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The Effects of COVID-19 Pandemic on (New) Life Insurances

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Abstract

This paper studies the life insurance demand responses to Covid-19 pandemic. It employs the unique individual-level daily data on new term life insurances together with both geographical and timely variation in the severity of the pandemic in Finland. These data are merged with the high-quality register data on the background characteristics of the customers and other Finnish population.

First, we observe that the take-out of new life insurances increased by 20 % in the first half of 2020 among individuals of ages 21–60, compared to the corresponding time periods in years 2018 and 2019. The average sum insured increased at the same time by 16 %. Second, we find that the life insurance demand responds heavily to all Covid-measures, each of which may be considered as reflecting the change in the perceived death risk. We also find that the responses are larger to the country-level measures compared to the hospital district level measures. An increase in each country-level Covid-measure by 10 % implies on average an increase in the number of new life insurances by roughly 1 % (elasticity e=0.1). We also find that highly educated people and people with high life insurance deficit levels responded to Covid-pandemic more often than other people.

Tiivistelmä

Koronapandemian vaikutukset uusiin henkivakuutuksiin

Tutkimuksessa tarkastellaan koronapandemian vaikutuksia henkivakuutusten kysyntään. Tarkasteluissa hyödynnetään yksilötason tietoja uusista henkivakuutuksista yhdessä sairaanhoitopiiritason ja maatason koronapandemian voimakkuutta kuvaavien suureiden kanssa.

Tulosten mukaan 21–60-vuotiaat ottivat uusia henkivakuutuksia 20 % enemmän vuoden 2020 alkupuolella kuin vastaavalla ajanjaksolla vuosina 2018–2019. Vakuutussummat kasvoivat vastaavasti 16 %. Henkivakuutusten kysynnän havaitaan myös reagoivan koronapandemian voimakkuuteen ja tämän reaktion olevan suurempi maatason koronatietoihin kuin sairaanhoitopiiritason tietoihin. Suomen tasolla 10 % lisäys koronapandemian voimakkuudessa (tartuntojen, kuolemien tai testattujen määrässä) lisäsi uusien henkivakuutusten ottamisia keskimäärin noin 1 %:n. Korkeasti koulutetut sekä ne, joilla oli ennen pandemiaa suuri vakuutusvaje, reagoivat pandemiaan muita useammin ottamalla henkivakuutuksen.

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Keywords: Covid-19, Life insurances, Households

Asiasanat: Koronapandemia, Henkivakuutukset, Kotitaloudet

JEL: G22, H31

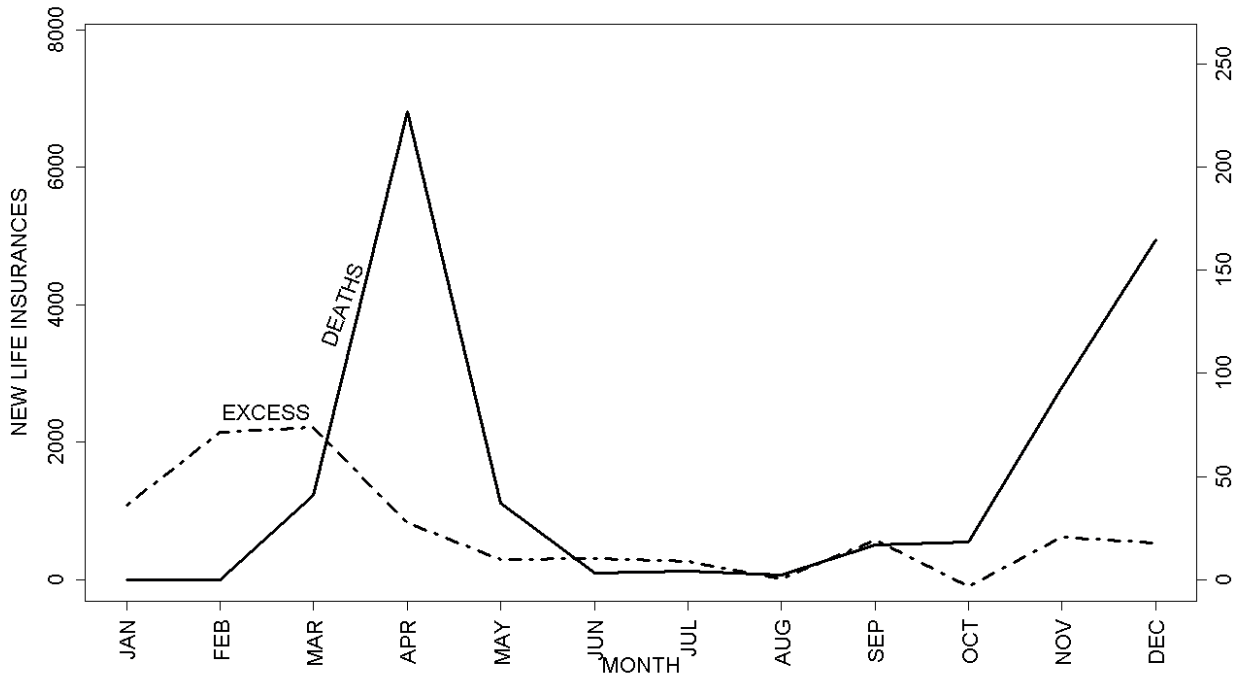
1. Introduction

The Covid-19 pandemic has increased the mortality risk especially among older individuals. This has caused many individuals to consider the adequacy of their protection against the monetary losses following from a death. While the social security system typically provides only partial shelter against the monetary loss associated with premature death of the breadwinner, there remains a demand for the voluntary life insurances, which is likely to increase as a response to an increased risk of death. This paper studies empirically how the take-out of new term life insurances[1] and the sums insured changed as a response to the severity of the Covid-19 pandemic in Finland.

The coronavirus disease 2019 (COVID-19) was first detected in China in December 2019, and by the end of the year authorities of the government of Wuhan reported having treated dozens of cases. The first reported coronavirus-related death took place on the 11th of January 2020. The first Covid-19 infection in Finland was reported on the 29th of January in 2020, just one day before the World Health Organization declared a global health emergency due to the coronavirus. The number of infections started to increase rapidly in Finland in the first half of March, and the schools started to operate remotely in Finland on the 18th of March in 2020. At the time the media was filled with the news about the pandemic, especially about the numbers of daily Covid-infections and Covid-related deaths. There was still major uncertainty on the eventual incidence and case fatality rates of the pandemic, which also influenced the demand for risk life insurances.

Already a first look at the data implies a substantial shift in the insurance behavior. Figure 1 shows the covid-related deaths (solid line) in Finland in 2020 together with the excess take-outs of new life insurances (dashed line) at a monthly level.

Figure 1. Covid-related deaths and excess new life insurances in Finland in 2020



[1] We analyse the demand for traditional life insurances with a lump-sum payout and no savings component (hereafter *term life insurances,* or *risk life insurances*). The motivations to buy products that involve saving are linked to portfolio behaviour (see e.g., Heo et al. 2013) and are likely interact with the pandemic also via the expected rate of return.

In this paper we focus on how the *new* risk life insurances responded to the Covid-pandemic in Finland. We exploit in our analysis a high-quality data that include the individual-level data on new life insurances on daily basis, existing life insurances at the end of each year, and the rich set of background characteristics of a person and his/her household covering the whole population of Finland in 2018-2020.[2] The severity of Covid-pandemic is measured both at the country-level and hospital district level, providing us with variation in the measures for the severity of the pandemic both in time and geographically. The severity of the pandemic is measured by the infection, death and test rates. The variation in these measures allows us to inference the life insurance responses to Covid-19 pandemic.

We find that the Covid-19 pandemic affected the demand for term life insurances in Finland. It increased the take-out of new life insurances by 20 % and the average sum insured by 16 % in the first half of 2020 among people of ages 21-60 compared to the earlier years.[3] While the purchases of life insurances respond heavily to both the country-level and hospital district level measures of the severity of the pandemic, the reaction to the country-level information was stronger. An increase in each of country-level Covid-measures by 10 % implied on average an increase in the number of new life insurances by about 1 % (elasticity $e = 0.1$). The corresponding response using the hospital district level variation was about half of that at the country-level.

Regarding the question of who took the (excess) new life insurances, we find that the people with higher life insurance deficit[4] (coverage minus need) responded more often to the increased risk of death by taking a new life insurance. Thus, it seems that the financially most vulnerable people reduced their financial vulnerability against a death of a breadwinner of a household as a response to the Covid-19 pandemic. We also find a large increase (34 %) in the number of purchases of new life insurance by highly educated people.

The structure of the paper is as follows. The follow-up section provides a simple theoretical framework for illustrating the demand behavior of life insurance and the way life insurance demand depends on the death risk. Section 3 shortly reviews the related literature. Section 4 describes the Finnish institutions related to the survivals' pensions and risk life insurances. Section 5 describes our data employed in analysis section 6. Section 7 concludes.

2. Theoretical Framework

This section provides a simple theoretical framework to illustrate 1) the decision making of an individual in life insurance markets and 2) how the optimal choice of the life insurance responds to a change in death risk. We follow the footsteps of Cawley and Philipson (1996) and build a model where an individual chooses the sum insured Q to maximize the expected utility. The expected utility depends on the death probability p and the wealth level in two cases: in case of a death (W_1), and in the absence of it (W_0). In case of a death the wealth is W_1:

$$W_1 = W + Q - L - q(Q)Q$$

[2] The scarce earlier literature on life insurance responses to Covid-pandemic has employed less accurate information, like a city-level information, as Qian (2021).
[3] We focus on people of ages 21–60 as they are likely to be breadwinners of the household and they also have access to the life insurance market with reasonable prices.
[4] The life insurance gap was analysed more thoroughly in Ropponen et al. (2023).

where W stands for the initial wealth, Q for the sum insured, L for the potential loss[5], $q(Q)$ for the unit price of insurance[6], and $q(Q)Q$ for the insurance premium. In the absence of death (with probability $1-p$), neither materializes the potential loss (L) nor the payment of sum insured (Q), and thus the wealth is W_0:

$$W_0 = W - q(Q)Q$$

The expected utility reads (with the Von Neumann-Morgenstern utility function) as follows:

$$EU(Q) = pU(W_1(Q)) + (1-p)U(W_0(Q))$$

Maximization of the expected utility with respect to the sum insured, Q, gives the optimal condition:

$$\frac{dEU(Q)}{dQ} = pU'(W_1)\frac{dW_1(Q)}{dQ} + (1-p)U'(W_0)\frac{dW_0(Q)}{dQ} = 0$$

Under the assumptions of concave utility function ($U' > 0$, $U'' < 0$), constant unit price q, and $0 < q < 1$, we get the following comparative statics:[7]

$$\frac{dQ}{dp} > 0$$

This means that the sum insured increases with the death probability. We will test this hypothesis in our analysis in section 6, where we study the life insurance responses to measures of Covid-19 incidence, Covid-19 deaths and tests carried out, each of which may be considered to illustrate an increased perceived death risk.

For a specific utility function $U(W) = -e^{-\theta W}$ we get for the life insurance deficit

$$L - Q = \frac{1}{\theta}\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right)$$

The life insurance deficit thus depends on the potential loss (L), the risk averse parameter (θ), the unit price of life insurance (q) and the death probability (p). We first observe that the life insurance deficit is negatively related to the potential loss. Second, a more risk averse individual has a smaller life insurance deficit. Third, for a high enough unit price of life insurance, an individual does not purchase life insurance. This is the case when the optimal condition would imply negative sum insured. Fourth, the demand for the life insurance (Q) remains less than the potential loss from a death (L), and thus the life insurance deficit positive, if the term within the logarithm is larger than one, that is if $\frac{q/(1-q)}{p/(1-p)} > 1 \Leftrightarrow \frac{q}{p} > 1$. That is $L - Q > 0$ when the unit price of insurance (q) is larger than the death risk (p). This condition is likely to hold, because it is in line with the insurance companies not making offers that would be monetarily harmful for them. To continue in operation the insurance companies must not sell a unit of sum insured with less than its expected cost of that unit.

[5] The potential loss is the amount of wealth loss in case an individual does not have a life insurance.

[6] We assume for the price of the unit insurance the following: $0 < q(Q) < 1$. The lower limit follows from the fact that no insurance company would sell its life insurance products with zero or negative price. The upper limit comes from an individual behavior. The case $q(Q) = 1$ would correspond to case where the cost of the insurance (insurance premium) $q(Q)Q$ would equal the sum insured Q. In that case an individual would not purchase a life insurance. This partial analysis does not include the reaction of the insurance company to the higher mortality risk. Harris et al. (2021) analyzed the offerings in the US until February 2021 and found that there was no overall increase in the premiums because of the pandemic.

[7] See Appendix A for the details of the derivations of the results in this section.

Furthermore, the theory provides a way to analyze the connection between previous insurance deficit and behavioral changes due to covid. Let us denote the relative cost of insurance $\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right) \equiv R$, and pre-covid observations with subindex pre, while the observations during covid receives subindex $covid$. Then,

$$L_{covid} - Q_{covid} = \frac{1}{\theta}\mathrm{R}_{\mathrm{covid}}$$

and if the underlying preferences (θ) remain constant, we can write

$$L_{covid} - Q_{covid} = \frac{L_{pre} - Q_{pre}}{R_{pre}}\mathrm{R}_{\mathrm{covid}} = L_{pre} - Q_{pre} * \frac{\mathrm{R}_{\mathrm{covid}}}{R_{pre}}.$$

The model implies a constant life insurance deficit, as long as the relative cost of insurance and preferences remain fixed. Later in this paper, we will compare our findings to this theoretical relationship.

3. Related Literature

We contribute to two strands of literature, the one that studies the effects of Covid-19 pandemic and the other one studying the life insurance markets. The Covid-19 pandemic has generated rapidly growing literature on its effects on the range of various margins. We focus here on studies related to the economic and health outcomes of individuals.[8]

Literature on the *labor market* implications of pandemic has focused mostly on the effects on hours worked, job losses, unemployment rates and reallocation of labor. One central determinant underlying many of the outcomes is whether the work can be done remotely or not (Adams-Prassl et al. 2020; Beland et al. 2020; Dingel and Neiman 2020; Holgersen et al. 2021). Adams-Prassl et al. (2020) find that workers who cannot perform none of their tasks at home are more likely to lose their jobs after the onset of the Covid-pandemic. Alstadsæter et al. (2020) show that the pandemic has affected the financially vulnerable population, like parents with young children, disproportionally. Barrero et al. (2021) study the reallocation of labor. Bartik et al. (2020) shows that a large fraction of firms had temporarily closed shop and reduced their number of employees due to the shock. Gupta et al. (2023) study the effects of social distancing policy on labor market outcomes. Lozano-Rojas et al. (2020) study the effects of school closures on the labor markets.

These studies indicate that the pandemic caused liquidity risks especially to the low-income people. Consumption smoothing liquidity constrained households should prefer having a life insurance (Ericson and Sydnor 2018), but the same personal traits (e.g., behavioral biases) explain both the lack of consumption smoothing (Parker 2017) and underinsurance (Pitthan and De Witte 2021).

Literature on *health outcomes* has focused on interaction between Covid-19 and mortality, physical health, mental health, well-being and relation to work outcomes (Brodeur et al. 2021a). Literature on *gender* and *racial* inequality consequences of the pandemic have shown adverse effects of Covid-19 for immigrant labor market (Borjas and Cassidy 2020), for minority unemployment (Couch et al. 2020) and the labor market of people working in leisure and hospitality services and non-essential retail (Forsythe et al. 2020). Health is checked already in the process of purchasing a life insurance, even though necessarily incompletely, which rules out of studying the interaction between vulnerability to serious Covid-19 infection and the demand for life insurances. In our analysis, heterogeneity is considered using attributes that are relevant for life insurance demand in normal times.

[8] For a review on the studies on the spread of the coronavirus, the social distancing, the macroeconomic impacts, the inequality consequences, the environmental outcomes and the policy measures taken due to Covid-19, see Brodeur et al. (2021b).

Life insurance literature has studied both the demand and supply side of the markets, as well as the life insurance deficit, which arises as the difference between the life insurance coverage and the need for life insurance in the case of a premature death of a household breadwinner. The theoretical background for the life insurance purchases is families' consumption smoothing decisions, which maximize expected lifetime utility under mortality uncertainty (see e.g., Chambers et al. 2011). The observed behavior does not, however, fit well with the predictions of the optimization models involving rational fully informed agents. One of the contradictory observations is that people with higher risk aversion (Nam and Sherman 2018) or higher risk of premature death (Hedengren and Stratmann 2016) have less likely term life insurances. Explanations for the unexpected outcomes have been searched from limitations of thinking related to people's choices (Coe et al. 2016), inadequate financial literacy (Lin et al. 2017) and missing (Kutlu-Koc and Kalwji 2017) or asymmetric information (Hendren 2013).

Bernheim et al. (2003) shows that there is a life insurance deficit in the US, and that it is especially large among young households and low-income people. Ropponen et al. (2023) employed individual-level data on life insurances to study the life insurance deficit in Finland and its underlying determinants (coverage and need for the life insurance). They find evidence on life insurance deficit and conclude that it is the largest among young people, men, highly educated and high-income individuals. Harris and Yelowitz (2018) show that the life insurances play a central role in determining whether a widow becomes under the risk of poverty after a death of a breadwinner of the household.

Qian (2021) has studied the life insurance responses to the Covid-19 pandemic. The study uses city-level data on confirmed Covid-19 cases and insurance company level revenue. It finds that the confirmed cases and per capita insurance revenue are positively correlated. Our study contributes to literature by studying life insurance market responses to the Covid-19 pandemic using individual-level data on new life insurances.

4. Institutions

This section reviews some of the most central elements related to the death benefits in Finland: social insurance compensations and the life insurance market. For a more detailed description, see Ropponen et al. (2023). He et al. (2023) discusses the roles of private insurance markets and social security during pandemics. The observed outcome, in which the mortality rates among working-aged people remained low, did not strain the finances of either of the insurance systems in Finland.

The Finnish social security system provides survivors' pensions for the widow and orphans in case the breadwinner of a household dies. The aim of survivors' pensions is to cover the remaining household. There are several statutory schemes that may pay survivors' pensions: the earnings-related pension scheme, the national pension scheme and accident insurances. In the earnings-related pension scheme, the widow is always entitled to survivor's pension, if the survivor has under-aged children with the deceased. Entitlement also arises in some other cases, yet depending on the age of the widow, the age of the spouses at the time when they were married, and the time they lived together.

For the widows born before 1975 the pension is for the rest of a lifetime, whereas for the widows born in 1975 or later it is for 10 years at the most, yet at least until the youngest child turns 18 years. The children have entitlement to orphans' pensions until they turn 20 years. The basis of the survivors' pension is the deceased person's earnings-related pension, or if not retired, the computational disability pension. The magnitudes for national pension scheme compensations are small, on average under 200 euros per month. Employees' group life assurance pays an age-dependent lump sum to the widow and a fixed sum to the orphans.

Importantly, the social security provides only partial shelter against the monetary losses associated with a death of a breadwinner of the household, thereby retaining the need for voluntary life insurances to maintain the previous living standard of the household.

The Finnish life insurance market includes many types of term life insurance policies that provide insure against the risk of a death. These include, for instance, loan protection insurances that are often attached to a mortgage. The term life insurance policies are sometimes also purchased as joint cover insurances, where the compensation is paid to the widow of the spouse who dies first, and the insurance terminates thereafter. Their prices are typically much cheaper than when the policies are sold individually. The term life insurance does not typically involve saving.

5. Data

Our data include detailed information both on the new term life insurances and the severity of Covid-pandemic in Finland. The unique data on new contracts come from the Finnish life insurance companies and include information on new life insurances at the individual-level and include their exact dates and the sums insured in years 2018-2020. These data are merged with the high-quality register data on the background characteristics of the customers and other Finnish population as well as their household characteristics. We also have individual-level information on the sums insured and life insurance deficit at the end of each year. This allows us to study, for example, whether the new life insurances are taken during the pandemic by people who have the largest life insurance deficit. The severity of the Covid-pandemic is measured both at the country and hospital district levels, providing both timely and geographic variation to these measures. As the measures for the severity of pandemic we use the relative numbers of Covid-infections, Covid-related deaths and people tested for Covid-19.

5.1 Life Insurance Data

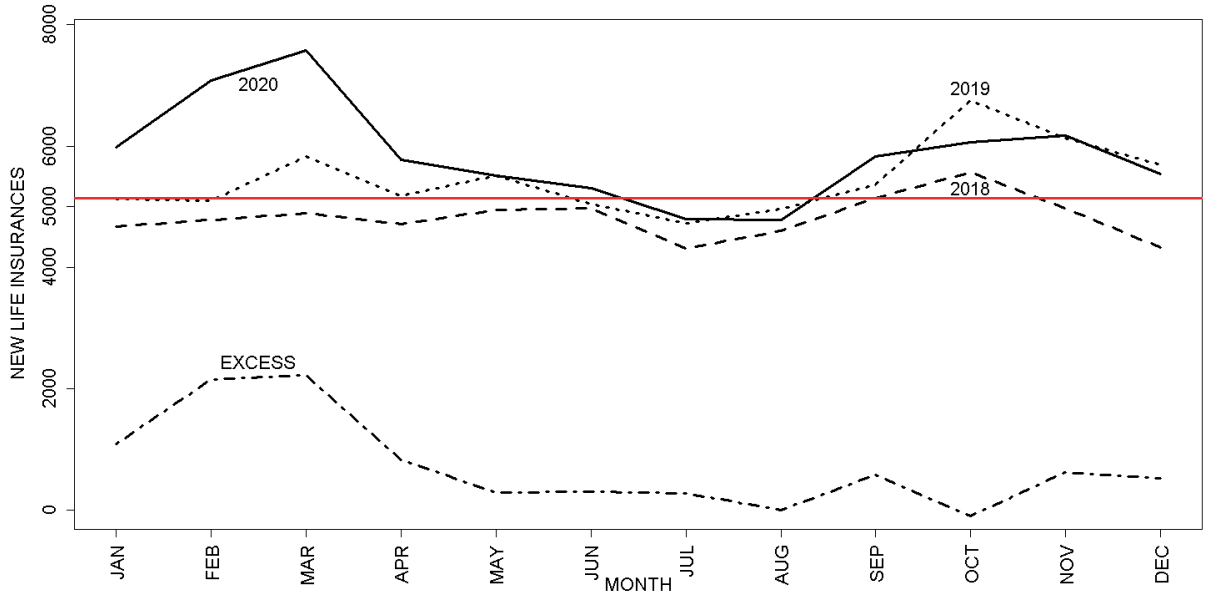
Let us first describe how the take-out of voluntary new term life insurances evolved in our sample during the time when the pandemic began to escalate in 2020.[9] Figure 2 shows the monthly frequencies of new life insurances in Finland for years 2018-2020. The figure shows that before the onset of the Covid-pandemic, in 2018 and 2019, the number of monthly new life insurances was on average 5,138 (red line in the figure). It also shows that the take-out was at elevated levels in the first months of 2020 (solid line) compared to years 2018 and 2019 (dotted and dashed lines). The line at the bottom of the figure shows the number of excess new life insurances in 2020 at the monthly level. It shows, for instance, that in February and March 2020 there were more than 2,000 additional new life insurances purchased compared to 2018 and 2019. Overall, the excess in new life insurances is about 6,000 in the year 2020, and from May 2020 on there are no large differences to previous years.

Figure A1 in Appendix B shows the time evolution of take-outs for different age groups between 21 and 60 years.[10] It shows that the take-out of new life insurances is at the elevated levels in each age group especially in the first months in 2020, compared to earlier years. Figure A2 in Appendix B shows the monthly averages of sums insured of new life insurances. It shows that for the year 2020 the average sum insured was 16 % larger than in pre-pandemic years 2018 and 2019 (118,186€ vs 101,525€). The figure also shows that even if the sum insured was at an elevated level especially in March 2020, it also remained at higher levels throughout the year 2020.

[9] There is no public data available on the aggregate market size, but using other information we can deduct that our data covers approximately 70 % of the term life insurances in Finland.

[10] We focus on people within this age-span as they are both likely to be the breadwinners of a household and still have access to life insurance markets. For people beyond the age-span there are much fewer observations, and especially for people over 70 years there mostly occur no markets for the life insurances.

Figure 2. Time evolution of take-out of new life insurances.



5.2 Pandemic Measures

Let us next consider the measures for the severity of Covid-pandemic. The first source of variation to be employed in the analysis section is the country-level timely variation of pandemic measures. Figure 3 shows the numbers of infections, deaths and tests at the weekly level in Finland in 2020. The upper left graph of the figure shows that the number of confirmed infections started to increase from week 11 on and reached the (local) maximum at the week 15 (in early April). An even higher number of the infections was reached at the end of 2020. However, as shown in the upper right graph, the death rates remain larger in the early 2020 (peak in mid-April, at week 16) compared to the end of the year. In early 2020 the virus spread also in the nursing homes, which was extremely problematic given the high age and weak health status of the residents in these places. The lower graph of the figure shows that the testing rates increase strongly towards the end of the year. Figure 4 aggregates the infection rates, death rates and testing rates at the monthly-level and combines this information with the information on new life insurances (in Figure 2).

Another source of variation employed in the analysis is the geographic variation in the intensity of pandemic. Figure 5 provides the weekly-level information of the infection rates and testing rates at hospital district level.[11] The left graph of the figure shows that there clearly exists variation in the infection rates across hospital districts. For example, around weeks 15-20 in the year 2020 there are two hospital districts, where the infection rates are well above that in the other hospital districts. The variation in the infection rates seems also to increase towards the end of the year. The right graph shows the weekly-level information on testing rates for hospital districts. The graph shows that the variation increases towards the end of the year. We employ the differences in the pandemic intensities to study the effects of Covid-19 pandemic on the life insurance market.

[11] The rates are constructed by dividing the number of cases within the hospital district by the number of people in that hospital district.

Figure 3. Weekly infections, deaths and tests in Finland in 2020

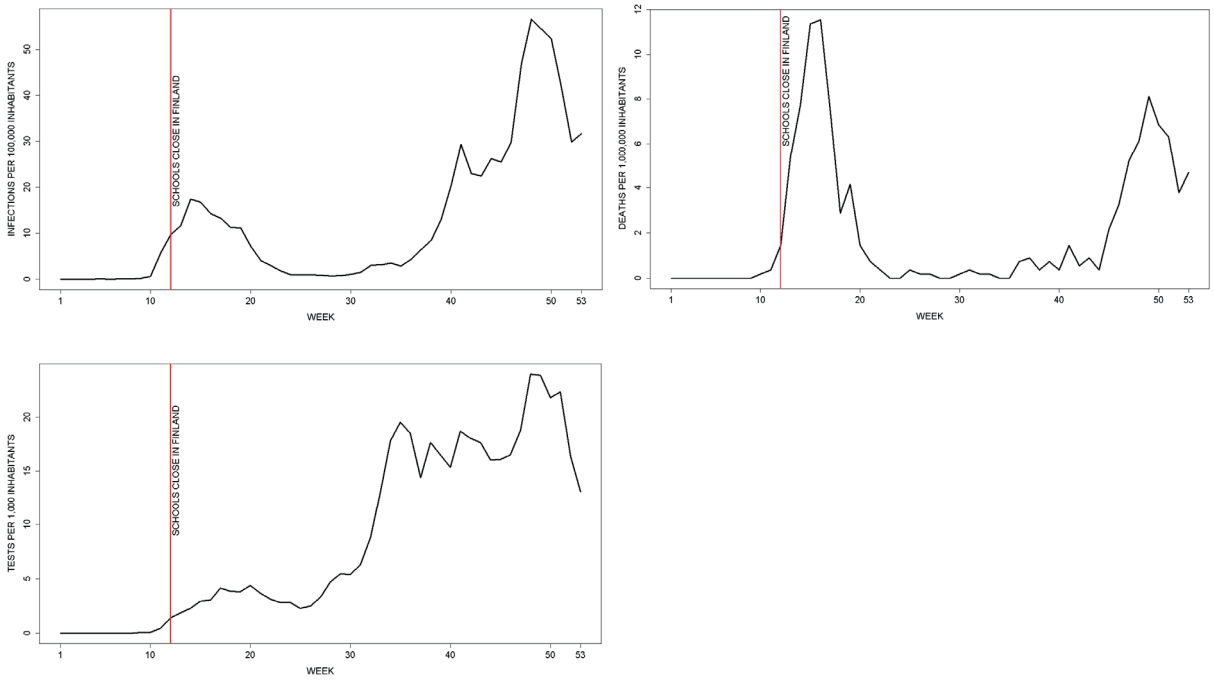


Figure 4. Monthly infections, deaths and tests together with new life insurances in Finland

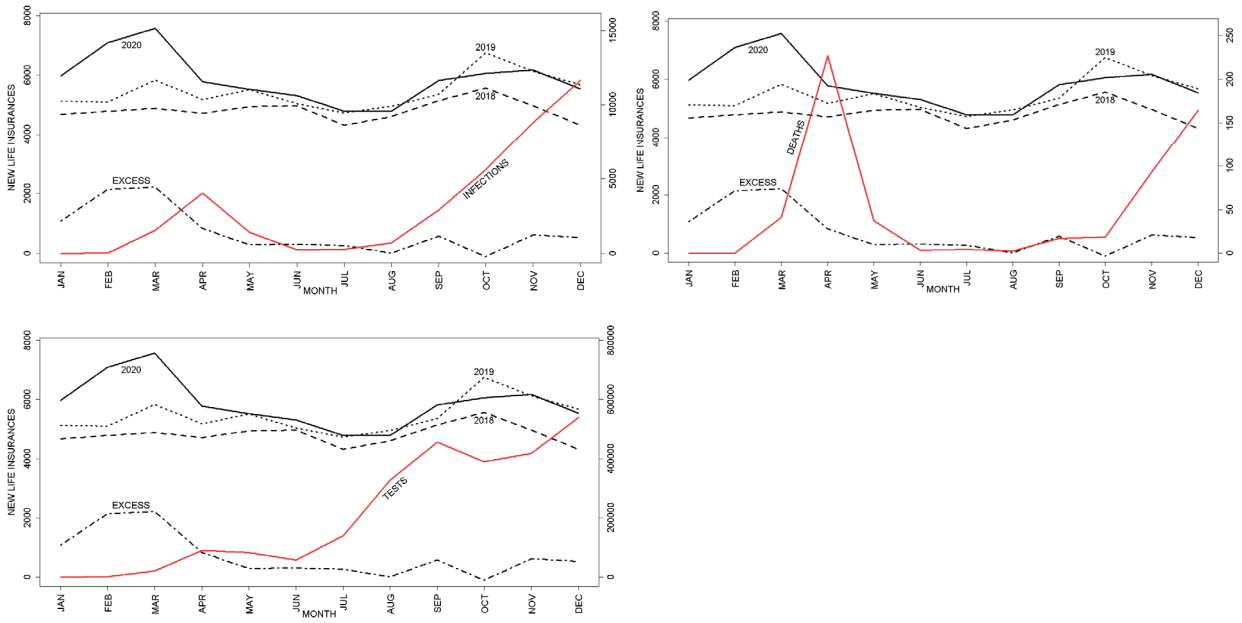


Figure 5. Infection rates and testing rates in the 19 hospital districts

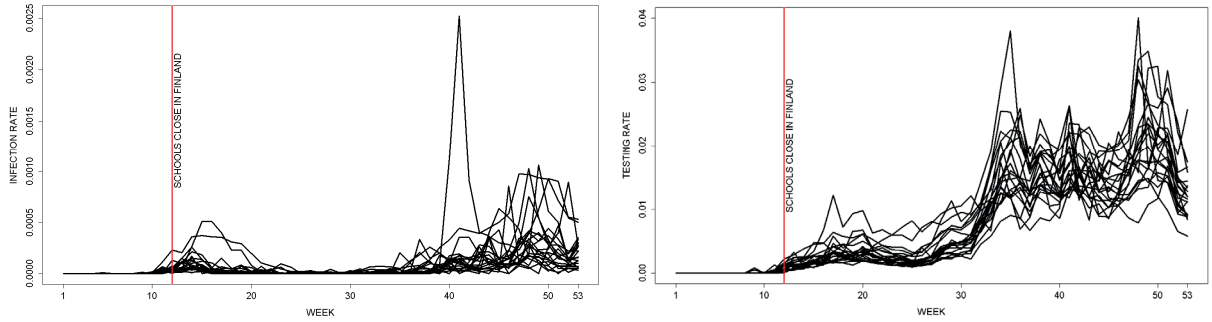


Table 1 summarizes the different variables regarding the life insurances and the covid-measures in the data.

Table 1. The variables in the data

	Level of Observation	Frequency	Information
Life Insurances	Individual	Day	Sum Insured; New Life Insurance
	Individual	Year	Sum Insured; Existing Life Insurance
Pandemic-Related Measures	Country	Week	Infection Rate
	Country	Week	Death Rate
	Country	Week	Testing Rate
	Hospital District	Week	Infection Rate
	Hospital District	Week	Testing Rate
Individual and Household Characteristics	Individual	Year	Gender
	Individual	Year	Age
	Individual	Year	Annual Income
	Household	Year	Number of Children

6. Analysis

In this section we study how the term life insurance demand responded to the Covid-pandemic in Finland. We study the effects on the take-out of new life insurance and the sum insured. We focus in our analysis on the short-run effects and use the observations from January to June in 2018–2020 (18 months all together).[12] We also focus on individuals of ages 21-60[13] as they are likely to be the breadwinners of their household[14] and to have access to life insurance markets[15].

The take-out of new life insurances for the pre-pandemic years (1-6/2018 and 1-6/2019) is in our data 1/556 and for the first pandemic year (1-6/2020) it is 1/463.[16] Thus, the take-out of new life insurances increased by 20 % in the first half of 2020 compared to the corresponding time-period in the pre-pandemic years. The corresponding average of sums insured are in our data 110,476€ (1-6/2018 and 1-6/2019) and 128,038€ (1-6/2020). The average sum insured has thus increased by 16 % in the first half of 2020.

In the remainder of this section, we first use both the country-level Covid-measures (section 6.1) and hospital district level Covid-measures (section 6.2) to study the responsiveness of life insurance markets to these

[12] Graphical illustrations above suggest the responses to follow very different paths in the beginning and end of 2020.
[13] There are 2,781,495 people of these ages in Finland.
[14] The purpose of life insurances is to compensate the remaining household for the lost income in case of a death of breadwinner.
[15] The literature acknowledges that there may not occur life insurance market for old people, because price of the insurance would become necessarily extremely high (as the price is a function of probability of dying, and therefore the function of age), and thus not lucrative from an individual point of view. If there is no market for old people, they cannot respond this way to an increased death risk, and they are therefore dropped out in our analysis.
[16] 0.0017981 = 1/556; 0.002159 = 1/463.

measures. Thereafter (in section 6.3) we study the characteristics of those people who took the new life insurances following the onset of the Covid-pandemic, and whether they differ from those taking new life insurances before the pandemic. We aim to understand two issues: to which pandemic measures people react the most, and who are those people who took the (excess) new life insurances. In more detail, we are interested in whether people responded more heavily to country-level information on the severity of the pandemic or to hospital district level information. Also, the socially important issue is whether those people with higher life insurance deficit are those that respond the most is analyzed.

We employ in our analysis a simple linear probability model (LPM) and conduct the analysis at the monthly level.[17] The linear probability model reads as follows:

$$Q_{it} = \beta p_{it} + \gamma Z_{it} + \varepsilon_{it}$$

The dependent variable Q_{it} stands for the take-out of new life insurance or sum insured, depending on which of these outcomes we study. For the take-out it takes value 1 if person i took a new life insurance at time t, and is 0 otherwise. For sum insured, Q_{it} is a continuous variable. Variable p_{it} stands for a Covid-related measure: infection rate, death rate or testing rate. Z_{it} includes the control variables, especially the individual characteristics and household characteristics that are observed in the earlier literature to be related to the life insurance demand. ε_{it} is an error term. The counterfactual evolution is in each regression the one where the Covid-related measure would be zero (that is the corresponding rate would be zero). The main hypothesis being tested in each regression is whether the new life insurances respond positively to an increase in the pandemic-related measure. That is in terms of our model (in section 2) whether $\frac{dQ}{dp} > 0$ or not. [18]

6.1 Life Insurance Responses to Country-Level Variation in Covid-19 measures

We begin by studying how the *country-level* temporal variation in Covid-measures affected the *take-out* of new life insurances of individuals. Three country-level pandemic measures are employed: the infection rate, death rate and testing rate. Table 2 shows the regression results when the life insurance take-out is explained by the first measure, the infection rate. In the first column of the table there are no control variables, while in the next columns we add one-by-one month, gender, age group, income level and the number of children as the control variables.[19] The control variable for month controls for seasonal variation in the take-out of new life insurances. Gender, age, income level and the number of children is also controlled for as they have been observed to affect life insurance behavior in earlier literature.

Table 2. The effect of infection rate on new life insurances (Country-Level; take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**0.54*** **	**0.57*** **	**0.57*** **	**0.56*** **	**0.65*** **	**0.93*** **
Baseline: 1/4,581	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

[17] For the robustness checks we have also performed logit and probit regressions. These are given in Appendix C. The results of these regressions provide very similar marginal effects as the linear probability model, suggesting that our choice of the model is not driving the results.

[18] Note that each of the Covid-measures is likely to be positively related to the perceived death probability. An increase in the sum insured implies in some cases a change from zero to a positive sum (that is increase in the take-out).

[19] For the last column the number of observations is smaller, because of missing information on the number of children.

The results in the table show that in line with the hypothesis, people react to the number of infections by purchasing new life insurances more often. The table first shows that on average 1 person out of 4,581 gets an infection of the coronavirus among Finnish population each month. The coefficient 0.93 in the right column of the table means that if the infection rate in Finland is doubled from the baseline (increase of 100 %) to 2 persons out of 4,581, the number of new life insurances changes on average by 2.0/10,000 (= 1/4,581*0.93*100 %). This is 11 % of the baseline for new life insurance (18/10,000). Doubling of the infection rate thus increases the number of new life insurances by 11 %, which corresponds to the life insurance take-out elasticity of infections of $e = 0.11$.[20]

Tables A1 and A2 in Appendix B show the corresponding take-out responses of life insurance for the death rate and test rate. The tables show that the take-out of new life insurances responds positively to both measures. Table A1 shows that doubling the death rate implies an 8 % increase in the take-out of life insurances.[21] This corresponds the life insurance take-out elasticity of death rate of $e = 0.08$. Table A2 implies the life insurance take-out elasticity of $e = 0.12$.[22] Thus, all the employed Covid-measures signal clearly increased death risk. Furthermore, they are of about the same size: an increase in each country-level Covid-measure by 10 % implies on average an increase in the number of new life insurances by about 1 %.

Table 3. The effect of infection rate on new life insurances (Country-Level; sum insured)

DEPENDENT VARIABLE: NEW LIFE INSURANCE (**Sum Insured**, thousands of €); BASELINE 0.199 (take-out 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**122.9*** **	**149.6*** **	**149.6*** **	**147.4*** **	**158.9*** **	**223.7*** **
Baseline: 1/4,581	(5.2)	(5.9)	(5.9)	(5.9)	(6.0)	(8.2)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Next, we study how the sums insured of the new life insurances were affected by the country-level Covid-measures. Compared to the above analysis we replace the dichotomous dependent variable in our model with a continuous one that stands for the sum insured. Table 3 shows how the infection rate affects the sum insured of new life insurances. Tables A3 and A4 show the corresponding results when using the death rate and test rate as the Covid-measures. The results show that also the average sums insured respond positively to all three Covid-measures. Table 3 shows that the doubling of the infection rate implies on average an increase of sum insured by 49 euros[23] from the baseline 199 euros.[24] Accounting for the change in the take-out (1/463 instead of 1/556), implies an increase in the average sum insured of by 4 %.[25] This corresponds to life insurance demand elasticity of $e = 0.04$. The corresponding range elasticity of the death rate is $e = -0.03$ and of the test rate is $e = 0.06$.[26] Overall, the sums insured do not seem to respond as positively as the take-outs.

[20] The lowest point estimate in the table (0.54) in turn implies an elasticity of $e = 0.07$.
[21] (14.6/107,759)/(18/10,000) = 8 %.
[22] (0.029*1/132)/(18/10,000) = 12 %.
[23] (223.7*1/4,581)*1,000 €) = 49 €.
[24] The average sum insured for new life insurance for pre-pandemic period (1-6/2018 and 1-6/2019) was 110,476€ and the corresponding take-out of 1/556. Thus, the baseline for the sum insured in the regression is 199 €.
[25] 248 € * 463 = 114,824 € and (114,824 – 110,476) / 110,476 = 4 %.
[26] 1/107,759 * 3,605 * 1,000 € = 33 €; 232 € *463 = 107,416 €; 1/132 * 7.1 *1,000 € = 54 €; 253 € * 463 = 117,139 €.

6.2 Life Insurance Responses to Hospital District Level Variation in Covid-19 measures

Next, we study how the new life insurances respond to the hospital district level (geographical) variation on infection rates and testing rates. Tables 8 and A5 show the results for the take-out of new life insurance. They show a positive response of new life insurance take-out to the hospital district level infection and testing rates. Table 8 shows that the doubling of infection rate implies a 5 % increase in the take-out of life insurances, and thus the elasticity of $e = 0.05$.[27] Compared to the corresponding result from the country-level ($e = 0.11$), this effect is smaller. The take-out of new life insurances thus responds more heavily to country-level variation than to the hospital district level variation in the infection rate. The same is true also for the testing rates: the results in table A5 imply that the doubling of test rate implies a 7 % increase in the take-out of new life insurances when considering the hospital district level ($e = 0.07$), while the results in table A2 show that the doubling of the test rate at the country-level increases the take-out of new life insurances by 12 % ($e = 0.12$).

Table 4. The effect of infections on new life insurances (Hospital district level; take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**0.19*** **	**0.17*** **	**0.17*** **	**0.13*** **	**0.11*** **	**0.29*** **
Baseline: 1/3,514	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Tables 5 and A6 show the results for the sum insured of new life insurances when using the hospital district level variations. The results show that the average sum insured of new life insurances changes by -3 % as a response to doubling of the hospital district level infection rate ($e = -0.03$). Doubling of test rate also implies a change of -3 % ($e = -0.03$).

Table 5. The effect of infections on new life insurances (Hospital district level; sum insured)

DEPENDENT VARIABLE: NEW LIFE INSURANCE (**Sum Insured**, thousands of €); BASELINE 0.199 (take-out 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**70.8*** **	**76.7*** **	**76.9*** **	**71.2*** **	**67.0*** **	**113.9*** **
Baseline: 1/3,514	(3.1)	(3.4)	(3.4)	(3.4)	(3.4)	(4.8)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Overall, both the take-out of new life insurances and the sums insured respond to the hospital district level Covid-measures. Still the response is stronger when using the country-level variation. At the country-level (hospital district level) the elasticity of take-outs for the infection rate is $e = 0.11$ ($e = 0.05$), for the death rate it is $e = 0.08$, and for the test rate it is $e = 0.12$ ($e = 0.07$). The corresponding elasticities for the sums

[27] (0.29 * (1/3,514)) / (1/556) = 0.05.

insured vary between positive and negative values. The responses to country-level variation are about twice the size of responses to hospital district level variation.

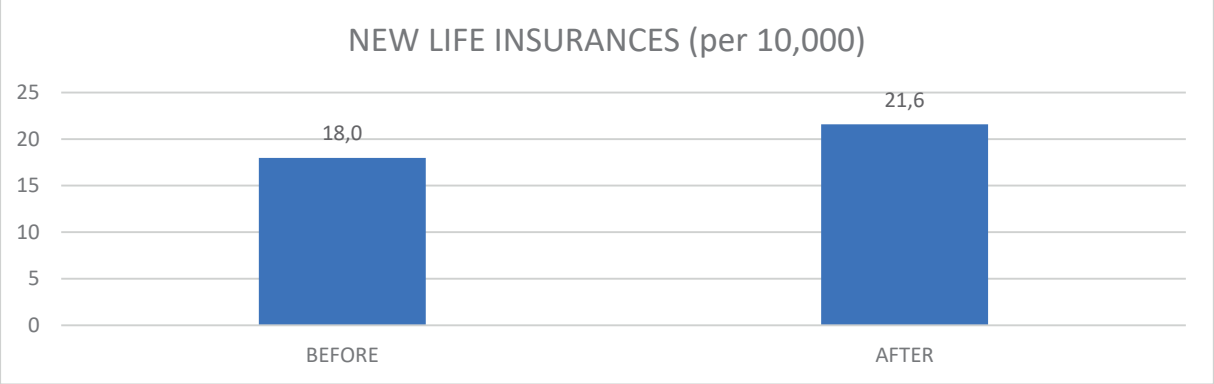
What then explains why people react more heavily to country-level than to hospital district level information? There are at least a few possible explanations for this result. It may arise if people are more aware of the evolution of the pandemic measures at the national level than at a more local level. Another explanation could be that people think that the pandemic will go through the whole population and that they will face country-level numbers as time goes by, even if the current local severity measures would be at lower levels.

6.3 Who Took the (Excess) New Life Insurances?

Above we observed that the life insurance demand has increased during the Covid-pandemic and that the life insurance demand responses to Covid-measures. Next, we study the characteristics of those people who took the (excess) new life insurances, and whether these characteristics differ from those taking life insurances before the pandemic. We also study whether those people whose life insurance deficit is the largest reacted the most.

Figure 6 shows the take-out rates for the new life insurances for people of ages 21-60 years before and during first year of the Covid-19 pandemic.[28] It shows that in each month out of 10,000 persons on average 18 took a new life insurance before the pandemic and 21-22 after the beginning of the pandemic. Thus, the take-out rate has increased after the beginning of the pandemic. Figure 7 illustrates the take-out rates according to four characteristics: gender, age, education and whether a person has children in his/her household.[29] The upper left graph shows that the take-out rate of new life insurances has been larger for males than for females both before and after the beginning of the pandemic, while it has increased in both groups. The upper right graph shows that take-out of new life insurances has increased in each age group from before period to the after year.

Figure 6. Take-out rates of the new life insurances



The lower left graph of Figure 7 shows the yearly evolution of new life insurance take-out for people according to their education level: low, middle and high.[30] This graph shows a clear increase in the take-out of the new life insurances for highly educated people: the increase was from 20,4 persons per 10,000 people to 27,4 per 10,000 people, which corresponds to 33,8 % increase in the take-out in year 2020. This is much larger than that of the people with low levels of education, 12.7 %, yet quite similar with people with middle

[28] Years 2018 and 2019 stand for the BEFORE years and year 2020 for the AFTER year. The corresponding figure for each of the three years is given in Figure A3 in Appendix B.
[29] Figure A4 in Appendix B shows the corresponding information for each year 2018, 2019 and 2020 separately.
[30] A person is considered to have a low level of education if s/he has taken only the primary school or the education level is unknown, a high level of education if s/he has a graduate degree or a doctoral degree. Otherwise, a person is coined to have a middle level education.

level of education. The lower right graph shows that the people with children increase their take-out more than those without children, yet the difference is not as large as for the highly educated people illustrated in the lower left graph.

Figure 7. Take-out rates of the new life insurances and individual and household characteristics

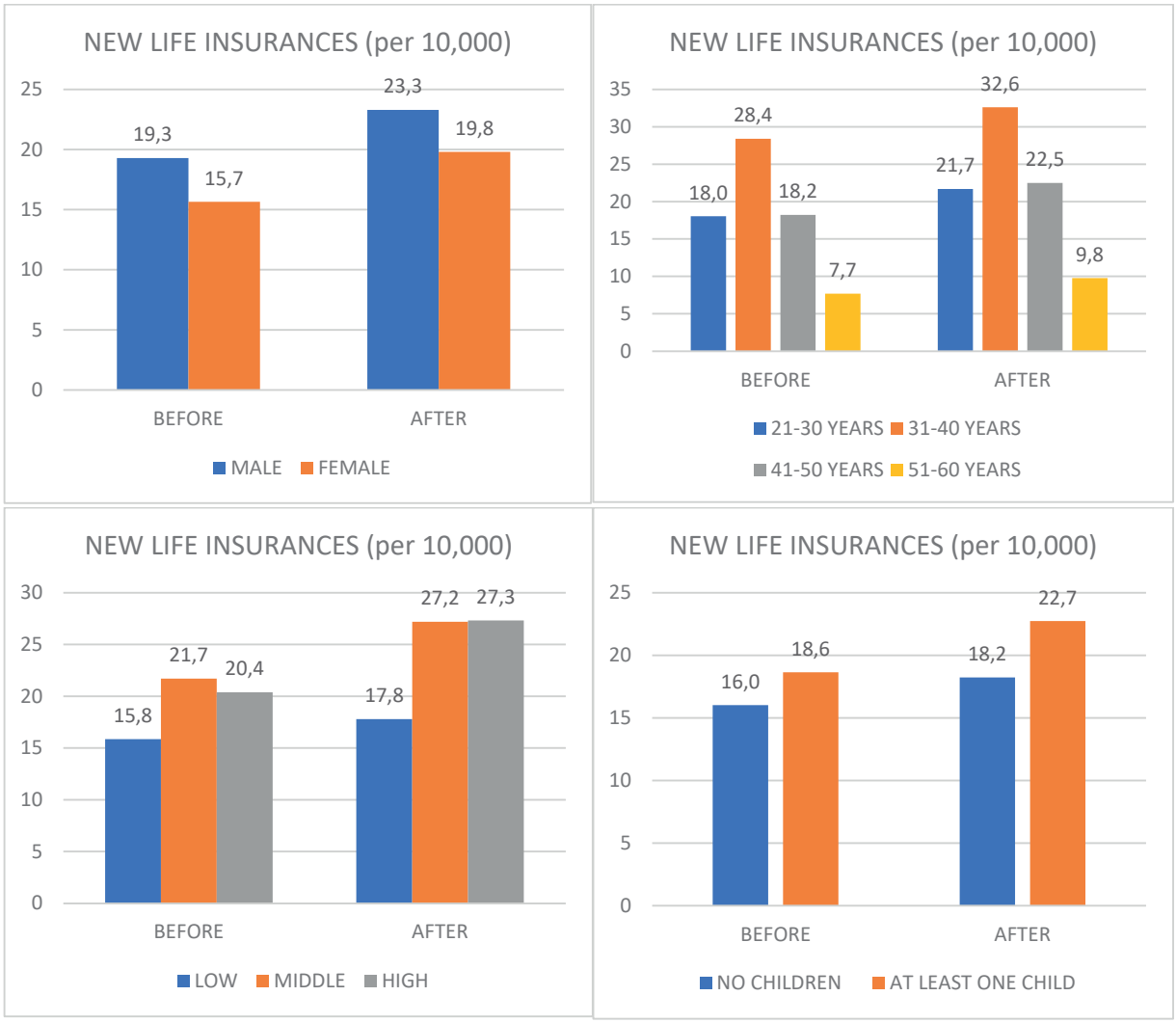
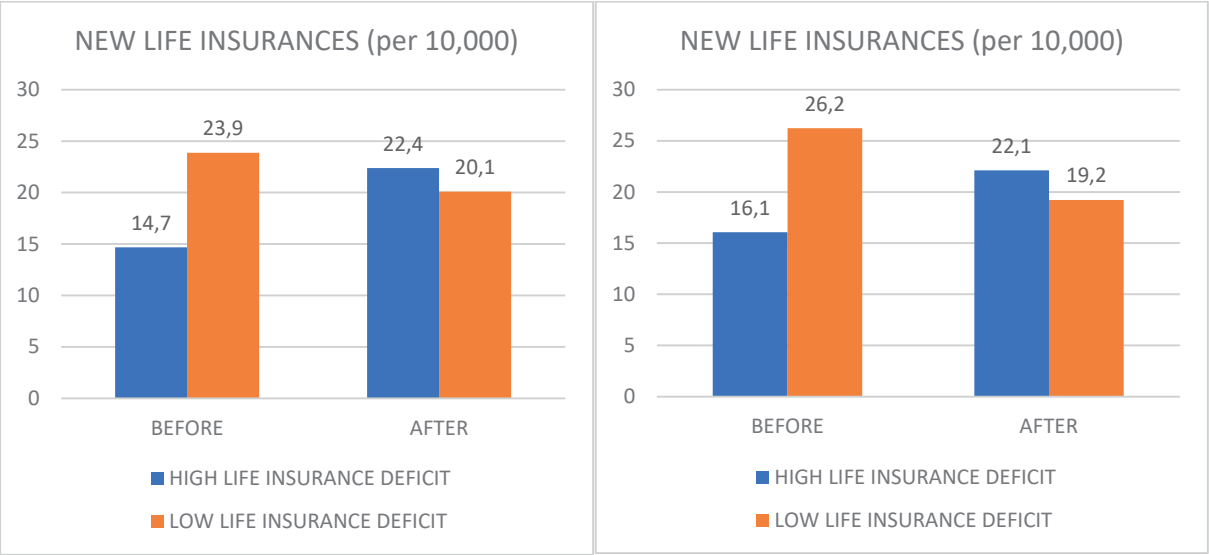


Figure 8 illustrates the evolution of the take-out of life insurances separately for people with the high and low life insurance deficit. [31] The left graph splits the sample to those with life insurance deficit over or under the average life insurance deficit (93,498 in our sample). The right graph shows the corresponding information but employs median as the limit instead of the average. Both graphs show that those with high life insurance deficit have taken much more often life insurances in 2020 than in the earlier years. According to the left graph information the increase is 52 %, while according to the right graph information it is 37 %. Those people who have lower life insurance deficit, have in turn not purchased life insurances in 2020 as often as in the earlier years. This is in line with the fact that they do not have as large a need for life insurance, and they may have been purchasing ones already before the pandemic.

[31] Figure A5 in Appendix B shows the corresponding information for each year 2018, 2019 and 2020 separately.

Figure 8. Take-out rates of the new life insurances and individual and life insurance deficit



Note: "High life insurance deficit" ("Low life insurance deficit") in the left graph refers to people over (under) the *average* life insurance deficit, while the right graph employs *median* as the dividing measure between high and low life insurance deficit.

Next, we study in more detail how the take-out of new life insurances differed by education level. Figure A7 in Appendix B shows the monthly evolution of take-out of new life insurances for three education levels: for people with low (upper left graph), middle (upper right graph) and high education (lower graph).[32] The figure shows first, in line with figure 7, that the people with low education levels take on average less life insurances (about 15/10,000) than people with higher levels of education (20+/10,000).[33] Importantly it also shows that people with higher education levels tend to respond on average more to the pandemic by purchasing life insurances more often. The lower right graph shows the excess of new life insurances in 2020 compared to earlier years. It shows that in February and March 2020 the excess take out of new life insurances were about 12 and 16 percentage points for highly educated people, respectively. Compared to about 20 % baseline, these correspond to 60 % and 80 % increases in the new life insurance take outs in these months. These are very large numbers also compared to the average increases of new life insurance take-out in February and March 2020, which is about 40 % (see Figure 2). This suggests that the highly educated people responded heavily to the pandemic by taking ne life insurances. For people with middle level of education the excess take out was about 7 and 11 percentage points for February and March 2020. For people with low education level the corresponding numbers were about 6 and 2.

Next, we investigate the above qualitative results with the regressions about how the take-out of new life insurances depends on the earlier life insurance purchases, the life insurance deficit and the level of education. In Table 6 we study how the take-out of new life insurances differs between individuals that have had a life insurance already in the end of 2019, compared to those that did not have one. The table shows that the take-out of those who already had life insurance is larger than that of those who did not have one. They are 0.18 – 0.25 percentage points more likely to take a new life insurance in 2020.[34]

Table 7 studies how the life insurance deficit affects the take-out of new life insurances. It shows that the point estimates vary between positive and negative. In more detail, controlling for the income changes the sign from positive to negative. The change occurs as incomes are one of the most important determinants of

[32] The corresponding figure including information for each year separately is depicted in A6 in Appendix B.
[33] This is also observed in Ropponen et al. (2023).
[34] Raw percentages for the two groups are 0.18 % vs 0.43 % respectively.

the life insurance deficit. The first four columns show a positive effect of the life insurance deficit on the take-out of new life insurances. This would suggest that the pandemic pushed those people to take new life insurances, who are monetarily at the most vulnerable situation in the case of a premature death of the breadwinner.

Table 8 studies how the level of education affects the take-out of new life insurances. The level of education of a person is coded as being "higher level of education" in those cases where his/her level of education is at the middle or high level (not a low level to follow the terminology above). The table shows that the people with higher education increased their new life insurance take-out more than low level of education. The difference is about 4 more new life insurances per 10,000 people.

Table 6. The effect of earlier life insurance on new life insurances (take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE 2020 **(0/1)**; BASELINE: 22/10,000 (or 1/463)						
	(1)	(2)	(3)	(4)	(5)	(6)
Life Insurance in 2019 (%)	**0.25*** **	**0.25*** **	**0.25*** **	**0.26*** **	**0.22*** **	**0.18*** **
Baseline: 0.141	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	16,527,486	16,527,486	16,527,486	16,527,486	16,154,730	11,400,120

Table 7. The effect of life insurance deficit on new life insurances (take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE 2020 **(0/1)**; BASELINE: 22/10,000 (or 1/463)						
	(1)	(2)	(3)	(4)	(5)	(6)
Life Insurance deficit (10^-9)	**4.8*** **	**4.8*** **	**4.6*** **	**2.8*** **	**-1.3*** **	**-1.9*** **
Baseline: 93,498	(0.09)	(0.09)	(0.10)	(0.10)	(0.13)	(0.11)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	10,968,558	10,968,558	10,968,558	10,968,558	10,780,704	10,283,226

Table 8. The effect of education level on new life insurances (take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE 2020 **(0/1)**; BASELINE: 22/10,000 (or 1/463)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Higher Level of Education (0/1) x Year 2020	**9.5*** **	**4.1*** **	**4.1*** **	**4.1*** **	**4.3*** **	**3.7*** **	**4.2*** **
Baseline: 0.134	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)
Control Variables:							
Year	YES	YES	YES	YES	YES	YES	YES
Higher Level of Education (0/1)	NO	YES	YES	YES	YES	YES	YES
Month	NO	NO	YES	YES	YES	YES	YES
Gender	NO	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Note: The regression estimates are in the units of 1/10,000.

Above we observed that people with larger life insurance deficit purchased life insurance in 2020 more often than those with smaller deficit. We also find some intriguing differences between people who purchase new life insurance during the covid-pandemic compared to the earlier years. First, as we observed above, in the first half of 2020 there were more new life insurance purchases (30,909) than in the first halves of the earlier years 2018 and 2019 (24,216 and 26,738 respectively). Second, we find that the corresponding average sum insured was larger in 2020 (132,138 €), compared to that in 2018 and 2019 (109,615 € and 118,187 €). Still, even if the sum insured was on average larger in 2020, the remaining average life insurance deficit for those people who took a new life insurance is larger in 2020 (145,797 €) than earlier (76,744 € and 78,338 € for years 2018 and 2019). In the absence of new life insurance purchases, their life insurance deficits would have been 186,359 € in 2018, 196,525 € in 2019, and 277,935 € in 2020. Thus, the pandemic encouraged people with larger initial life insurance deficits to take new life insurances more often, making the people who took a new life insurance in 2020 differ from those that took one in 2018 or 2019. They took on average larger new life insurances, their remaining life insurance deficit is larger, and their life insurance deficit would have been even larger in the absence of new life insurance. The reductions in the life insurance deficit due to new life insurances are 59 % for 2018, 60 % for 2019, and 48 % for 2020.

Finally, it is worthwhile comparing our findings to the predictions of the theory. It was shown before that under commonly used assumptions a simple theoretical model implies a constant life insurance deficit, as long as the relative cost of insurance (determined by the ratio of insurance costs and mortality risks) and preferences remain constant. We do not have direct empirical evidence on changes in the insurance terms in Finland, but the available international evidence (Harris et al. 2021) suggest that the insurance cost did not respond, at least fully, to the increased mortality rate, thus improving the de facto terms of insurance. If that is the case, the insurance deficit should have decreased under optimal insurance behavior.

In this respect, the heterogeneity of the response is interesting and may yield new information regarding the underlying causes of the insurance deficit. The deficit decreased more in the group that had previously higher deficit, which may imply a possible signaling effect due to the raised awareness of the mortality risks. Also, the fact that the effect was less pronounced in the group of low-educated people, even after controlling for a wide variety of factors that may have affected the insurance terms, suggests that the reason for the deficit may relate to informational constraints. That is, higher education may allow better perception of the benefits of life insurance in the changed environment.

7. Conclusions

We have studied how the COVID-19 pandemic affected the life insurance behavior in Finland. We find that the *number* of new life insurances increased by 20 % in the first half of 2020 among people of ages 21-60 compared to the earlier years. The *average* sum insured increased at that time by 16 %.

Regarding the response to Covid-19 measures we find that the purchases of new life insurances respond to the severity of Covid-pandemic. The response is found to be stronger to *country-level temporal* variation than to hospital district level variation in the Covid-measures. The take-out elasticities of new life insurances are found to be for each of the country-level measures (infection rate, death rate, test rate) about 0.1 (baseline take-out 5,000/month). The corresponding elasticities for the average sums insured vary between positive and negative depending on the measure. One possible reason for the response to be larger to the country-level information is that the news provided typically country-level information, making people more aware of Covid-indicators at this level, and thus responding to this most salient information. Another possibility would be that people assume the pandemic to go through the population making the country-level information relevant for them later in the future.

Finally, we focused on the question of who took the (excess) new life insurances. We find that people who had a voluntary term life insurance at the end of 2019 responded more heavily to the pandemic by purchasing more new life insurances in 2020. The importance of being well-informed and far-sighted, observed in previous insurance demand studies, is seen here also via a stronger reaction among the highly educated people. We also find that the people with higher life insurance deficit are more responsive. This means that those people who needed the cover of life insurance the most (financially most vulnerable people), responded more often, and thereby reduced their life insurance deficit.

Our results suggest that during a health crisis, which strongly increases uncertainty of mortality, people behave in life insurance markets more as the theoretical models predict, compared to the conclusions drawn from the earlier empirical literature, which rests mostly on data from normal times. The pandemic turned out to increase the mortality rates of the working-age people rather little. It still seems to have reduced the life insurance gaps in Finland. Obvious policy implication is to increase financial literacy and information on mortality risks in the population.

References

Adams-Prassl, Abi, Teodora Boneva, Marta Golin, and Christopher Rauh (2020): Inequality in the impact of the coronavirus shock: Evidence from real time surveys, Journal of Public Economics 189, 104245

Alstadsæter, Annette, Bernt Bratsberg, Gaute Eielsen, Wojciech Kopczuk, Simen Markussen, Oddbjorn Raaum, and Knut Røed (2020): The First Weeks of the Coronavirus Crisis: Who Got Hit, When and Why? Evidence from Norway, NBER Working Papers 27131

Barrero, Jose Maria, Nicholas Bloom, Steven J. Davis, and Brent H. Meyer (2021): COVID-19 Is a Persistent Reallocation Shock, AEA Papers and Proceedings 111: 287-291

Bartik, Alexander W., Marianne Bertrand, Zoe Cullen, Edward L. Glaeser, Michael Luca, and Christopher Stanton (2020): The impact of COVID-19 on small business outcomes and expectations, Proceedings of the National Academy of Sciences, 117(30): 17656–17666

Beland, Louis-Philippe, Abel Brodeur, and Taylor Wright (2020): The short-term economic consequences of COVID-19: exposure to disease, remote work and government response, IZA Discussion Papers 13254

Bernheim, B. Douglas, Lorenzo Forni, Jagadeesh Gokhale, and Laurence J. Kotlikoff (2003): The Mismatch Between Life Insurance Holdings and Financial Vulnerabilities: Evidence from the Health and Retirement Study, American Economic Review 93(1): 354–365

Borjas, George J. and Hugh Cassidy (2020): The adverse effect of the COVID-19 labor market shock on immigrant employment, NBER Working Papers 27243

Brodeur, Abel, Nikolai Cook, and Taylor Wright (2021a): On the effects of Covid-19 safer-at-home policies on social distancing, car crashes and pollution, Journal of Environmental Economics and Management 106, 102427

Brodeur, Abel, David Gray, Anik Islam, and Suraiya Bhuiyan (2021b): A literature review of the economics of COVID-19, Journal of Economic Surveys 35: 1007-1044

Cawley, John and Tomas Philipson (1996): An Empirical Examination of Information Barriers to Trade in Insurance, NBER Working Paper 5669

Chambers, Matthew, Don E. Schlagenhauf and Eric R. Young (2011): Why Aren't More Families Buying Life Insurance? Center for Retirement Research at Boston College Working Paper No. 2011-7

Chetty, Raj, John N. Friedman, Nathaniel Hendren, Michael Stepner, and The Opportunity Insights Team (2023): The economic impacts of covid-19: Evidence from a new public database built using private sector data, NBER Working Papers 27431, Revised April 2023

Coe, Norma B., Anek Belbase and April Yanyuan Wu (2016): Overcoming Barriers to Life Insurance Coverage: A Behavioral Approach, Risk Management and Insurance Review 19(2): 307–336

Couch, Kenneth A., Robert W. Fairlie, and Huanan Xu (2020): Early evidence of the impacts of COVID-19 on minority unemployment, Journal of Public Economics 192, 104287

Dingel, Jonathan and Brent Neiman (2020): How many jobs can be done at home? Journal of Public Economics 189, 104235

Ericson, Keith Marzilli and Justin R. Sydnor (2018): Liquidity constraints and the value of insurance. No. w24993. National Bureau of Economic Research.

Forsythe, Eliza, Lisa B. Kahn, Fabian Lange, and David Wiczer (2020): Labor demand in the time of COVID-19: Evidence from vacancy postings and UI claims, Journal of Public Economics 189, 104238

Gupta, Sumedha, Laura Montenovo, Thuy Nguyen, Felipe Lozano-Rojas, Ian Schmutte, Kosali Simon, Bruce Weinberg, and Coady Wing (2023): Effects of social distancing policy on labor market outcomes, Contemporary Economic Policy 41: 166-193

Harris, Timothy F. and Aaron Yelowitz (2018): Life Insurance Holdings and Well-being of Surviving Spouses, Contemporary Economic Policy 36(3): 526–538

Harris, Timothy F., Aaron Yelowitz, and Charles Courtemanche (2021): Did COVID-19 change life insurance offerings? Journal of Risk and Insurance 88(4): 831–861

Hedengren, David and Thomas Stratmann (2016): Is there Adverse Selection in Life Insurance Markets? Economic Inquiry 54(1): 450–463

Hendren, Nathaniel (2013): Private Information and Insurance Rejections, Econometrica 81(5): 1713–1762

He, Qihao, Michael Faure, and Chengwei Liu (2023): The possibilities and limits of insurance as governance in insuring pandemics, Geneva Papers on Risk Insurance – Issues and Practice 48: 641–668

Heo, Wookjae, John E. Grable, and Swan Chatterjee (2013): Life Insurance Consumption as a Function of Wealth Change, Financial Services Review, 22(4): 389-404

Holgersen, Henning, Zhiyang Jia, and Simen Svenkerud (2021): Who and how many can work from home? Evidence from task descriptions, Journal of Labour Market Research 55(4)

Kutlu-Koc Vesile and Adriaan Kalwij (2017): Individual Survival Expectations and Actual Mortality: Evidence from Dutch Survey and Administrative Data, European Journal of Population 33(4): 509–532

Lin, Chaonan, Yu-Jen Hsiao and Cheng-Yung Yeh (2017): Financial literacy, financial advisors, and information sources on demand for life insurance, Pacific-Basin Finance Journal 43: 218–237

Lozano-Rojas, Felipe, Xuan Jiang, Laura Montenovo, Kosali I. Simon, Bruce A. Weinberg, Coady Wing (2020): Is the cure worse than the problem itself? Immediate labor market effects of covid-19 case rates and school closures in the U.S., NBER Working Paper 27127

Nam, Youngwon and Hanna Sherman (2018): The Effects of Risk Aversion on Life Insurance Ownership of Single-Parent Households, Applied Economics Letters 26(15): 1285–1288

Parker, Jonathan A. (2017). Why don't households smooth consumption? Evidence from a $25 million experiment. American Economic Journal: Macroeconomics, 9(4), 153-183.

Pitthan, Francisco, and Kristof De Witte (2021): Puzzles of insurance demand and its biases: A survey on the role of behavioural biases and financial literacy on insurance demand. Journal of Behavioral and Experimental Finance 30: 100471.

Qian, Xianhang (2021): The impact of COVID-19 pandemic on insurance demand: the case of China, European Journal of Health Economics 22: 1017-1024

Ropponen, Olli, Tero Kuusi, and Tarmo Valkonen (2023): Mind the Gap – Assessing the Size and Determinants of the Life Insurance Gap, Journal of Finnish Economic Association, forthcoming

Appendix A: Theoretical Framework

This appendix provides a simple theoretical framework to illustrate 1) the decision making of an individual in life insurance markets and 2) how the optimal choice of the life insurance responds to a change in death risk. We follow the footsteps of Cawley and Philipson (1996) and build a model where an individual chooses the sum insured Q to maximize the expected utility. The expected utility depends on the death probability p and the wealth level in two cases: in case of a death (W_1), and in the absence of it (W_0). In case of a death the wealth is W_1:

$$W_1 = W + Q - L - q(Q)Q$$

where W stands for the initial wealth, Q for the sum insured, L for the potential loss[35], $q(Q)$ for the unit price of insurance[36], and $q(Q)Q$ for the insurance premium. In the absence of death (with probability $1-p$), neither materializes the potential loss (L) nor the payment of sum insured (Q), and thus the wealth is W_0:

$$W_0 = W - q(Q)Q$$

The expected utility reads (with the Von Neumann-Morgenstern utility function) as follows:[37]

$$EU(Q) = pU(W_1(Q)) + (1-p)U(W_0(Q))$$

Maximization of the expected utility with respect to the sum insured, Q, gives the optimal condition:

$$\frac{dEU(Q)}{dQ} = pU'(W_1)\frac{dW_1(Q)}{dQ} + (1-p)U'(W_0)\frac{dW_0(Q)}{dQ} = 0$$

This equation implicitly gives the demand for life insurance as a function of death probability: $Q = Q(p)$.

Let us next study the comparative statics by taking a derivative of the first order condition with respect to the death probability p.

$$\frac{d}{dp}\left(\frac{dEU(p,Q(p)}{dQ(p)}\right) = \overbrace{\frac{\partial}{\partial p}\left(\frac{dEU(p,Q(p))}{dQ(p)}\right)}^{\left[U'(W_1)\frac{dW_1(Q)}{dQ} - U'(W_0)\frac{dW_0(Q)}{dQ}\right]} + \frac{d^2EU(p,Q(p)}{dQ(p)^2}\frac{dQ}{dp} = 0$$

And solving for the demand response to death probability $\frac{dQ}{dp}$ gives us the following

[35] The potential loss is the amount of wealth loss in case an individual does not have a life insurance.

[36] We assume for the price of the unit insurance the following: $0 < q(Q) < 1$. The lower limit follows from the fact that no insurance company would sell its life insurance products with zero or negative price. The upper limit comes from an individual behavior. The case $q(Q) = 1$ would correspond to case where the cost of the insurance (insurance premium) $q(Q)Q$ would equal the sum insured Q. In that case an individual would not purchase a life insurance. This partial analysis does not include the reaction of the insurance company to the higher mortality risk. Harris et al. (2021) analyzed the offerings in the US until February 2021 and found that there was no overall increase in the premiums because of the pandemic.

[37] We assume the utility function to be concave: $U' > 0$, $U'' < 0$.

$$\frac{dQ}{dp} = -\frac{1}{\frac{d^2EU(p,Q(p))}{dQ(p)^2}}\left[U'(W_1)\frac{dW_1(Q)}{dQ} - U'(W_0)\frac{dW_0(Q)}{dQ}\right]$$

The second order condition for the maximum is $\frac{d^2EU(p,Q(p))}{dQ(p)^2} < 0$. Thus $-\frac{1}{\frac{d^2EU(p,Q(p))}{dQ(p)^2}} > 0$, and the sign of $\frac{dQ}{dp}$ is determined by sign of the terms within the brackets $U'(W_1)\frac{dW_1(Q)}{dQ} - U'(W_0)\frac{dW_0(Q)}{dQ}$. In case the unit price of insurance remains constant and does not depend on the sum insured ($q'(Q) = 0$), $\frac{dW_1(Q)}{dQ} = 1 - q$ and $\frac{dW_0(Q)}{dQ} = -q$. Thus, the optimal sum insured (Q) responses positively on an increased death probability (p):

$$\frac{dQ}{dp} = -\frac{1}{\frac{d^2EU(p,Q(p)}{dQ(p)^2}}[(1-q)U'(W_1) + qU'(W_0)] > 0$$

To focus on the demand response in a more detailed manner, let us consider a special case with the utility function $U(W) = -e^{-\theta W}$.[38] Now the optimal sum insured is determined by the following condition:

$$Q = L - \frac{1}{\theta}\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right)$$

The optimal life insurance now depends on the potential loss (L), the risk averse parameter (θ), the unit price of life insurance (q) and the death probability (p). We first observe that the sum insured is positively related to the potential loss.[39] Second, a more risk averse individual has a larger sum insured. Third, for a high enough unit price of life insurance, an individual does not purchase life insurance.[40] This is the case when the optimal condition would imply negative sum insured. Fourth, the demand for the life insurance (Q) remains less than the potential loss from a death (L) if the term within the logarithm is larger than one, that is if $\frac{q/(1-q)}{p/(1-p)} > 1 \Leftrightarrow \frac{q}{p} > 1$.[41] That is $Q < L$ when the unit price of insurance (q) is larger than the death risk (p). This condition is likely to hold, because it is in line with the insurance companies not making offers that would be monetarily harmful for them. To continue in operation the insurance companies must not sell a unit of sum insured with less than its expected cost of that unit.

[38] This is a utility function with a constant absolute risk aversion (CARA), that is $\frac{U''(W)}{U'(W)} = \theta = constant$. This form of the utility function ignores the wealth effect.

[39] By rearranging the terms and taking a logarithm we see that also the life insurance deficit ($L - Q$) is the smaller the larger the risk averse of an individual (captured by parameter θ):

$$\ln(L-Q) = ln\left(\frac{1}{\theta}\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right)\right) = -\ln(\theta) + ln\left(\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right)\right)$$

[40] This is the case when the unit price of insurance (q) is high compared to the death probability (p), $\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right) > L\theta$.

[41] In this case the life insurance gap is positive: $L - Q = \frac{1}{\theta}\ln\left(\frac{\frac{q}{1-q}}{\frac{p}{1-p}}\right) > 0$.

Appendix B: Figures and Tables

Figure A1. Time evolution of take-out of new life insurances with respect to age groups.

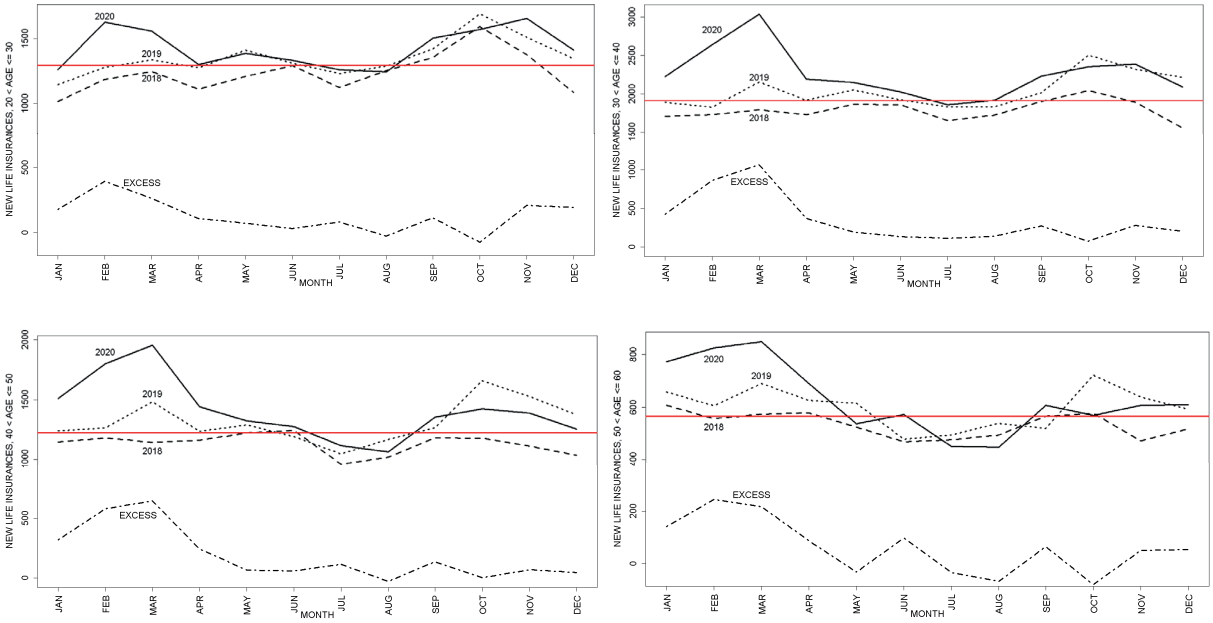


Figure A2. Time evolution of the average sums insured of new life insurances.

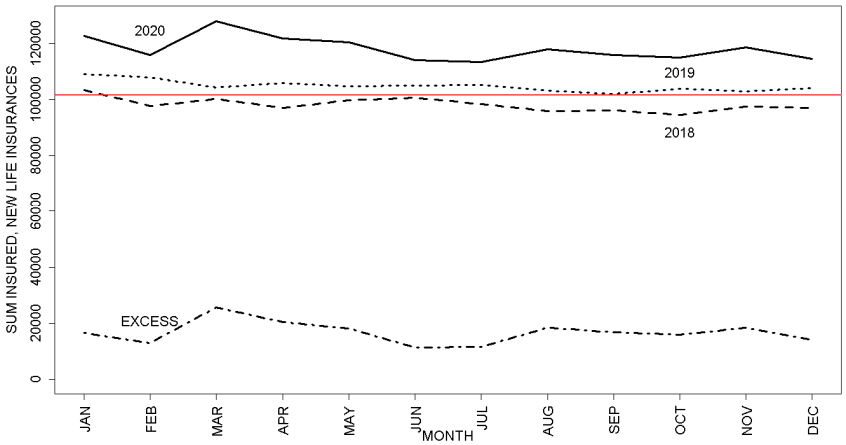


Figure A3. Take-out rates of the new life insurances

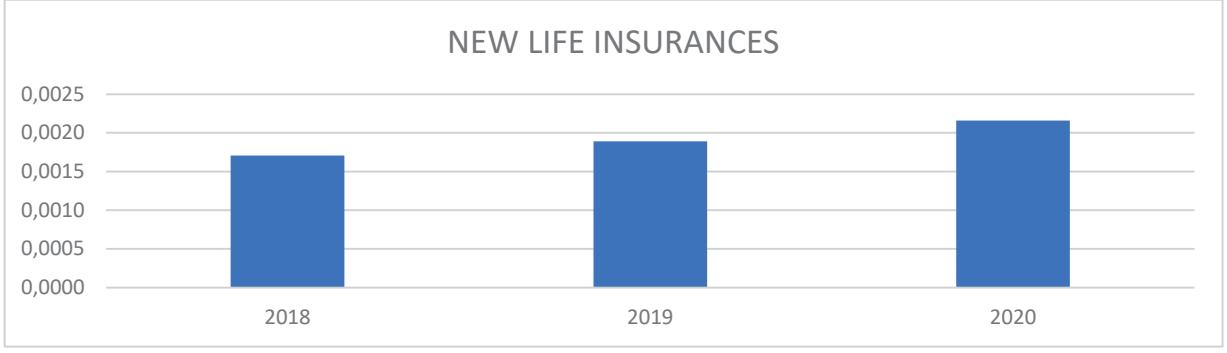


Figure A4. Take-out rates of the new life insurances and individual and household characteristics

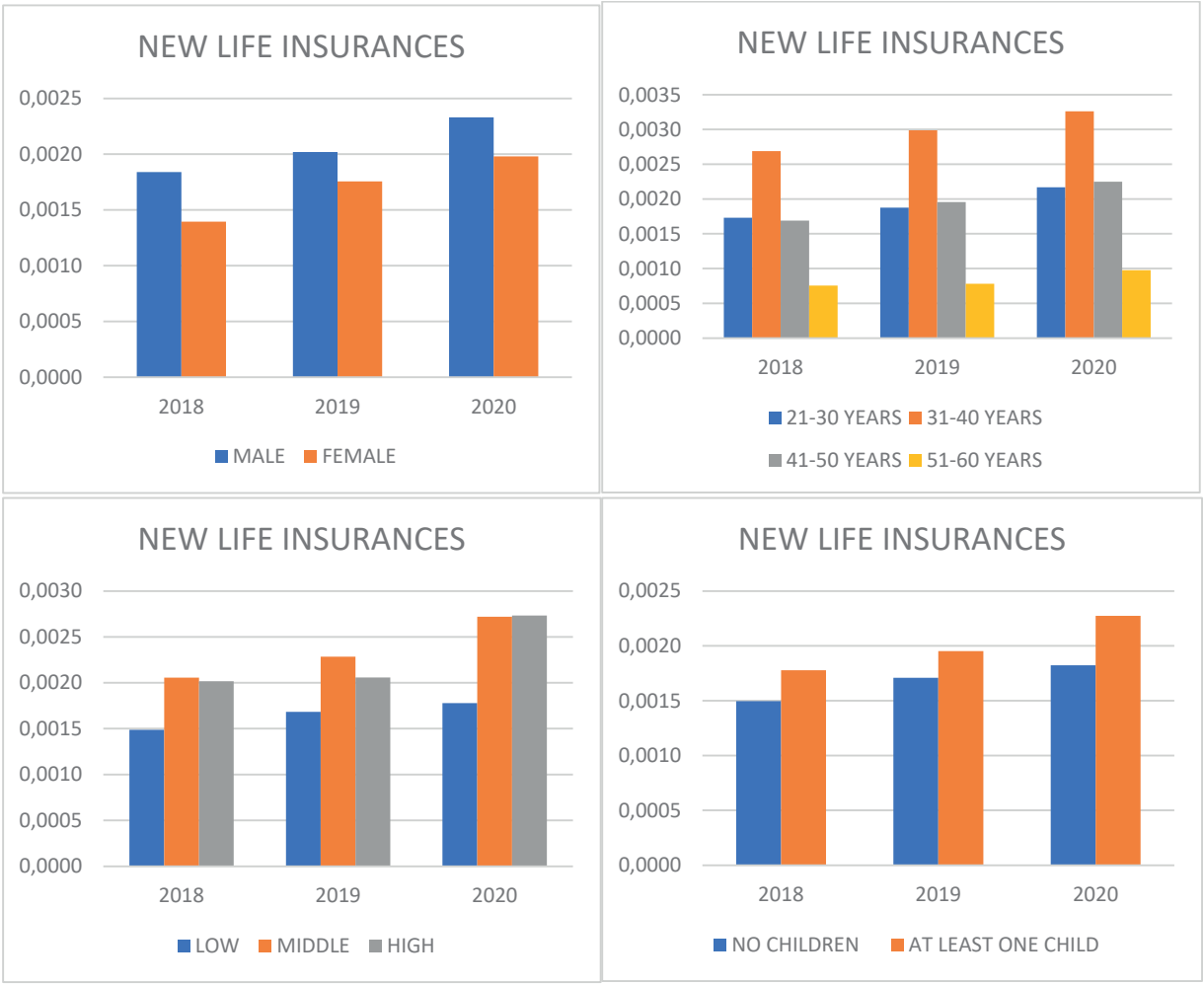


Figure A5. Take-out rates of the new life insurances and individual and life insurance deficit

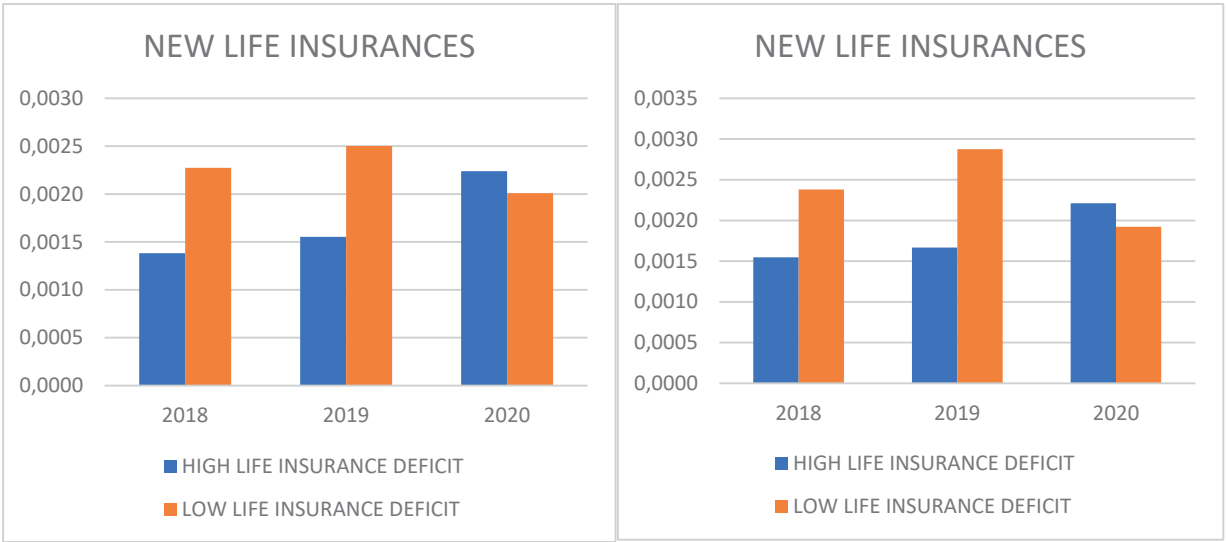
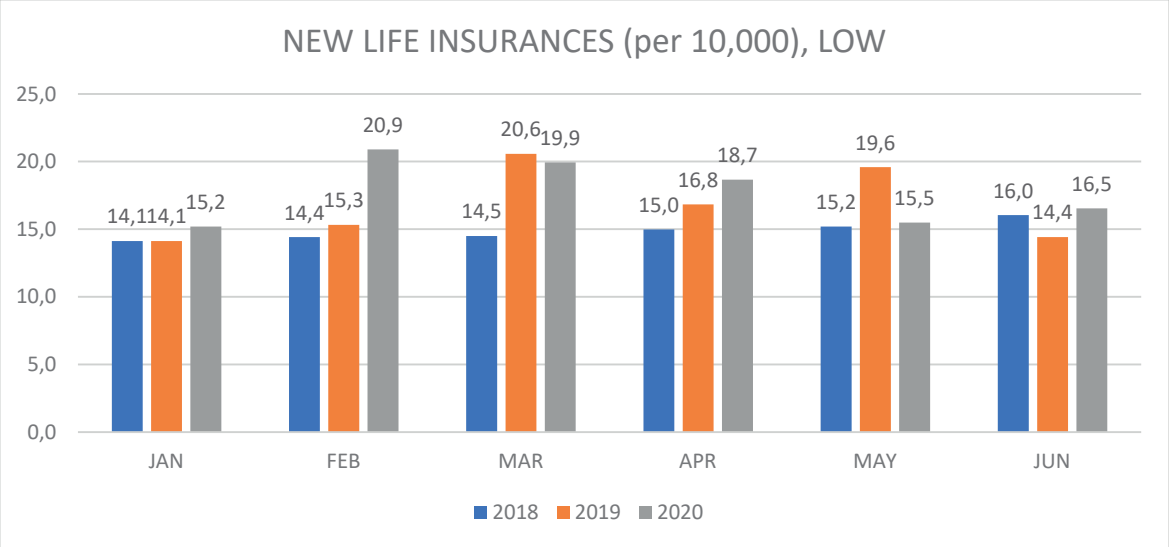
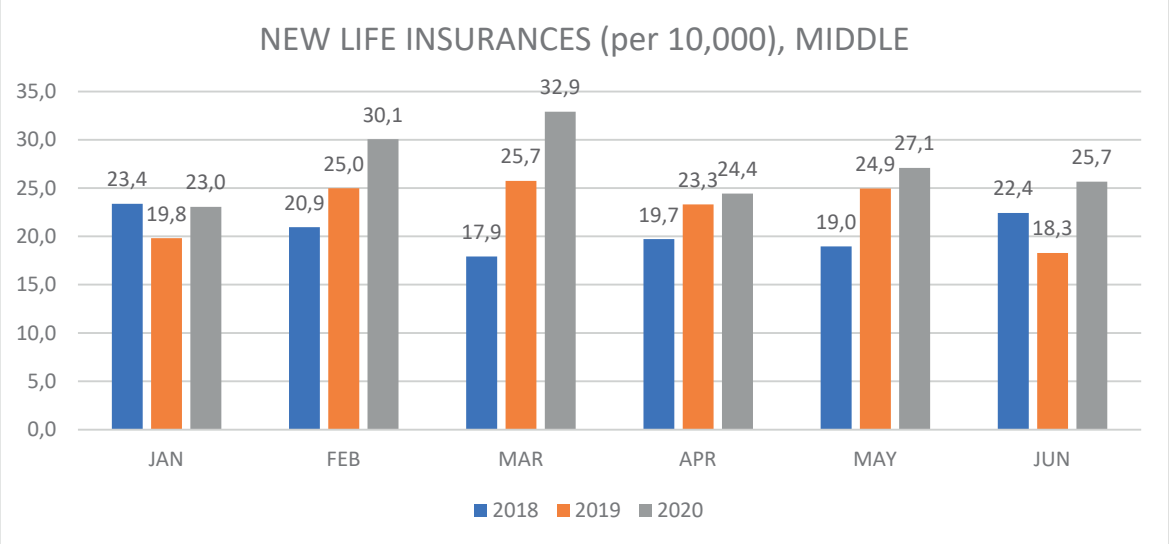


Figure A6. Education levels (low, middle, high) and take-out of new life insurances





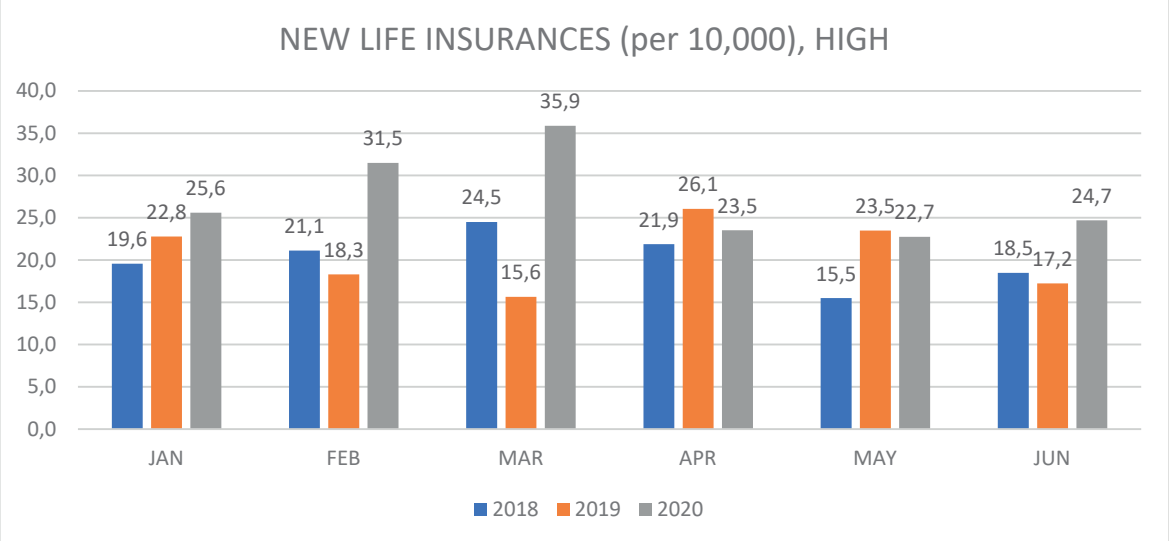


Figure A7. Education levels (low, middle, high) and take-out of new life insurances

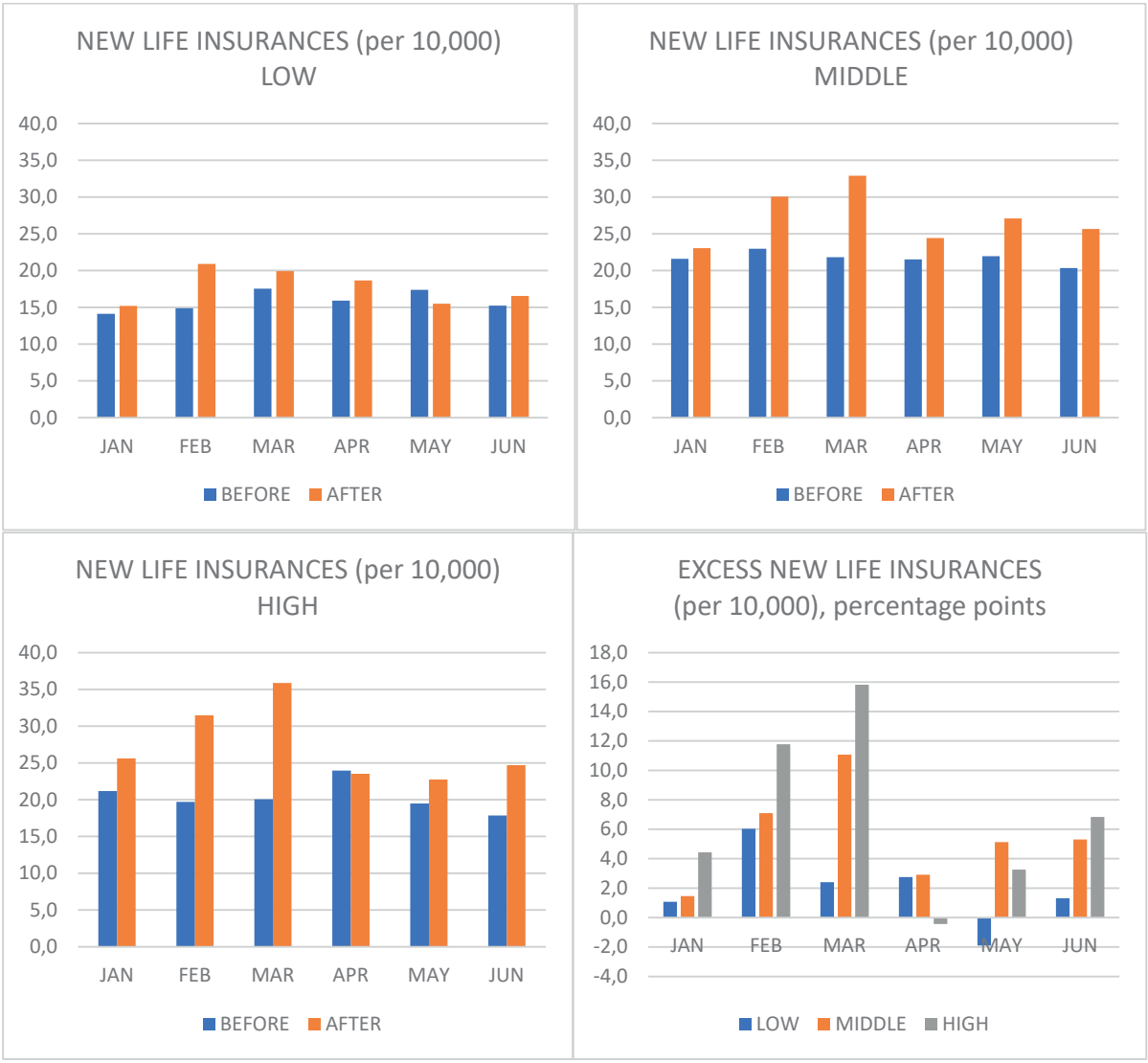


Table A1. The effect of death rate on new life insurances (Country-Level; take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Death Rate	**7.4*****	**8.5*****	**8.5*****	**8.3*****	**9.9*****	**14.6*****
Baseline: 1/107,759	(0.65)	(0.76)	(0.76)	(0.76)	(0.77)	(1.03)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Table A2. The effect of test rate on new life insurances (Country-Level; take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**0.013*** **	**0.017*** **	**0.017*** **	**0.017*** **	**0.020*** **	**0.029*** **
Baseline: 1/132	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Table A3. The effect of death rate on new life insurances (Country-Level; sum insured)

DEPENDENT VARIABLE: NEW LIFE INSURANCE (**Sum Insured**, thousands of €); BASELINE 0.199 (take-out 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Death Rate	**1,834*** **	**2,412*** **	**2,411*** **	**2,375*** **	**2,557*** **	**3,605*** **
Baseline: 1/107,759	(99)	(115)	(115)	(115)	(116)	(160)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Table A4. The effect of test rate on new life insurances (Country-Level; sum insured)

DEPENDENT VARIABLE: NEW LIFE INSURANCE (**Sum Insured**, thousands of €); BASELINE 0.199 (take-out 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**3.3*** **	**4.7*** **	**4.7*** **	**4.6*** **	**5.0*** **	**7.1*** **
Baseline: 1/132	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Table A5. The effect of tests on new life insurances (Hospital district level; take-out)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**0.006*** **	**0.007*** **	**0.007*** **	**0.007*** **	**0.008*** **	**0.012*** **
Baseline: 1/87	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0009)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Table A6. The effect of tests on new life insurances (Hospital district level; sum insured)

DEPENDENT VARIABLE: NEW LIFE INSURANCE (**Sum Insured**, thousands of €); BASELINE 0.199 (take-out 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**1.4*** **	**1.9*** **	**1.9*** **	**1.8*** **	**2.0*** **	**2.8*** **
Baseline: 1/87	(0.09)	(0.10)	(0.10)	(0.10)	(0.10)	(0.14)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	50,066,904	35,256,210

Appendix C: Robustness Checks

Tables A7 and A8 show the robustness checks for the country-level results of take-outs in table 2 in cases where we use logit and probit regressions instead of linear probability model. Tables A9 and A10 show the corresponding results for table A1, and tables A11 and A12 for table A2. Regarding the hospital district level results, tables A13 and A14 correspond to table 4, and tables A15 and A16 to table A5.

Table A7. The effect of infection rate on new life insurances (Country-Level; take-out; logit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**262*** **	**288*** **	**288*** **	**280*** **	**334*** **	**371*** **
Baseline: 1/4,581	(16.8)	(19.7)	(19.7)	(19.7)	(19.8)	(20.8)
Marginal Effect	**0.50*** **	**0.55*** **	**0.55*** **	**0.54*** **	**0.64*** **	**0.90*** **
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A8. The effect of infection rate on new life insurances (Country-Level; take-out; probit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**83.1*** **	**90.4*** **	**90.2*** **	**88.5*** **	**105.7*** **	**121.1*** **
Baseline: 1/4,581	(5.3)	(6.2)	(6.2)	(6.3)	(6.3)	(6.8)
Marginal Effect	**0.51*** **	**0.55*** **	**0.55*** **	**0.54*** **	**0.64*** **	**0.90*** **
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A9. The effect of death rate on new life insurances (Country-Level; take-out; logit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Death Rate	**3,612*** **	**4,320*** **	**4,317*** **	**4,193*** **	**5,081*** **	**5,816*** **
Baseline: 1/107,759	(321)	(386)	(386)	(386)	(387)	(407)
Marginal Effect	**6.9*** **	**8.3*** **	**8.3*** **	**8.0*** **	**9.8*** **	**14.0*** **
	(0.62)	(0.74)	(0.74)	(0.74)	(0.75)	(0.98)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A10. The effect of death rate on new life insurances (Country-Level; take-out; probit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Death Rate	**1,144*** **	**1,357*** **	**1,351*** **	**1,317*** **	**1,605*** **	**1,898*** **
Baseline: 1/107,759	(102)	(122)	(122)	(123)	(124)	(133)
Marginal Effect	**7.0*** **	**8.3*** **	**8.2*** **	**8.0*** **	**9.7*** **	**14.1*** **
	(0.62)	(0.74)	(0.74)	(0.74)	(0.75)	(0.99)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A11. The effect of test rate on new life insurances (Country-Level; take-out; logit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**6.7*** **	**9.0*** **	**8.9*** **	**8.6*** **	**10.7*** **	**12.2*** **
Baseline: 1/132	(0.59)	(0.67)	(0.67)	(0.67)	(0.67)	(0.71)
Marginal Effect	**0.013*** **	**0.017*** **	**0.017*** **	**0.017*** **	**0.021*** **	**0.029*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A12. The effect of test rate on new life insurances (Country-Level; take-out; probit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**2.1*** **	**2.8*** **	**2.8*** **	**2.8*** **	**3.4*** **	**4.0*** **
Baseline: 1/132	(0.19)	(0.21)	(0.21)	(0.21)	(0.21)	(0.23)
Marginal Effect	**0.013*** **	**0.017*** **	**0.017*** **	**0.017*** **	**0.021*** **	**0.030*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.05)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A13. The effect of infections on new life insurances (Hospital district level; take-out; logit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**95.5*** **	**82.4*** **	**82.9*** **	**62.8*** **	**50.8*** **	**112.4*** **
Baseline: 1/3,514	(10.2)	(11.2)	(11.2)	(11.2)	(11.1)	(11.7)
Marginal Effect	**0.18*** **	**0.16*** **	**0.16*** **	**0.12*** **	**0.10*** **	**0.27*** **
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A14. The effect of infections on new life insurances (Hospital district level; take-out; probit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Infection Rate	**30.3*** **	**25.9*** **	**26.0*** **	**19.7*** **	**16.1*** **	**36.7*** **
Baseline: 1/3,514	(3.3)	(3.5)	(3.5)	(3.6)	(3.6)	(3.9)
Marginal Effect	**0.19*** **	**0.16*** **	**0.16*** **	**0.12*** **	**0.10*** **	**0.27*** **
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A15. The effect of tests on new life insurances (Hospital district level; take-out; logit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**3.08*** **	**3.69*** **	**3.70*** **	**3.33*** **	**4.14*** **	**4.86*** **
Baseline: 1/87	(0.31)	(0.33)	(0.33)	(0.33)	(0.33)	(0.34)
Marginal Effect	**0.006*** **	**0.007*** **	**0.007*** **	**0.006*** **	**0.008*** **	**0.012** **
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0008)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

Table A16. The effect of tests on new life insurances (Hospital district level; take-out; probit)

DEPENDENT VARIABLE: NEW LIFE INSURANCE **(0/1)**; BASELINE: 18/10,000 (or 1/556)						
	(1)	(2)	(3)	(4)	(5)	(6)
Test Rate	**0.97*** **	**1.17*** **	**1.17*** **	**1.09*** **	**1.35*** **	**1.63*** **
Baseline: 1/87	(0.097)	(0.10)	(0.10)	(0.10)	(0.11)	(0.11)
Marginal Effect	**0.006*** **	**0.007*** **	**0.007*** **	**0.007*** **	**0.008*** **	**0.012*** **
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0008)
Control Variables:						
Month	NO	YES	YES	YES	YES	YES
Gender	NO	NO	YES	YES	YES	YES
Age Group	NO	NO	NO	YES	YES	YES
Income	NO	NO	NO	NO	YES	YES
Number of Children	NO	NO	NO	NO	NO	YES
Observations	50,066,904	50,066,904	50,066,904	50,066,904	49,552,524	34,996,356

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