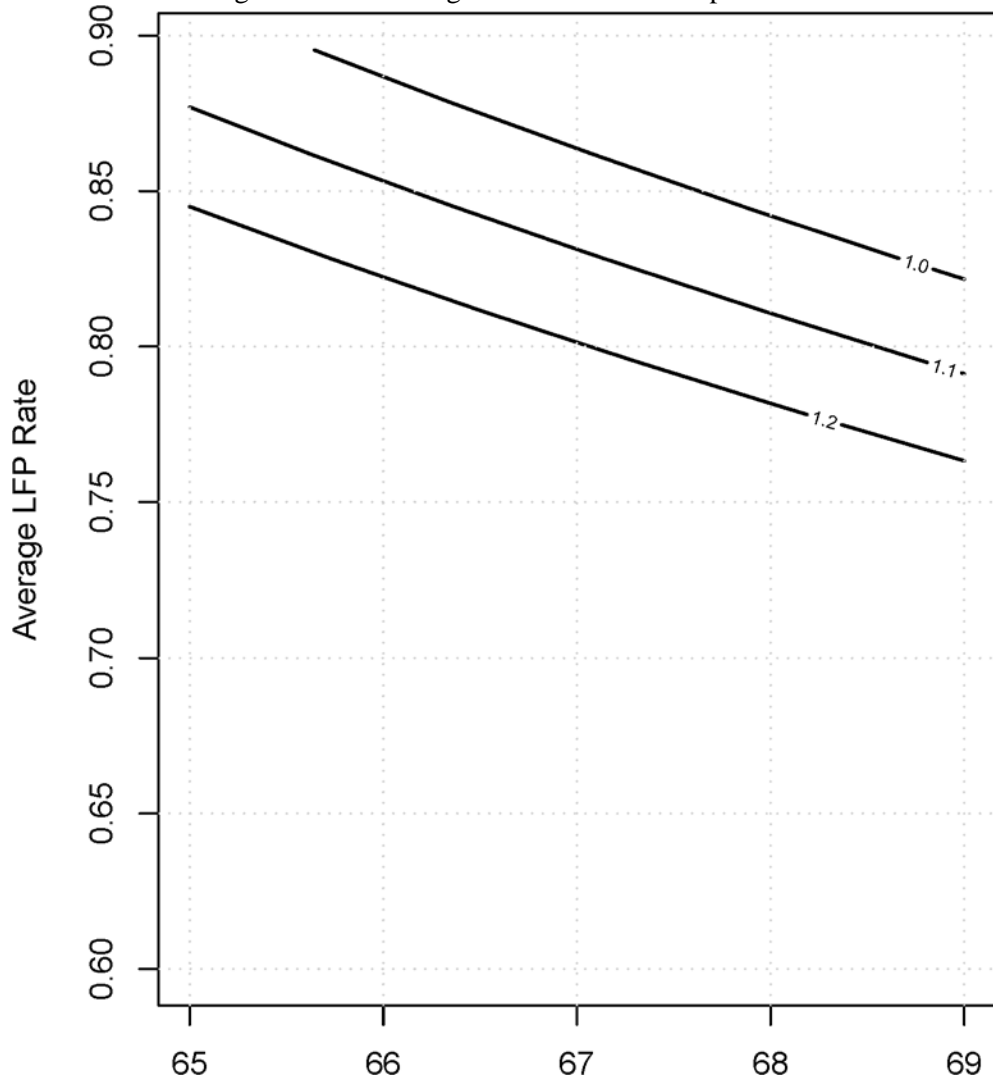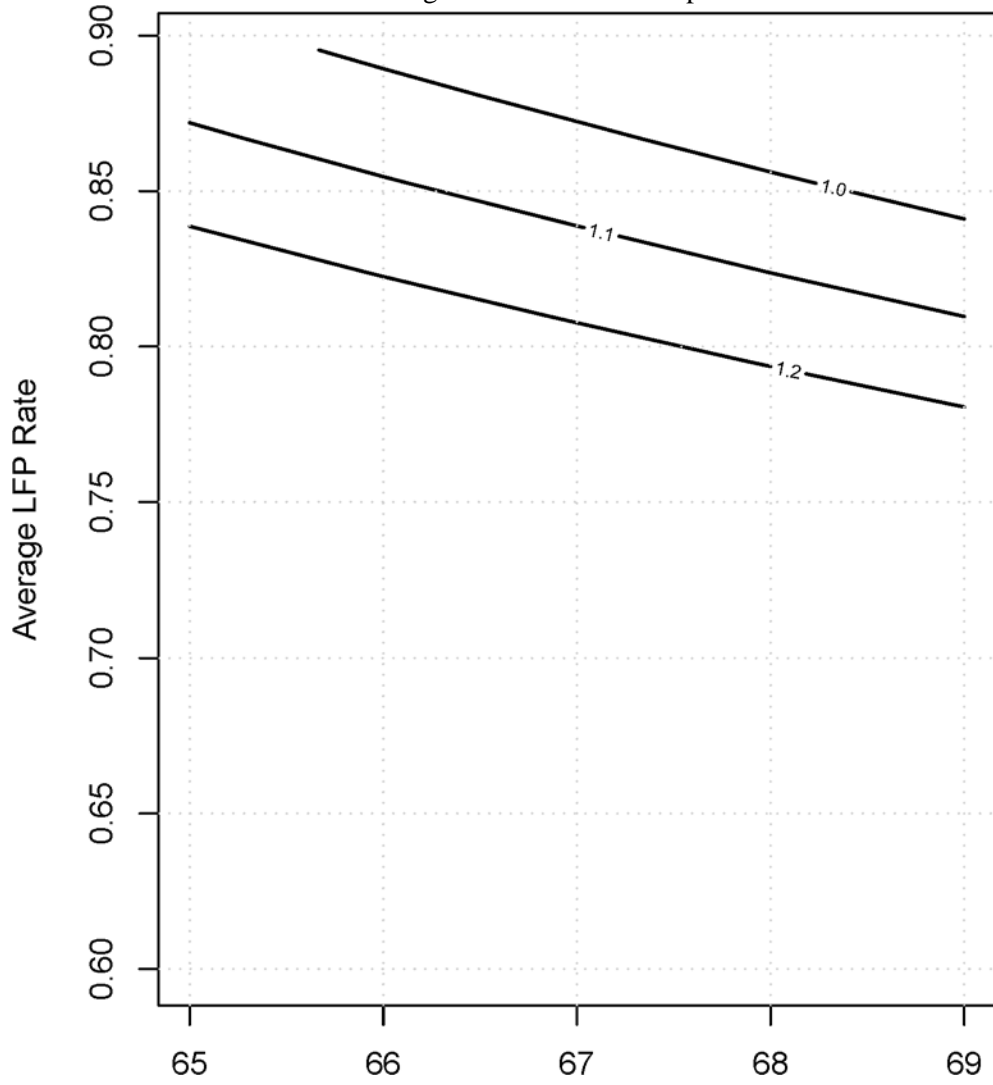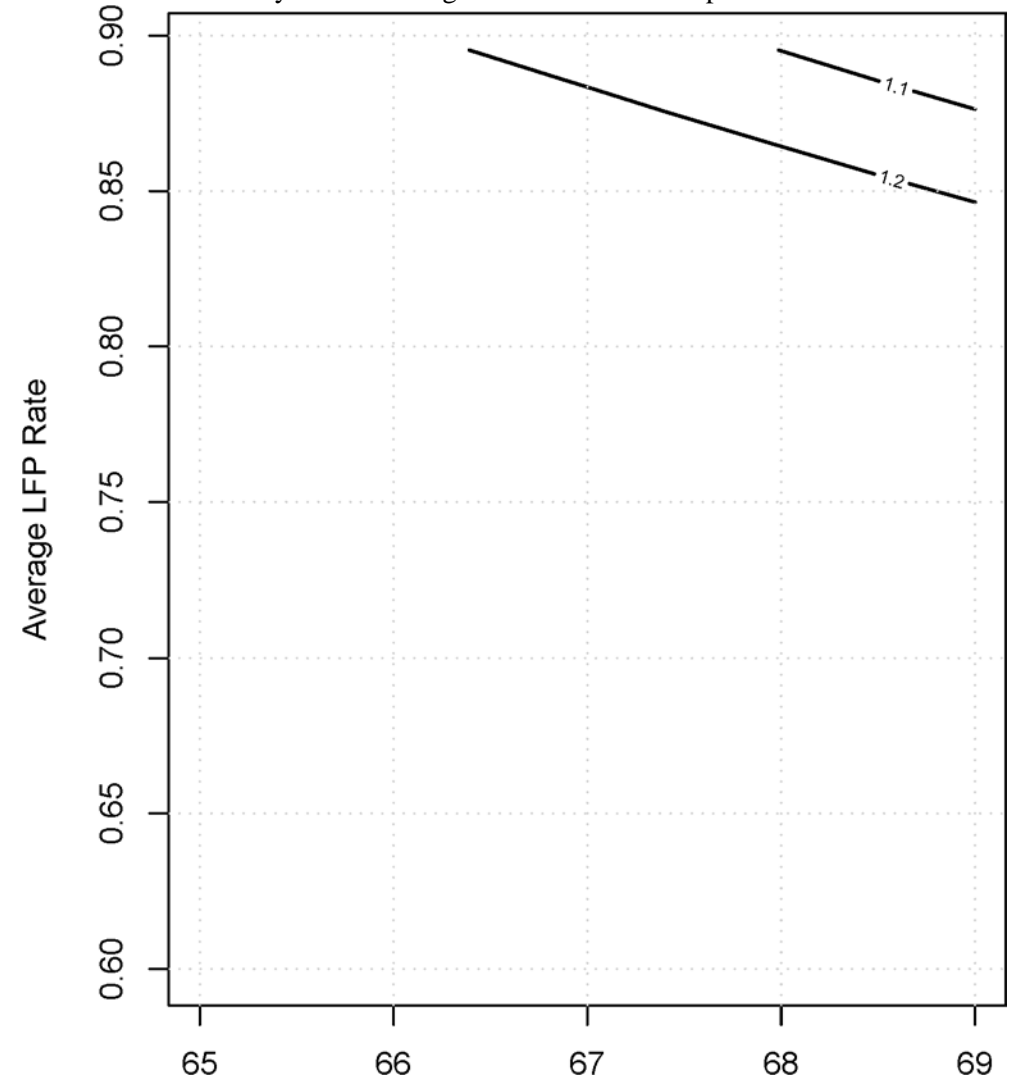
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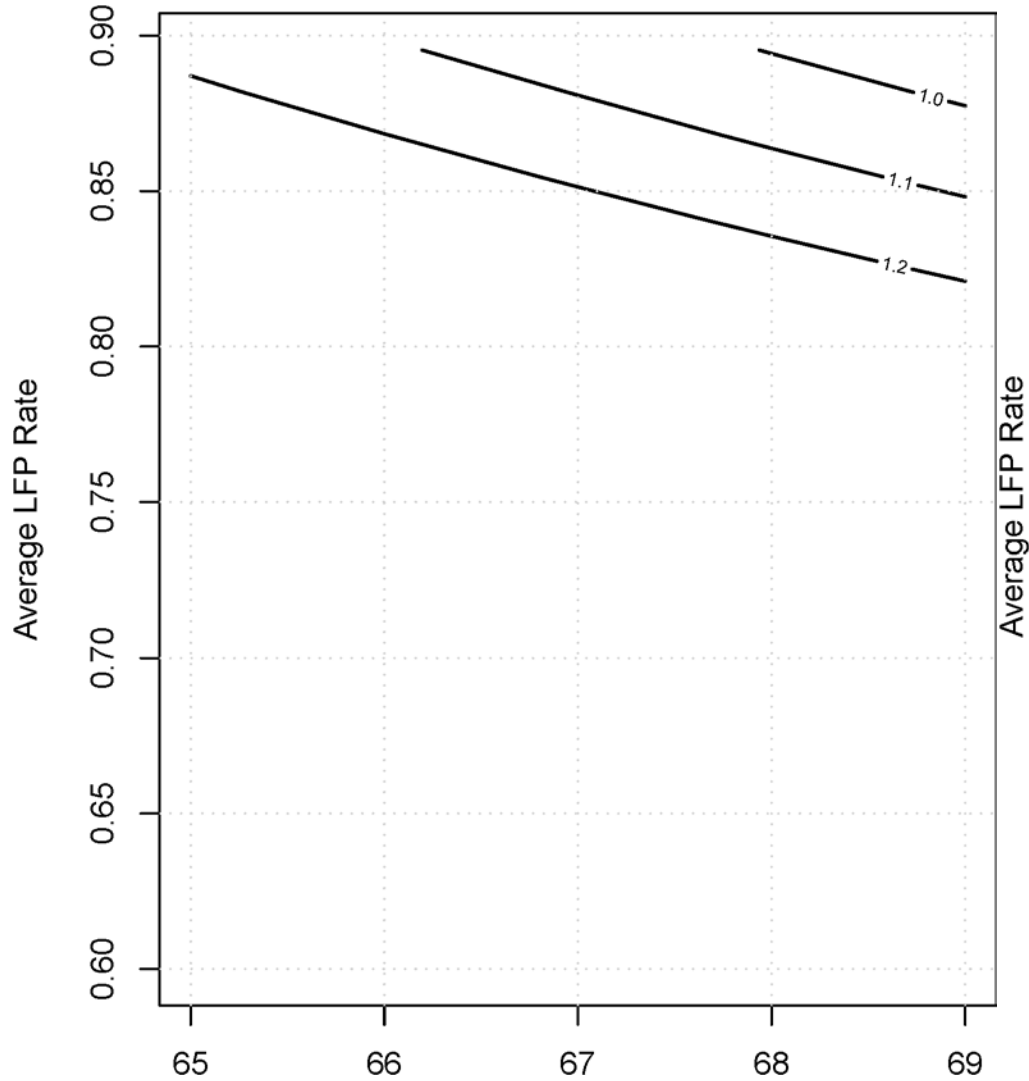
Tradeoff Between Retirement Age and LFPR.

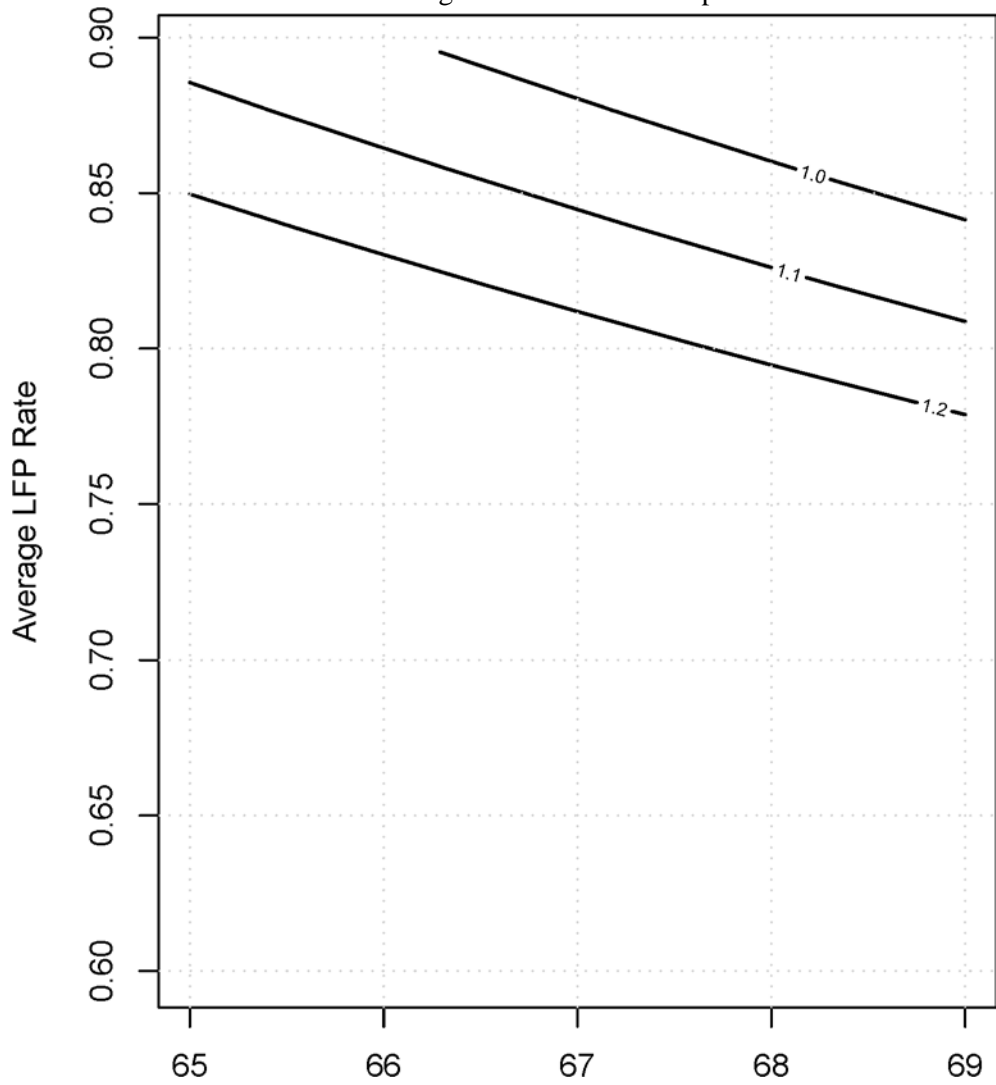Belgium 2050: Average Labor Force Participation Rate 2009=0.71

Tradeoff Between Retirement Age and LFPR.

Bulgaria 2050: Average Labor Force Participation Rate 2009=0.73

Tradeoff Between Retirement Age and LFPR.

Cyprus 2050: Average Labor Force Participation Rate 2009=0.78
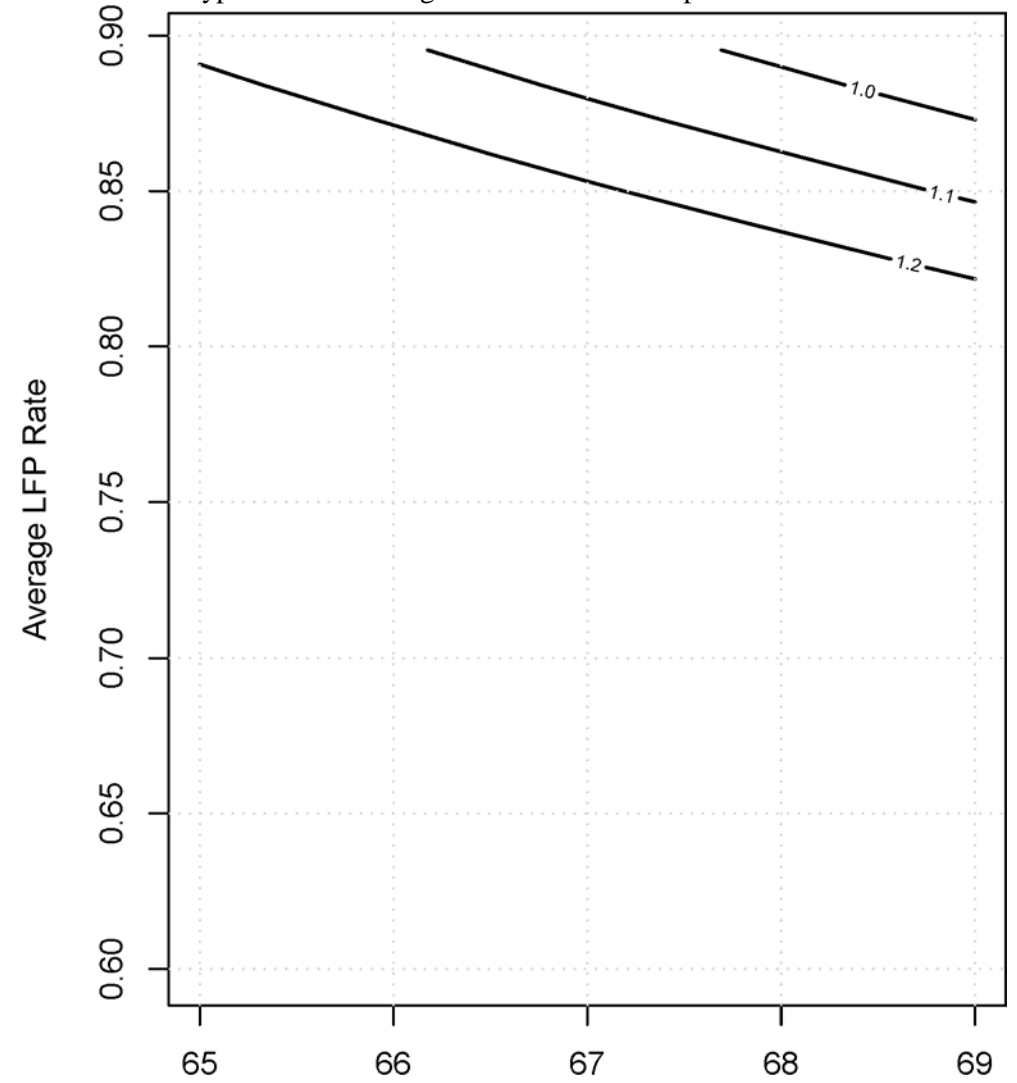
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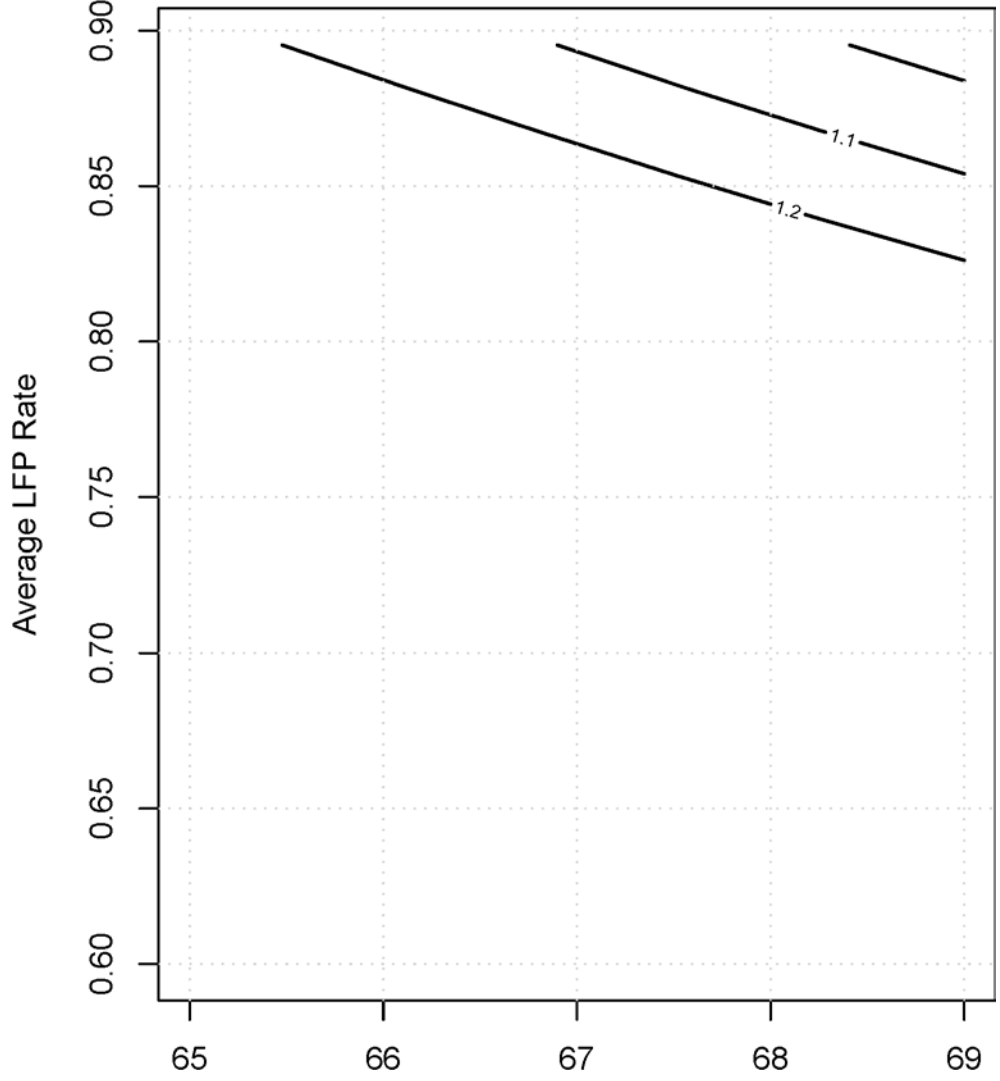
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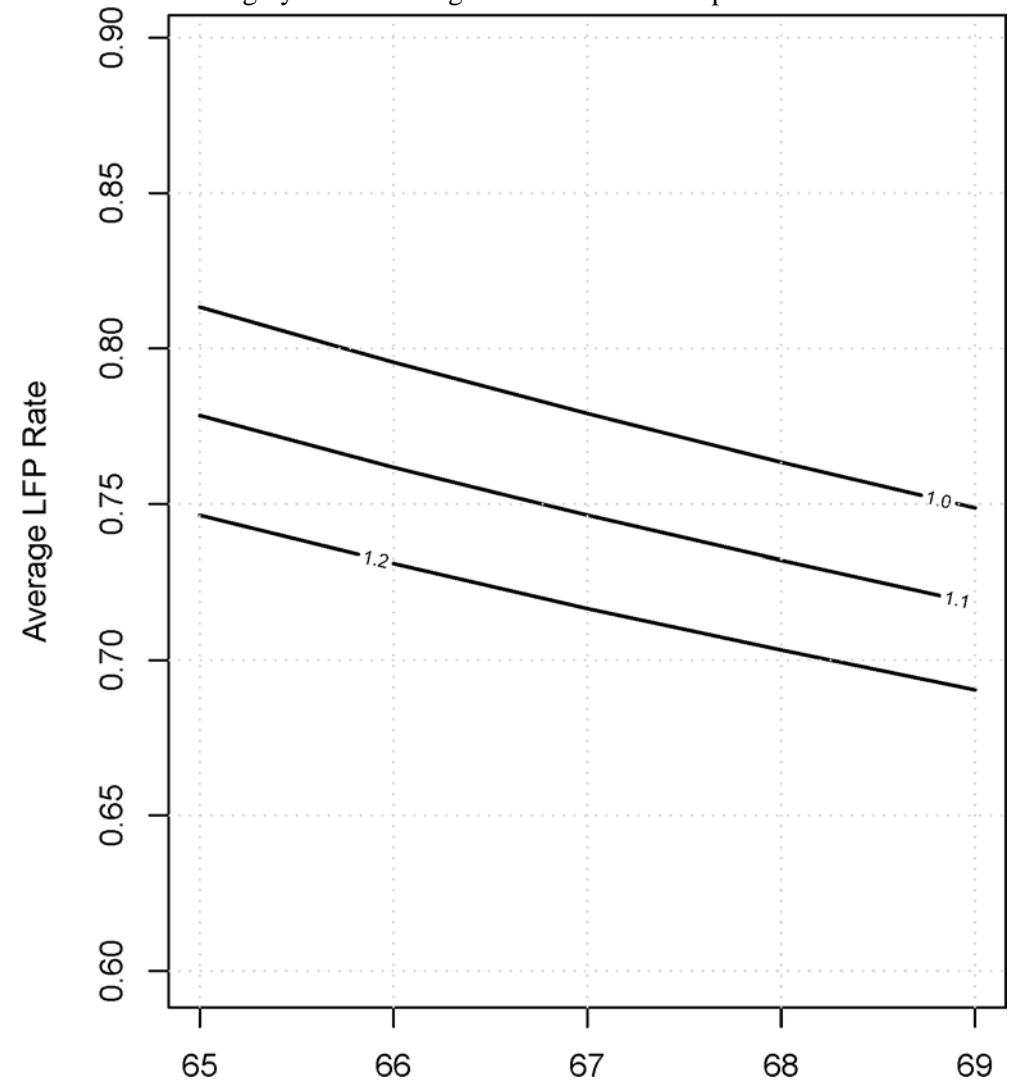Denmark 2050: Average Labor Force Participation Rate 2009=0.82
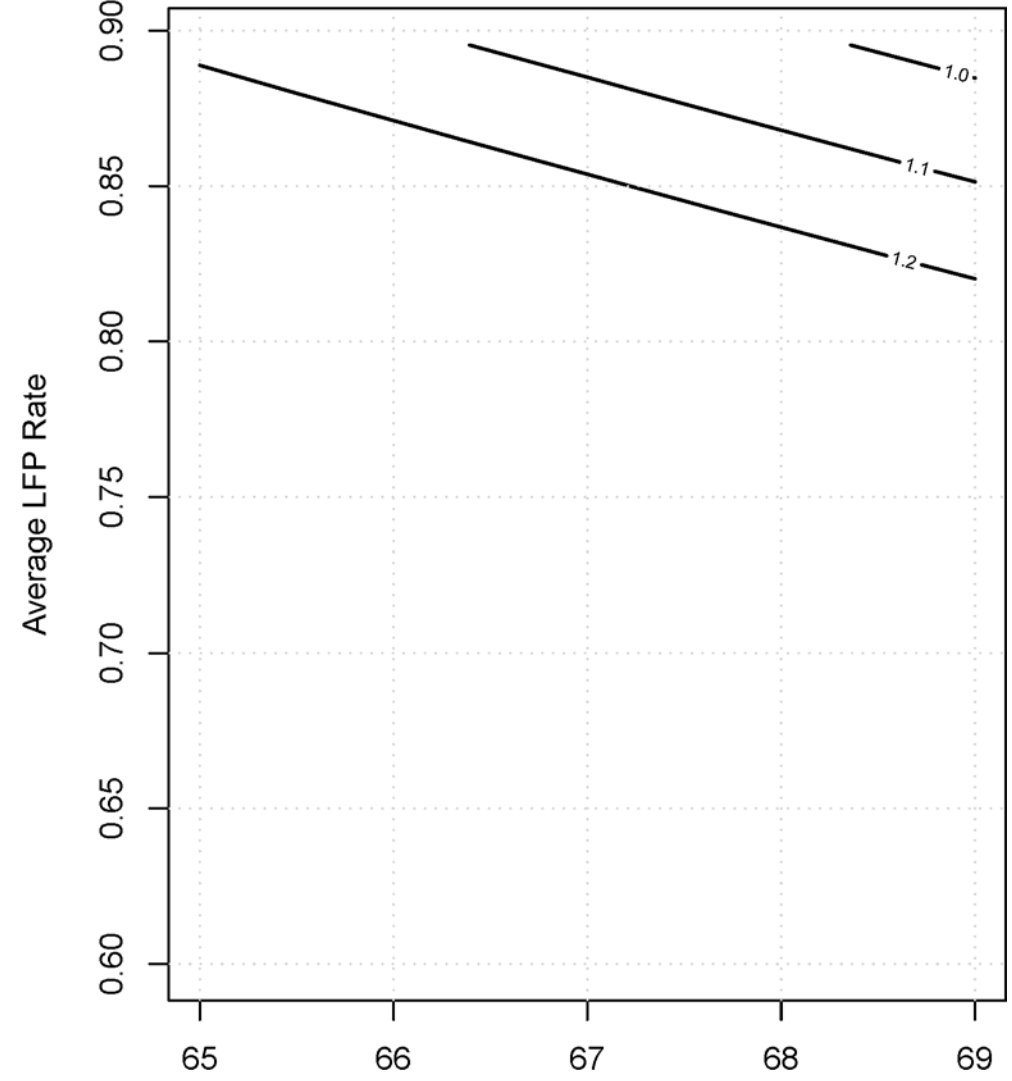
Tradeoff Between Retirement Age and LFPR.

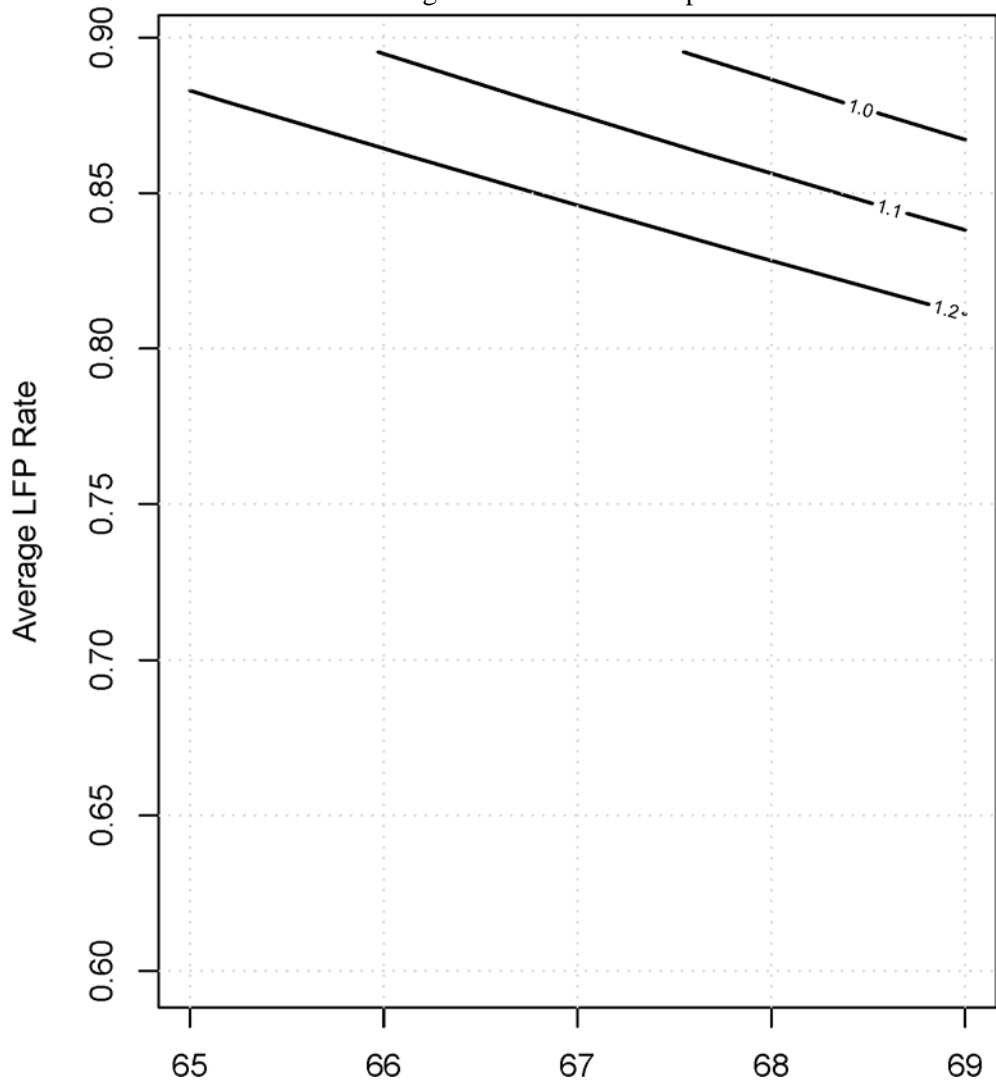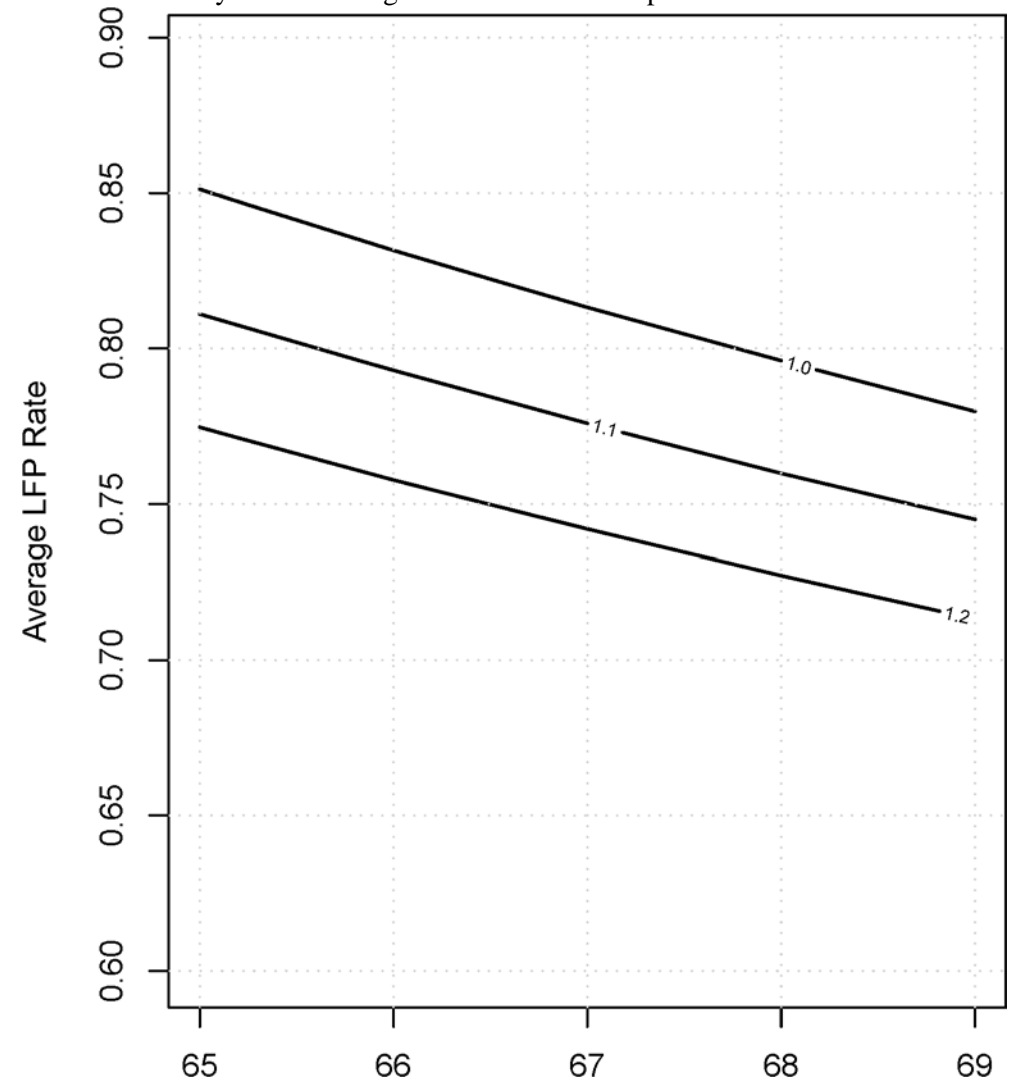Estonia 2050: Average Labor Force Participation Rate 2009=0.80
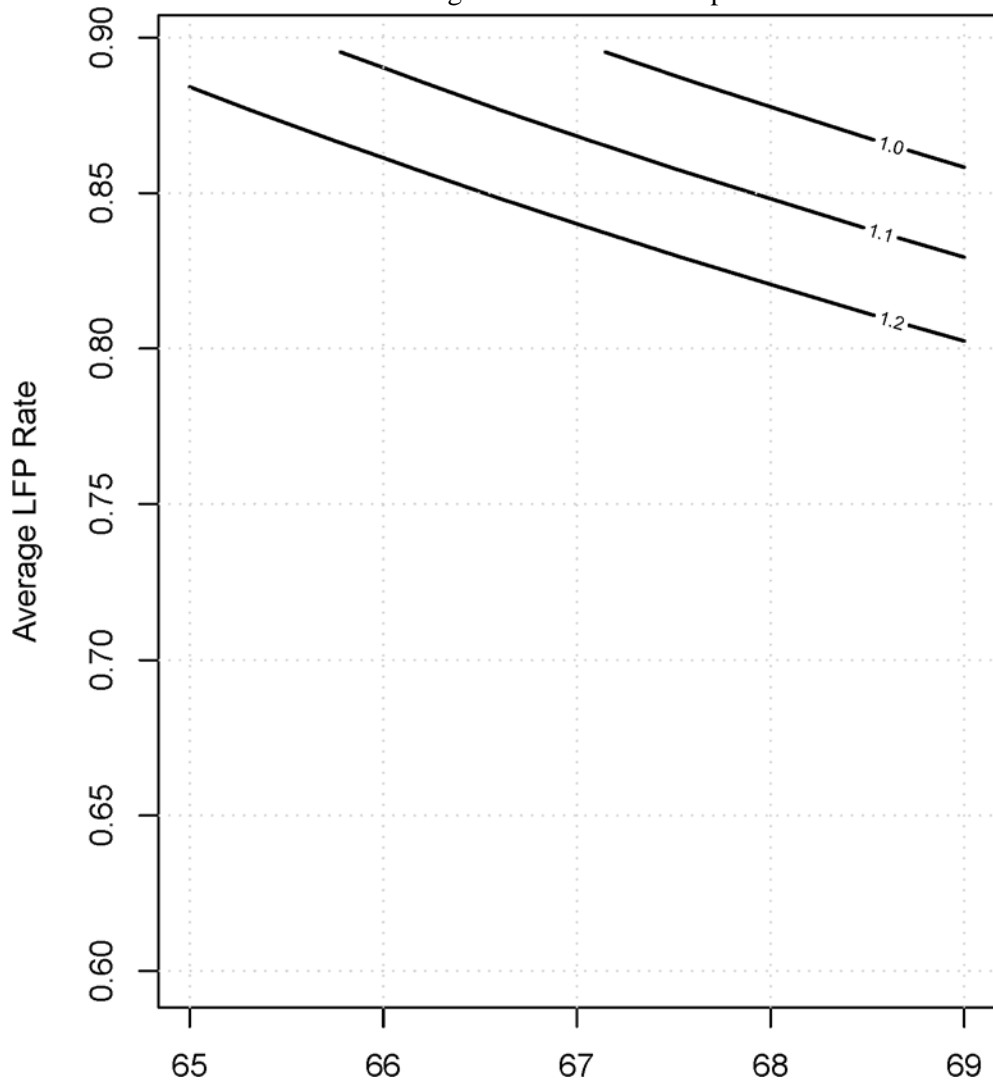
Tradeoff Between Retirement Age and LFPR.

Finland 2050: Average Labor Force Participation Rate 2009=0.80
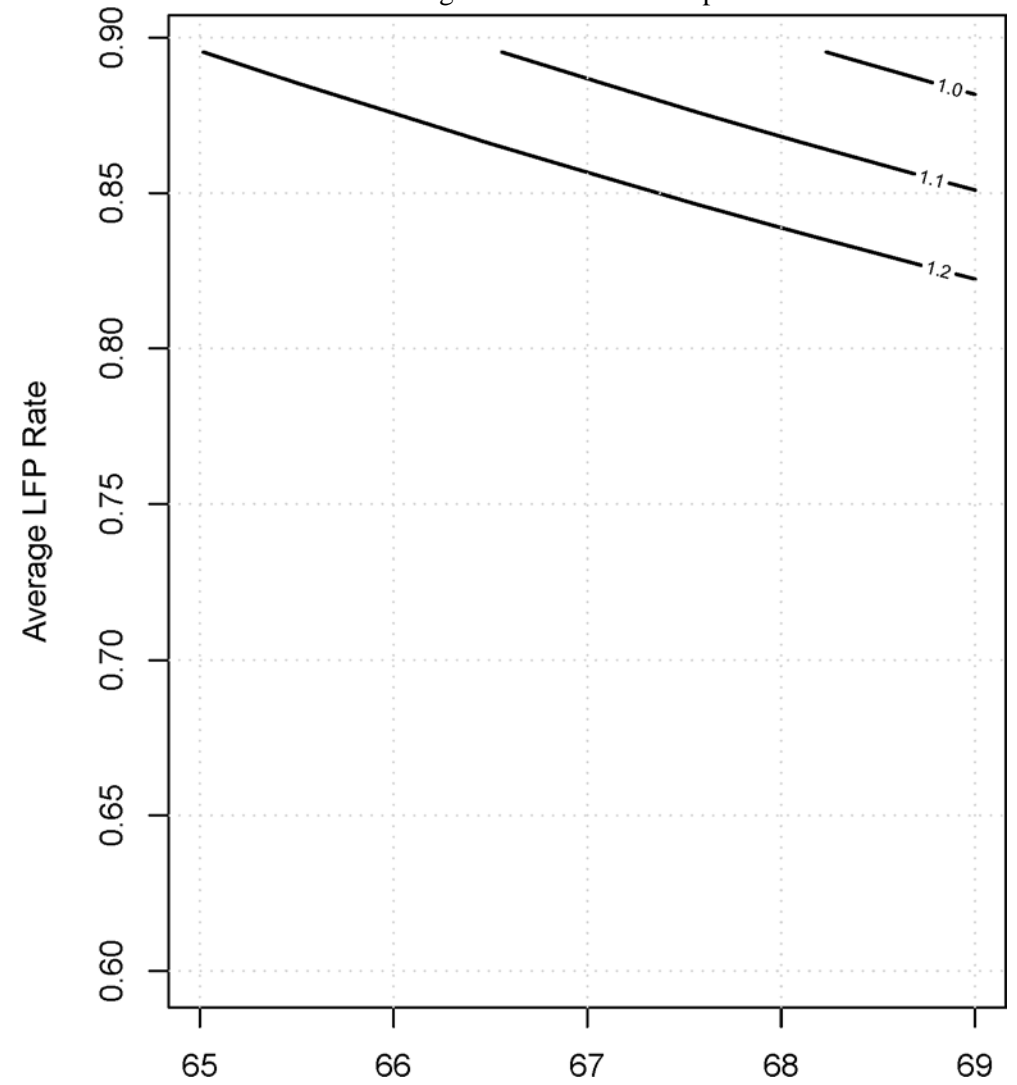
Tradeoff Between Retirement Age and LFPR.

France 2050: Average Labor Force Participation Rate 2009=0.75

Tradeoff Between Retirement Age and LFPR.

Germany 2050: Average Labor Force Participation Rate 2009=0.80

Tradeoff Between Retirement Age and LFPR.

Greece 2050: Average Labor Force Participation Rate 2009=0.71

Tradeoff Between Retirement Age and LFPR.

Hungary 2050: Average Labor Force Participation Rate 2009=0.66

Tradeoff Between Retirement Age and LFPR.

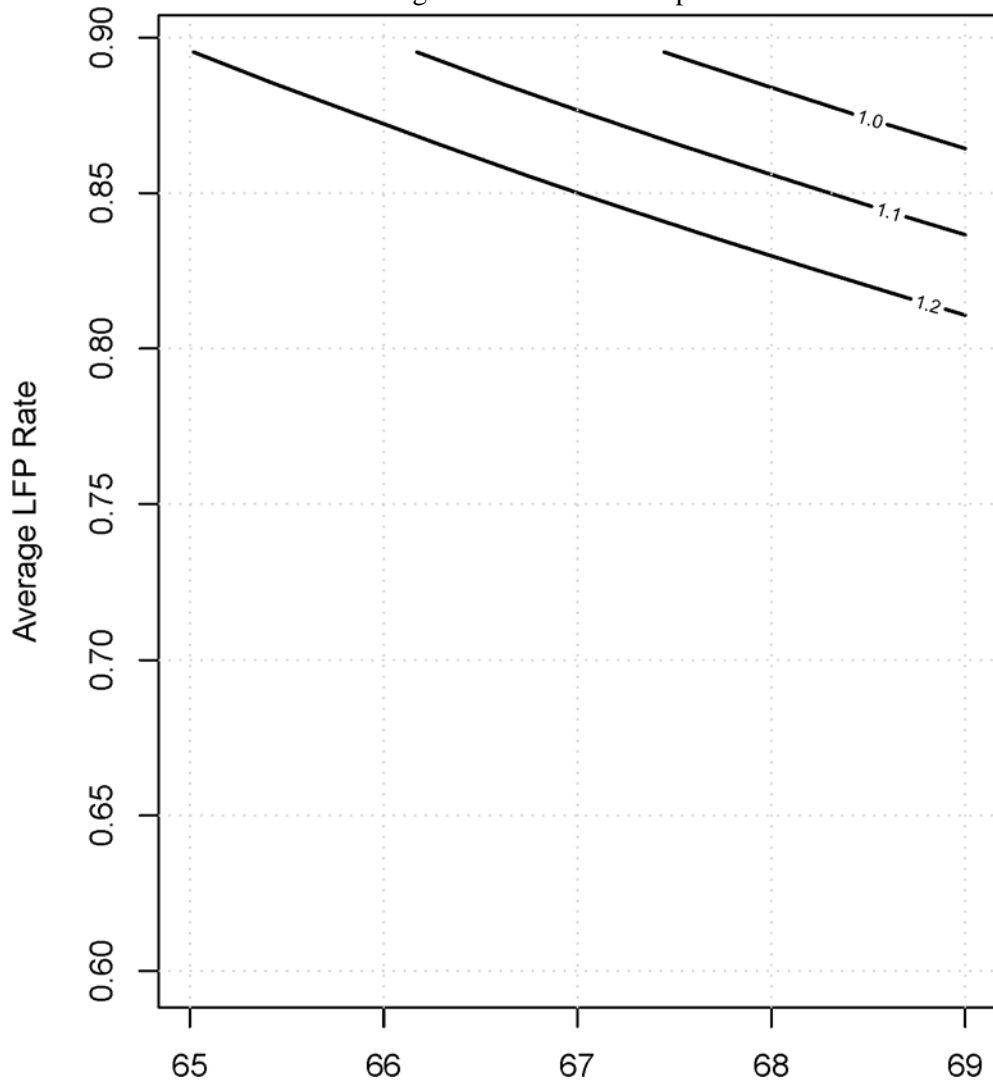Ireland 2050: Average Labor Force Participation Rate 2009=0.73

Tradeoff Between Retirement Age and LFPR.

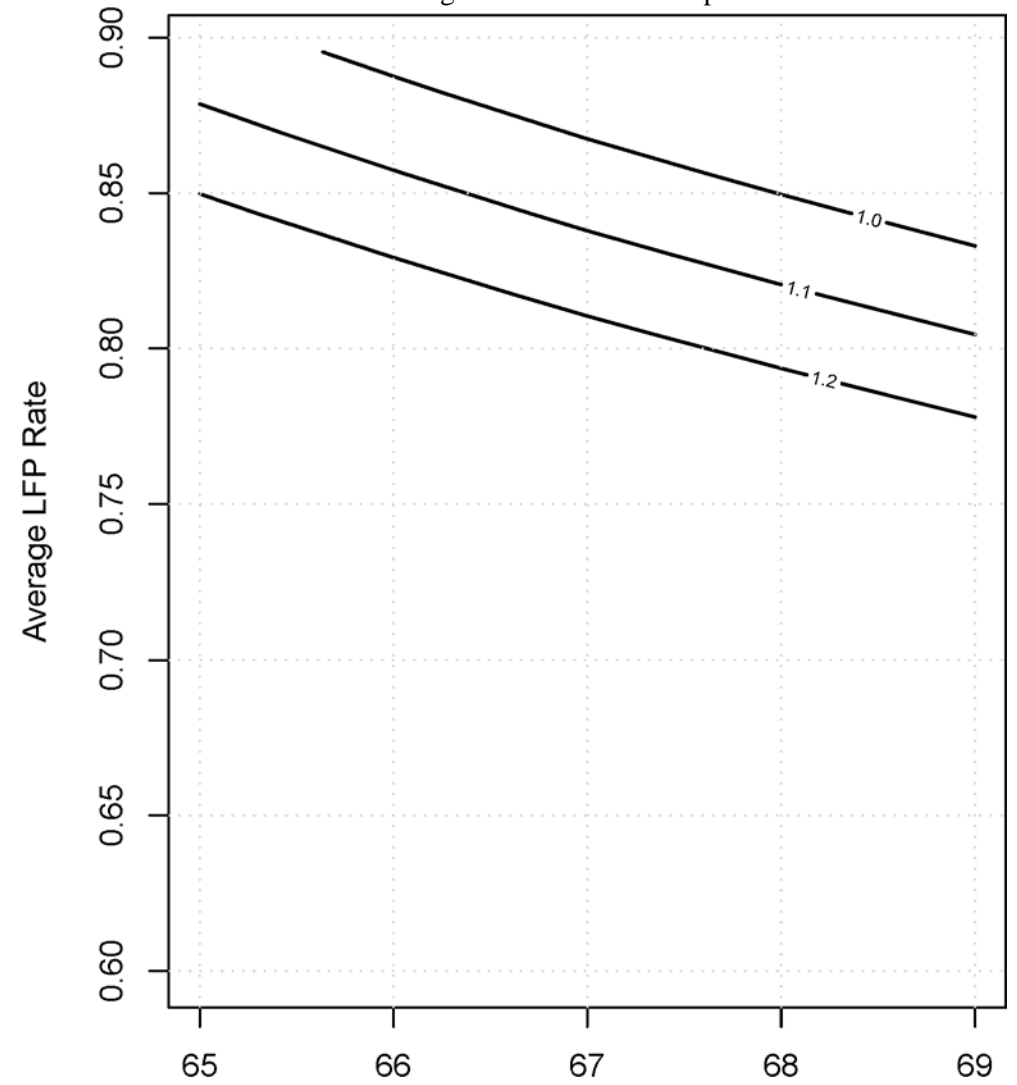Italy 2050: Average Labor Force Participation Rate 2009=0.65

Tradeoff Between Retirement Age and LFPR.

Latvia 2050: Average Labor Force Participation Rate 2009=0.80
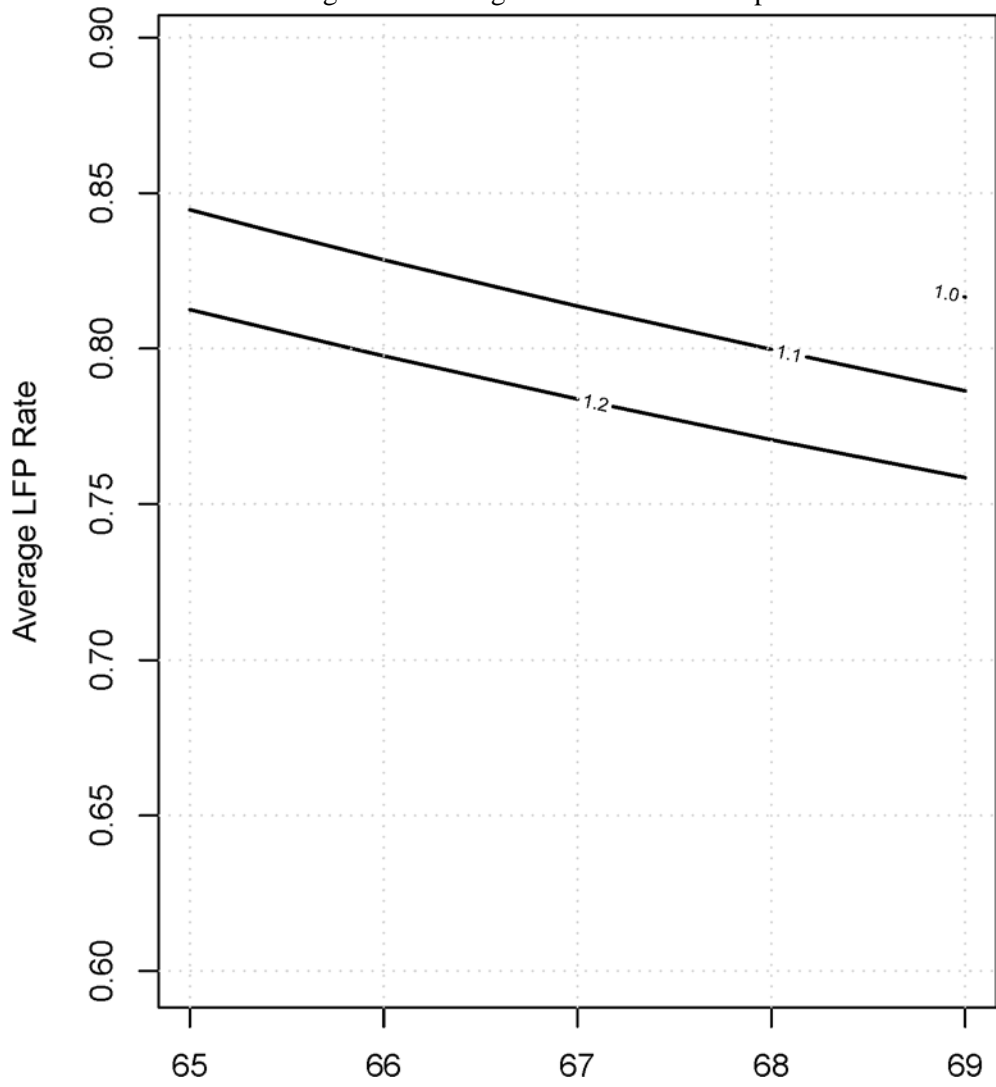
Tradeoff Between Retirement Age and LFPR.

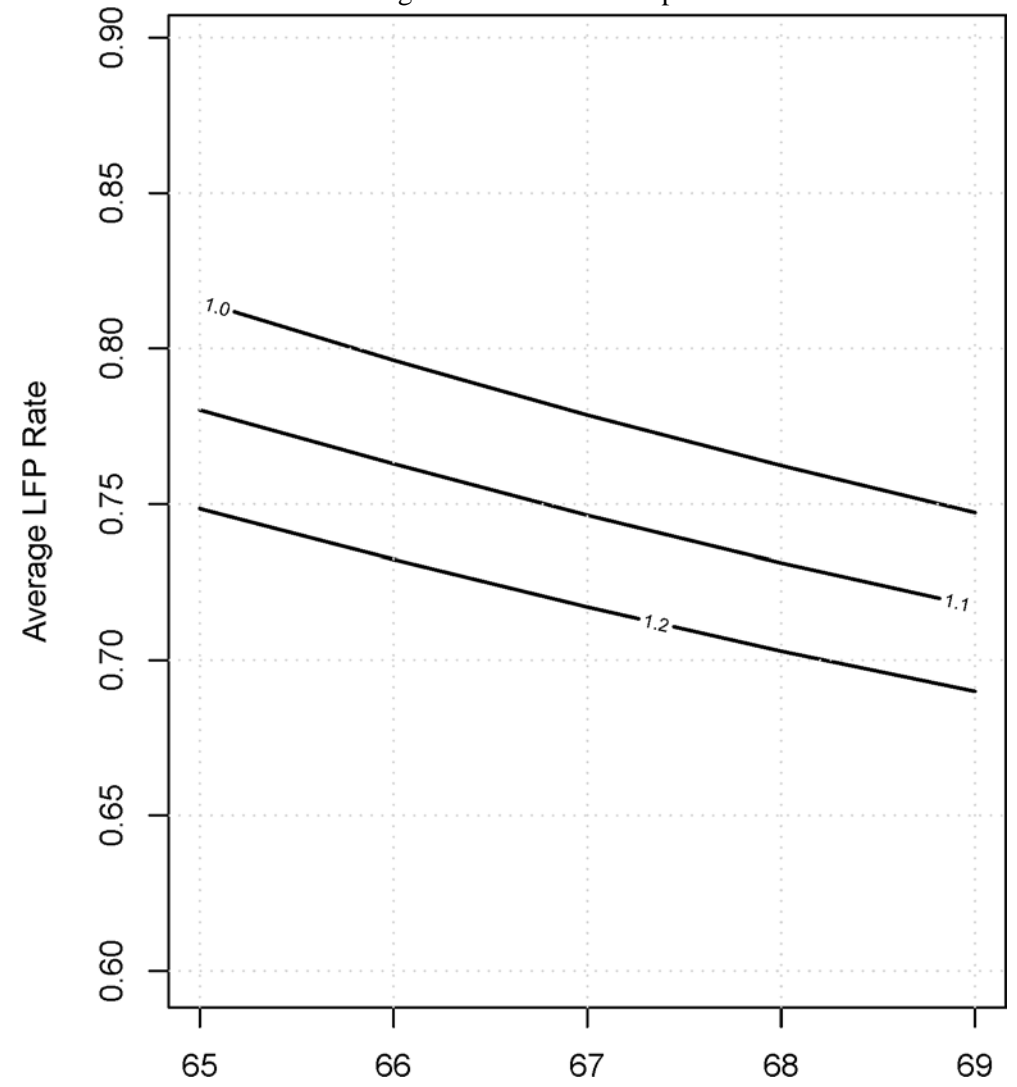Lithuania 2050: Average Labor Force Participation Rate 2009=0.77

Tradeoff Between Retirement Age and LFPR.

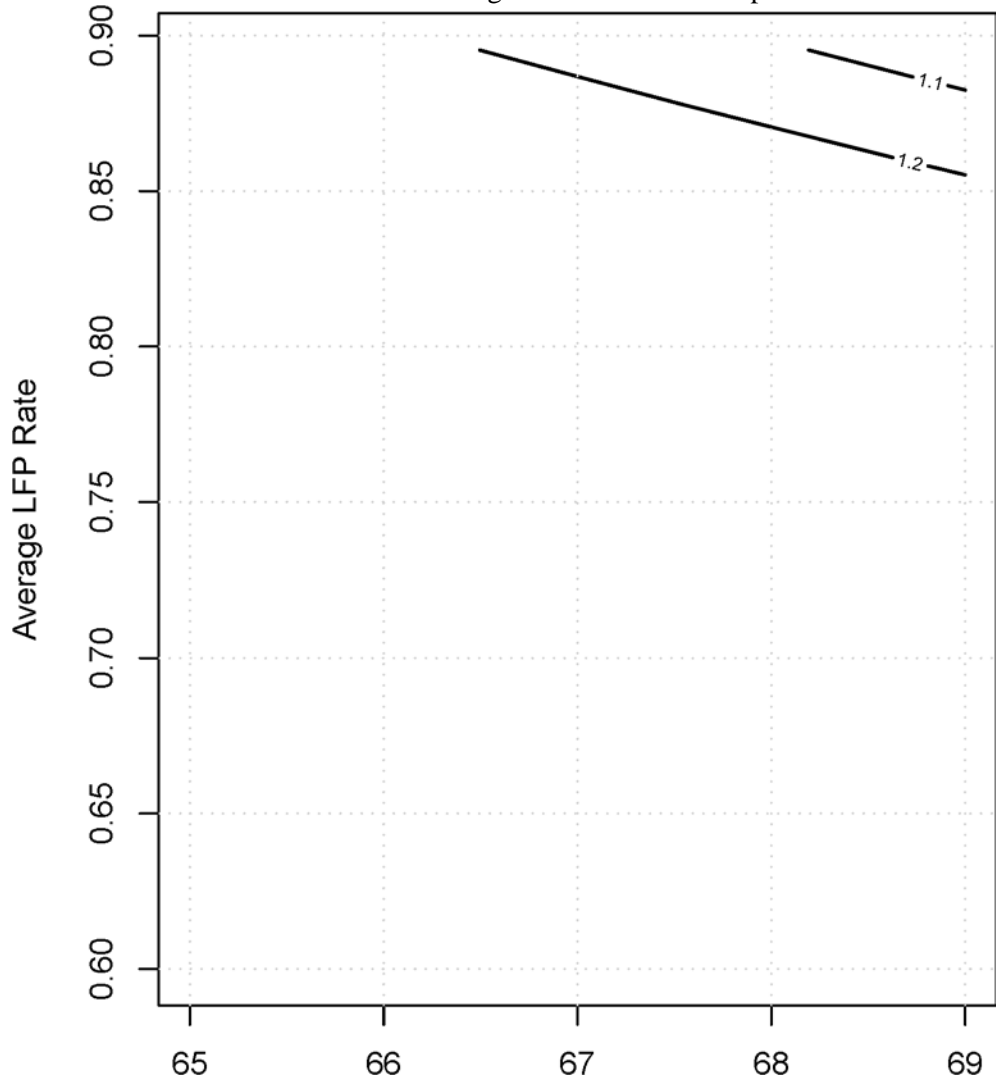Luxembourg 2050: Average Labor Force Participation Rate 2009=0.70

Tradeoff Between Retirement Age and LFPR.

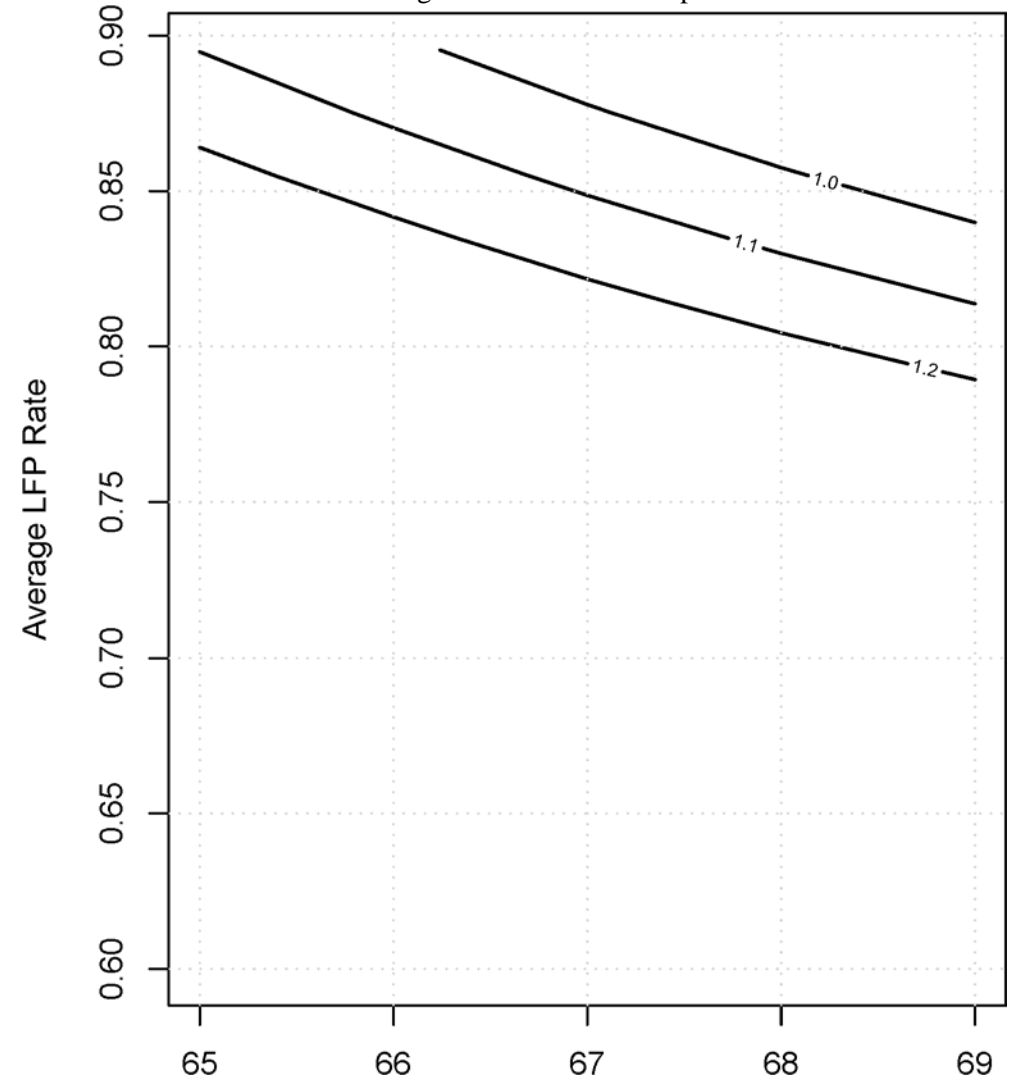Malta 2050: Average Labor Force Participation Rate 2009=0.63

Tradeoff Between Retirement Age and LFPR.

Netherlands 2050: Average Labor Force Participation Rate 2009=0.81

Tradeoff Between Retirement Age and LFPR.

Poland 2050: Average Labor Force Participation Rate 2009=0.69

Tradeoff Between Retirement Age and LFPR.

Portugal 2050: Average Labor Force Participation Rate 2009=0.77

Tradeoff Between Retirement Age and LFPR.

Romania 2050: Average Labor Force Participation Rate 2009=0.67

Tradeoff Between Retirement Age and LFPR.

Slovakia 2050: Average Labor Force Participation Rate 2009=0.73

Tradeoff Between Retirement Age and LFPR.

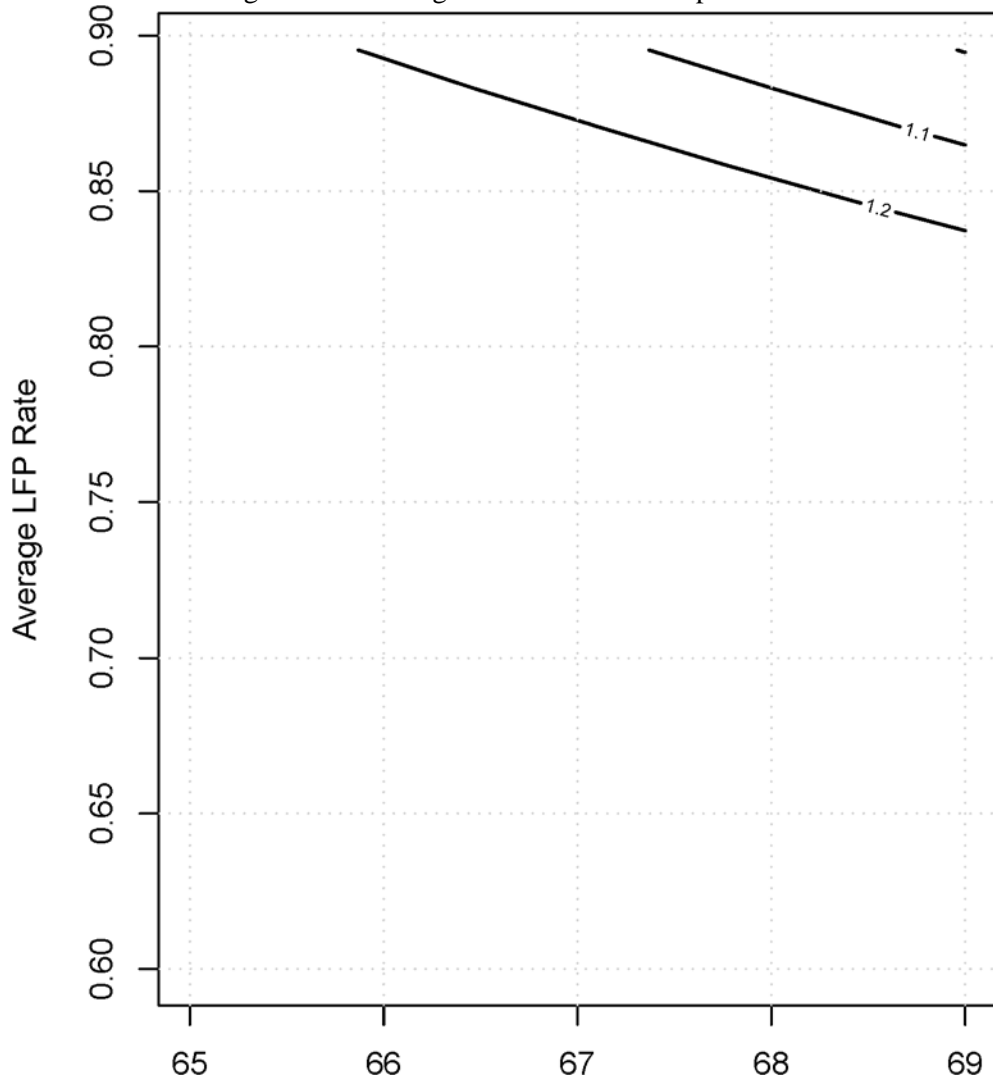Slovenia 2050: Average Labor Force Participation Rate 2009=0.74

Tradeoff Between Retirement Age and LFPR.

Spain 2050: Average Labor Force Participation Rate 2009=0.75

Tradeoff Between Retirement Age and LFPR.

Sweden 2050: Average Labor Force Participation Rate 2009=0.84

Tradeoff Between Retirement Age and LFPR.

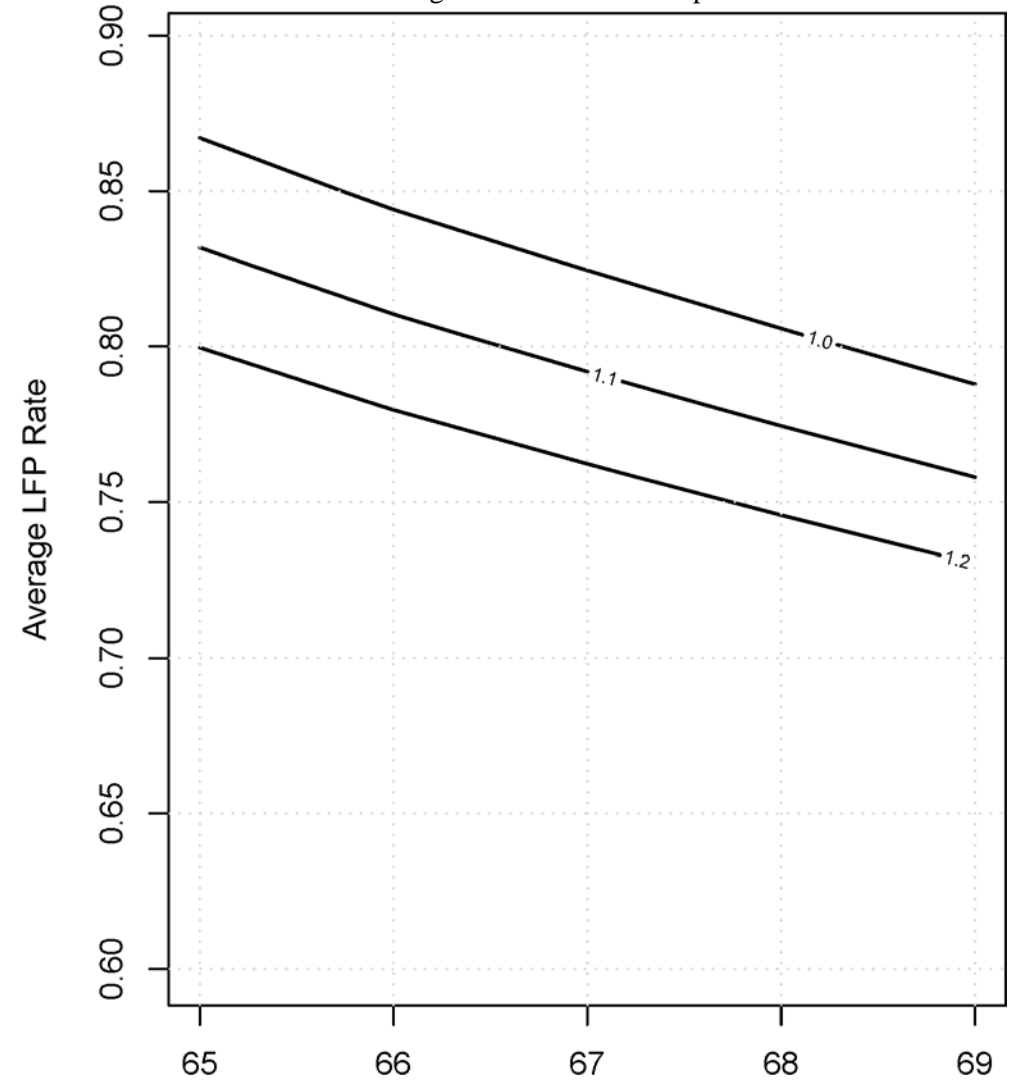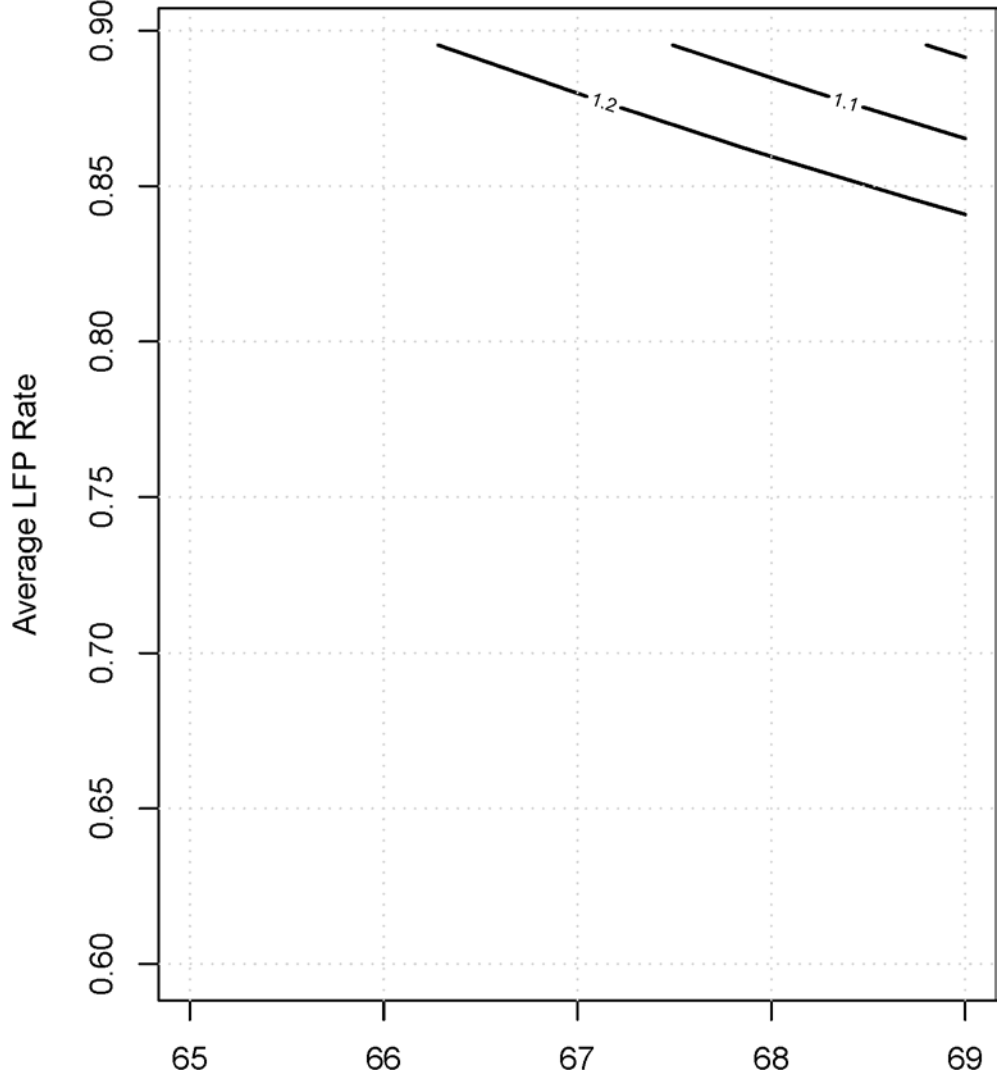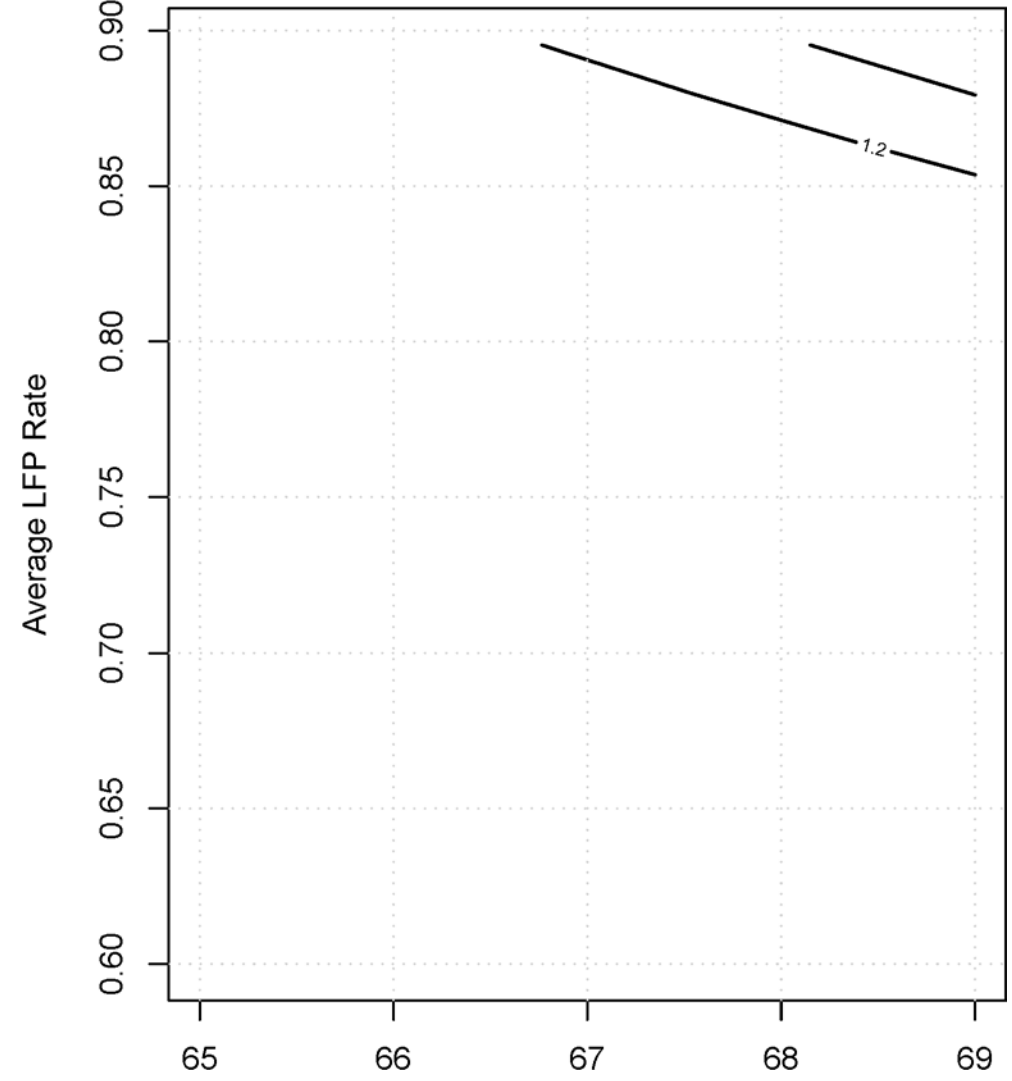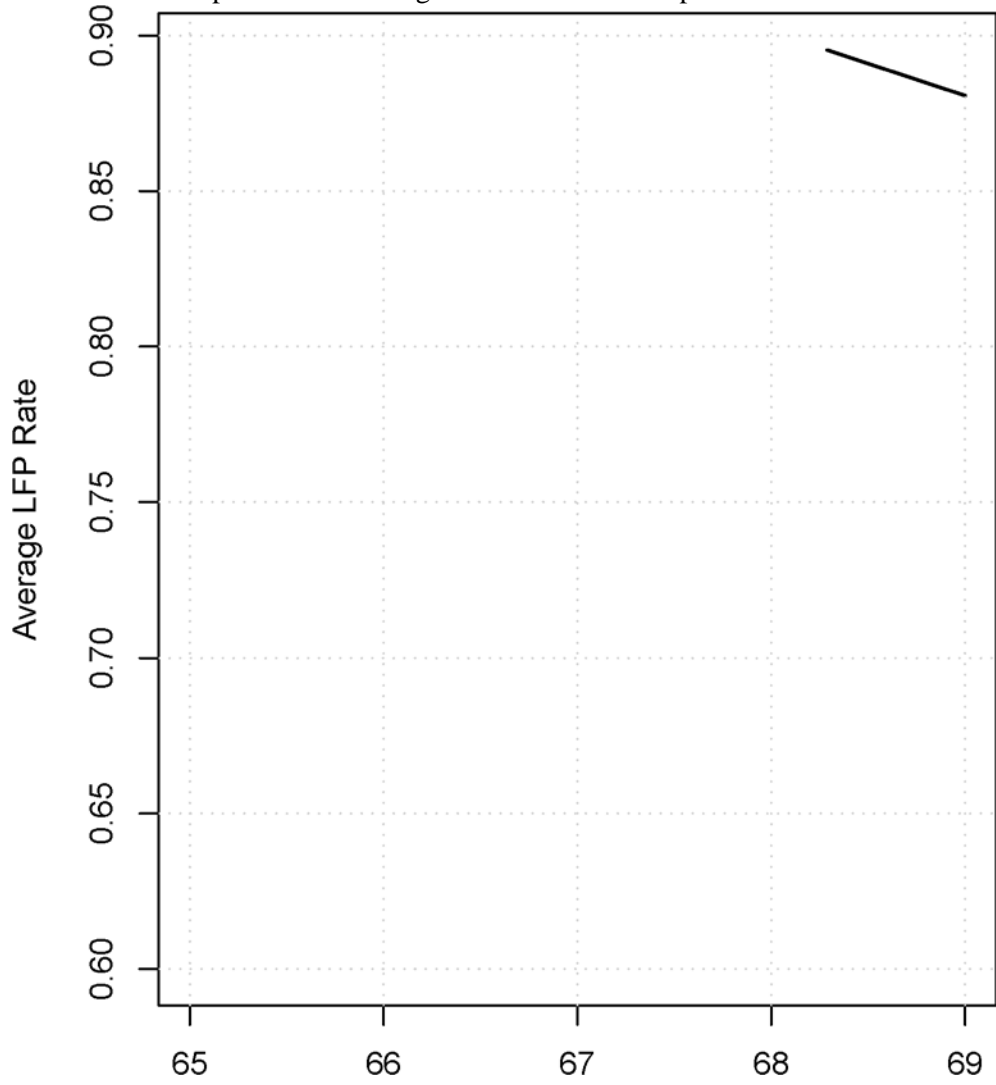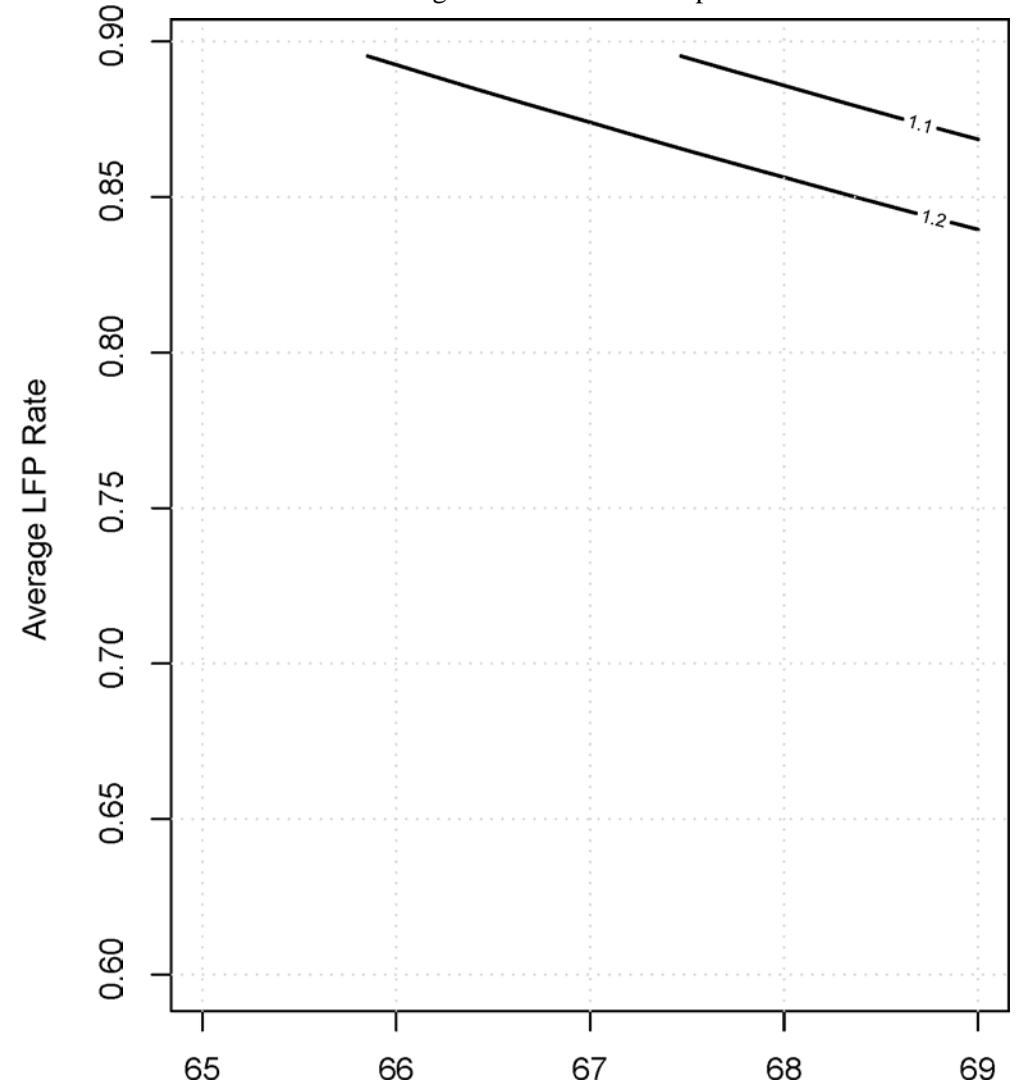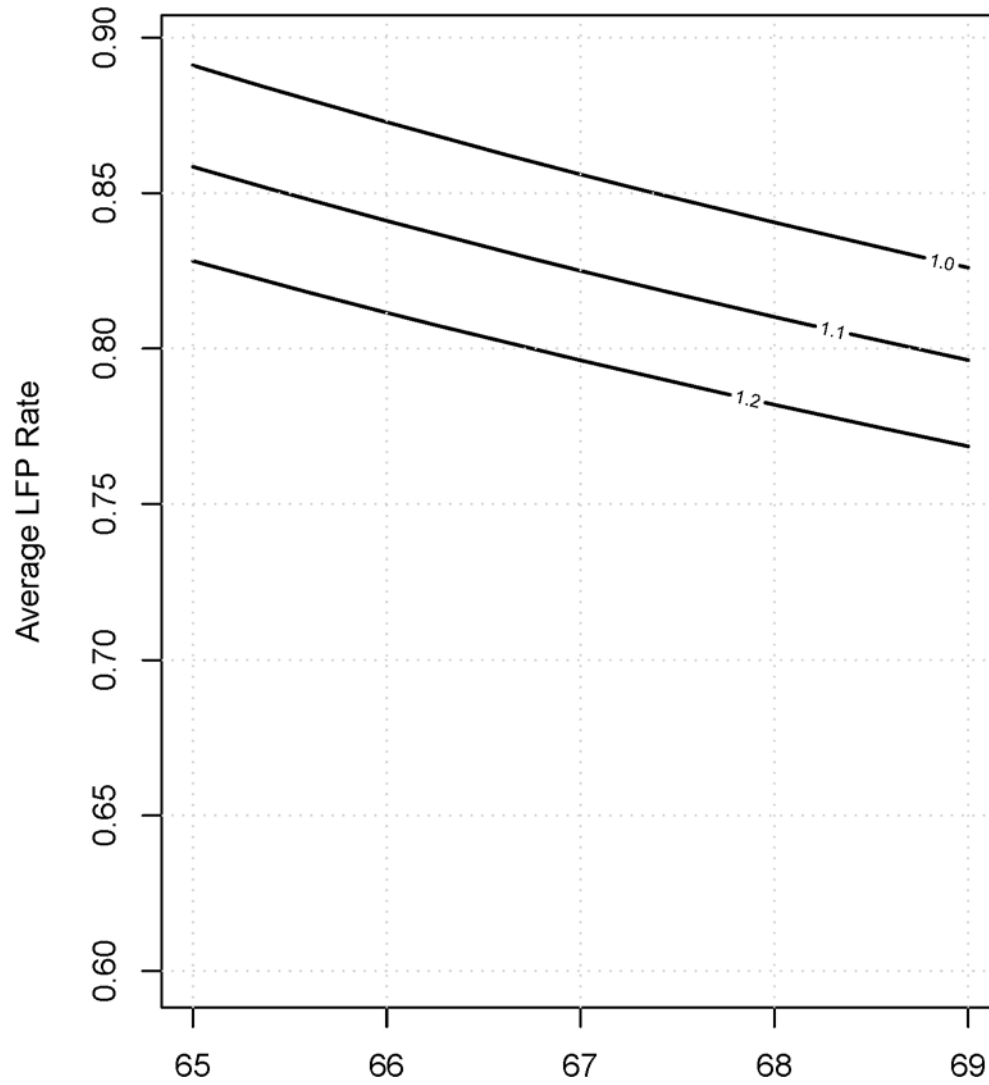UK 2050: Average Labor Force Participation Rate 2009=0.79

Appendix Section 3: Labor Force Participation Rates

Table A1. Labor Force Participation Rates at Ages 40-44 to 60-64, EU-27 Countries, 2009.

Country/Age Group	40-44	45-49	50-54	55-59	60-64
Austria	90.7	88.5	81.4	61.0	21.4
Belgium	87.2	84.6	76.7	53.2	19.6
Bulgaria	88.0	85.8	81.0	68.9	30.4
Cyprus	88.3	85.0	80.7	68.8	46.2
Czech Rep.	94.3	93.7	90.3	70.7	27.2
Denmark	91.5	89.7	88.3	83.2	37.5
Estonia	91.5	90.7	86.1	78.6	51.7
Finland	91.0	90.3	87.2	76.8	41.2
France	90.8	89.7	85.6	62.5	18.1
Germany	90.4	89.4	85.7	76.5	41.8
Greece	85.1	81.3	72.6	56.5	32.0
Hungary	85.2	81.8	75.3	52.1	13.6
Ireland	79.0	78.7	74.8	63.6	44.4
Italy	79.6	77.9	72.9	52.5	20.9
Latvia	90.9	90.2	85.7	79.0	40.0
Lithuania	88.5	88.0	82.7	72.0	39.8
Luxembourg	85.6	81.5	76.5	54.9	20.2
Malta	72.5	64.9	59.9	48.5	13.8
Netherland	89.5	88.0	84.2	74.7	38.6
Poland	87.6	83.5	73.0	45.7	19.1
Portugal	88.8	87.0	80.2	64.3	42.1
Romania	83.0	79.4	69.8	53.1	31.6
Slovakia	92.1	91.1	85.1	61.4	17.3
Slovenia	91.8	91.4	80.9	49.6	18.8
Spain	85.5	82.8	75.5	62.8	36.6
Sweden	92.4	90.7	88.4	84.6	64.0
UK	86.3	86.4	83.0	74.2	46.8

Source: Eurostat.
Labor force participation rates by sex, age groups and nationality (%) [lfsa_argan]
(Last update: 28-07-2011). Accessed July 29, 2011 from:
http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

Table A2: Maximum Age-Specific Labor Force Participation Rates: EU-27 Countries Plus Switzerland, Iceland, and Norway in 2009.

Age	Maximum Labor Force Participation Rate
20-24	81.9
25-29	90.2
30-34	94.2
35-39	93.3
40-44	94.3
45-49	93.7
50-54	93.1
55-59	89.6
60-64	75.5
65-69	51.7
70-74	21.9

Source: Eurostat.
Labor force participation rates by sex, age groups and nationality (%) [lfsa_argan] (Last update: 28-07-2011). Accessed July 29, 2011 from:
http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

Note: These are the maxima that appear in equation (3) above in Appendix Section 1.

Appendix Section 4: The Relationship between Age-Specific Disability Rates and Labor Force Participation Rates

Table A3: Relationship between the log of the prevalence of disability (limited and severe) and labor force participation rates for men 45 to 64 years old, EU-SILC countries, 2009.

```
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)           -2.10190    0.20535 -10.235 3.71e-14 ***
Prev. of Disability   -0.38890    0.72572  -0.536  0.59428
Age[50-54]             0.20741    0.07644   2.713  0.00896 **
Age[55-59]             0.93922    0.11267   8.336 3.26e-11 ***
Age[60-64]             1.81400    0.12740  14.239  < 2e-16 ***
Belgium                0.09399    0.15673   0.600  0.55127
Czech Republic        -0.45157    0.15300  -2.952  0.00470 **
Denmark               -0.46246    0.15154  -3.052  0.00355 **
Estonia               -0.06411    0.14810  -0.433  0.66686
Finland               -0.04496    0.14775  -0.304  0.76207
France                -0.11399    0.15824  -0.720  0.47448
Germany               -0.38981    0.15340  -2.541  0.01401 *
Greece                -0.22714    0.15397  -1.475  0.14607
Hungary                0.45598    0.15049   3.030  0.00378 **
Ireland               -0.13354    0.15914  -0.839  0.40516
Italy                 -0.07391    0.15960  -0.463  0.64519
Luxembourg            -0.08832    0.16285  -0.542  0.58986
Netherlands           -0.32485    0.15024  -2.162  0.03513 *
Poland                 0.34518    0.14884   2.319  0.02428 *
Portugal              -0.20911    0.14785  -1.414  0.16312
Spain                 -0.21094    0.15359  -1.373  0.17540
Sweden                -0.59779    0.19767  -3.024  0.00384 **
United Kingdom        -0.28403    0.15959  -1.780  0.08085 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2088 on 53 degrees of freedom
Multiple R-squared: 0.9464,    Adjusted R-squared: 0.9242
F-statistic: 42.55 on 22 and 53 DF,  p-value: < 2.2e-16
```

Sources:

Disability Rates: European Health Expectancy Monitoring Unit (EHEMU) 2009., Data on activity limitation from Statistics on Income and Living Conditions (SILC) Survey. Accessible under: www.ehemu.eu/.

Labor Force Participation Rates: Eurostat. Activity rates by sex, age groups and nationality (%) [lfsa_argan]. (Updated: 28-07-2011). Accessed July 29, 2011 from: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

Notes: Age groups and countries are dummy variables. The omitted age group is 45-49 years old. The omitted country is Austria. Dependent variable is the age-specific labor force participation rate.

The results with respect to the statistical significance of the disability rate are the same when the dependent variable is the labor force participation rate instead of the log of the labor force participation rate and when we consider females instead of males.