Private Health Insurance in Ireland: Trends and Determinants

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Abstract: This study examines the determinants of demand for private health insurance in Ireland. Survey data commissioned by the Health Insurance Authority from 2009 to 2017 are used to estimate multivariate models of health insurance demand. The results show that older and sicker individuals are more likely to have private health insurance, suggesting that adverse selection may be an issue in the Irish market. Irish-born are found to be more likely to have private health insurance. Preferences for health insurance also play an important role in predicting the purchase of health insurance. After controlling for the role of socio-economic factors and individual preferences, annual variations in the economy are not found to affect private health insurance coverage.

I INTRODUCTION

This study examines the determinants of demand for private health insurance (PHI) in Ireland from 2009 to 2017. Studying PHI in the context of Ireland is interesting for several reasons. The Irish health care system provides universal access to public hospital care, subject to certain charges and conditions. Given this entitlement, PHI can be viewed as supplementary health insurance.[1] Even though PHI is supplementary insurance, the popularity of PHI in Ireland has grown

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[1] In Ireland PHI is supplementary health insurance since the additional cover may either duplicate public coverage or fill in gaps in the public coverage, such as covering services that the public health system does not cover.

dramatically. Only 15 per cent of the Irish population was covered by PHI in 1970. By 1996, almost 40 per cent of the population was covered by PHI, and in 2005, 50 per cent of the population had PHI coverage (Harmon and Nolan, 2001).[2] The steep rise of PHI coverage has since been stemmed by the downturn in the Irish economy. Ireland's economy entered a severe recession in 2008 in tandem with the global financial crisis of 2007-2008. Over the period 2007-2009, Ireland's recession was the third worst among the EU27 countries (Keegan *et al*., 2013; Whelan, 2014). With higher unemployment and lower incomes, PHI coverage fell between 2009 and 2013. Since 2014, possibly reflecting improving economic conditions, PHI coverage is on the rise again.[2] Ireland is an interesting case study for understanding the role of the economy in supplementary PHI since PHI coverage and economic conditions have varied substantially over the past decade.

Theoretically, an individual's demand for PHI will depend on the individual's expected loss due to health expenditures, and on the individual's degree of risk aversion. Individuals with poor health status are likely to have a higher expected demand for health care, and as a result may have a higher demand for PHI. This results in the problem of adverse selection in the PHI market. Adverse selection exists if individuals who expect to have high health expenditures purchase PHI. As a result, insurance companies face a pool of customers with a worse health profile than the general population. Adverse selection can create challenges in pricing insurance products and in maintaining a diversified customer base, and ultimately can undermine the stability of insurance markets (Cutler and Zeckhauser, 2000). An alternative to the existence of adverse selection is a phenomenon called advantageous selection where individuals with better health are more likely to purchase PHI. For instance, it is possible that individuals with better mental health are more able to make insurance purchases leading to advantageous selection. Alternatively, if insurers select healthier individuals for PHI, we may observe advantageous selection. Determining whether the PHI market in Ireland displays adverse selection or advantageous selection is an empirical question and is relevant to health insurance policy. This study will explore this issue by examining the role of health in the demand for PHI.

In the Irish context, concerns about adverse selection in the PHI market increased with the recession. PHI in Ireland is community rated, and so premiums cannot be adjusted depending on health status. With worsening economic conditions, the young and healthy were disproportionately likely to exit the PHI market, and this may have led to rising premiums (Turner, 2015). Concerns about stabilising the PHI market led to the implementation of Lifetime Community Rating in 2015, a policy that places a premium loading factor on individuals who are first-time buyers of PHI after the age of 34. A loading of 2 per cent of the gross premium applies for every year of age higher than age 34 that an individual has attained when

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[2] Author's calculations based on Health Insurance Authority survey data.

they first purchase PHI. The goal of Lifetime Community Rating was to encourage people to join the PHI market at a younger age to keep rising premiums in check.[3] The necessity for Lifetime Community Rating, and the expected efficacy of this policy depends on the existence and the magnitude of adverse selection in the PHI market.

This paper uses data from a biannual survey from 2009 to 2017, conducted by the Health Insurance Association, to analyse the key determinants of PHI coverage in Ireland. This survey contains detailed data on individual demographics, health status, PHI coverage, and preferences. This paper has several goals. It aims to investigate the importance of year-to-year variations in economic conditions in explaining the changing demand for PHI. It is possible that the variation in PHI coverage between 2009 and 2017 could be explained by changes in macroeconomic conditions. It is also possible that changes in socio-demographic factors over this period may explain changes in PHI. The empirical work in this paper aims to parse out the relative contribution of each of these factors in explaining changes in PHI coverage. The paper also focuses on the role of health status in the demand for PHI to shed light on the importance of adverse selection within the Irish health insurance market. The availability of recent survey data on the Irish PHI market enables this paper to provide current results on the factors that influence the demand for PHI.

II BACKGROUND TO THE IRISH HEALTH CARE SYSTEM

2.1 Interaction of the Public and Private Health Care Systems

Ireland's health care system is a blend of public and privately funded and provided care. The public health care system provides universal entitlement to acute hospital care in public hospitals, subject to certain charges. Universal entitlement entails that any person, regardless of nationality, who is accepted by the Health Services Executive (HSE) as being ordinarily resident in Ireland is eligible to use public health services.[4] The benefits available include free public hospital coverage in public wards (subject to the payment of statutory charges) and specialist care in public outpatient clinics. Some dental and optical care is covered, and there is assistance for pharmaceutical purchases, rehabilitative and long-term care, although these are subject to statutory charges. Individuals availing of public hospital care cannot choose their doctors (Colombo and Tapay, 2004; Nolan, 2006; Turner, 2015).

In addition to the universal entitlement to public hospital care, there are two government schemes that provide more comprehensive health care benefits to a subset of the population. These are the Medical Card and the GP visit card. Over one-third of the population in Ireland have Medical Cards. Individuals can gain

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[3] https://www.hia.ie/consumer-information/lifetime-community-rating-explained.
[4] A person is deemed to be ordinarily resident if they have been living in Ireland for a year or intend to live in Ireland for at least a year.

eligibility for Medical Cards based on a combination of their income and age. For example, in 2019, the income threshold for a Medical Card for a single person under age 66 was €184 per week.[5] Different thresholds apply for individuals based on family structure and age.[6] In addition, some individuals qualify for a Medical Card without a means test based on having specific chronic medical conditions. Individuals with a Medical Card do not have to pay charges for public hospitals, visits to the GP or medical specialists in public hospitals. Furthermore, they do not pay for dental, aural and ophthalmic care, and pay a nominal charge for prescribed medication. Individuals with Medical Cards are also eligible to receive free rehabilitative care, home care, and long-term care.[7]

Individuals with income above the threshold for Medical Cards may be entitled to a GP visit card if their income is below a higher threshold. In 2019, individuals with incomes above €184, but below €276 per week were eligible for a GP visit card that entitled them to free GP care only. Furthermore, all individuals over the age of 70 and under the age of six have been entitled to a GP visit card, regardless of income, since mid-2015. As the name suggests, this card entitles the holder to free visits to participating GPs.

Individuals who do not have Medical Cards or GP visit cards pay fee-for-service for GP visits. There is no set charge for GP visits, they vary by provider, and are typically around €50.[8] They also pay state subsidised charges for inpatient and outpatient public hospital services.

2.2 Role of PHI

Despite the universal entitlement to public hospital care, PHI can increase access to health care in several ways. PHI can be used to pay for care in private hospitals. Private hospitals have been growing in importance in health care delivery. They account for almost one-third of acute hospitals, and they provide a high proportion of 'high-tech' procedures. For instance, 65 per cent of all spinal surgeries and 50 per cent of all heart surgeries are conducted in private hospitals (Private Hospitals Association, 2017). PHI can also be used to pay for care in public hospitals in private or semi-private beds. Public wards can often be crowded, and the media is rife with reports of patients being left on trolleys in corridors as a result of bed shortages in public hospitals (Burke, 2018; Ryan, 2018). Another issue with relying on public hospitals is that there are long waiting lists for access to non-emergent inpatient and outpatient procedures in these hospitals. Having private insurance can reduce waiting times and increase access to specialists. Many PHI

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[5] https://www.citizensinformation.ie/en/health/medical_cards_and_gp_visit_cards/medical_card.html
[6] Individuals who are aged 66-69 can gain eligibility for Medical Cards at higher income thresholds than the under 66. In addition, thresholds for the over 70s differ from those under the age of 70.
[7] See Finn and Hardiman (2011) and Nolan (2006) for a detailed review of the evolution of the Irish health care system.
[8] http://irishlinks.co.uk/doctors-ireland.htm

policies also provide some coverage for GP visits and other outpatient health visits. (Harmon and Nolan, 2001; Finn and Hardiman, 2011). PHI can be purchased from multiple insurers (Vhi, Irish Life Health, Laya) and plan benefits, coverage, and premiums vary between providers.

Historically, PHI has been implicitly subsidised by two aspects of government policy. First, insurance premiums receive favourable tax treatment. Currently, premiums receive tax relief at the standard tax rate of 20 per cent.[9] Insurers can deduct this relief at source from the gross premium. Tax relief was initially introduced to encourage the take-up of PHI and was available at the marginal tax rate that applied to the individual (either 27 per cent or 48 per cent). From 1996, the rate of tax relief was reduced to 27 per cent and later to 20 per cent (Colombo and Tapay, 2004). Second, PHI has been implicitly subsidised by insurance companies not being charged the full economic cost of private beds in public hospitals. Furthermore, privately insured patients in public beds were only charged a nominal statutory nightly charge. After 2014, this subsidisation has been reduced with private insurance being charged a higher share of the cost for both public and private beds. Despite the reduced subsidisation, PHI take-up appears to have been unaffected (Turner, 2015).

2.3 The Health System and the Economy

Ireland's economy entered a severe recession in 2008. Over the next five years, Irish house prices fell by 50 per cent from their peak values in 2007, and the housing construction industry collapsed. Unemployment soared, with two-thirds of the increase in unemployment accounted for by the decline in construction employment. Irish GDP declined by 10 per cent over 2008 and 2009. Before the recession, Irish government finances were heavily reliant on the property market. As a result, during the recession, government revenue fell sharply, necessitating a series of contractionary government budgets (Whelan, 2014). The economic downturn in Ireland resulted in a cut of about 12 per cent to the public health budget from 2008. From 2008 to 2012, despite a declining public health budget, the health sector displayed evidence of increased efficiency. The number of people eligible for Medical Cards increased and there was more hospital activity. However, from 2013 onwards, there was an increase in rationing with longer waiting lists for hospital procedures (Keegan *et al.*, 2013). There were also cuts to health care staffing and pay, and a declining depth of coverage (Burke *et al.*, 2014). Planned reforms were slowed down or abandoned due the crisis. Furthermore, after 2008, individuals over the age of 70 were subject to income eligibility rules to qualify for Medical Cards (Mladovsky *et al.*, 2012).

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[9] From 2013 onwards, tax relief has been limited to €1,000 for adults and €500 for children.

III RELATED LITERATURE

Several studies have examined the demand for PHI in Ireland. Harmon and Nolan (2001) used data from the 1994 Living in Ireland Survey to estimate a probit model of PHI demand that showed that older individuals, those with higher incomes, and those without Medical Cards were more likely to have PHI. Poor health was found to lower the probability of having PHI, suggesting the presence of advantageous selection. Finn and Harmon (2006) extended the analysis in Harmon and Nolan (2001) by estimating a dynamic panel data model using the Living in Ireland Survey from 1994 to 2001. Education, age, and income were all found to increase PHI coverage. In a similar result to Harmon and Nolan (2001), poor health status was found to decrease PHI coverage. Finn and Harmon also showed significant persistence in PHI coverage; individuals who had PHI coverage in the previous period were substantially more likely to be covered in the current period. Bolhaar *et al*. (2012) also used the Living in Ireland Survey for the same period as Finn and Harmon and estimated dynamic panel data models to determine the role of asymmetric information and selection in the purchase of health insurance. They found that general health problems did not appear to drive insurance purchase, but poor mental health was associated with a lower propensity to purchase insurance, providing evidence for advantageous selection in PHI demand. Age, education, and income were found to increase PHI coverage. Lagged PHI coverage played an important role in current PHI coverage. The literature on Irish PHI demand is essentially based on a single series of surveys 'Living in Ireland', that is now quite out of date. This current study uses a different, new source of data, to update and add to the literature on PHI demand in Ireland. However, it is important to be cautious in comparing results from the existing Irish literature to the current study since the survey instruments and the analysis years differ.

A much larger literature exists on PHI demand in other countries. Like Ireland, the UK also has a system where public health care and supplementary private health insurance co-exist. The literature on PHI demand in the UK has examined the importance of the quality of the public health care system as a determinant of PHI demand. For instance, Bíró and Hellowell (2016) found that PHI demand in the UK increased as waiting times in the public health care system increased. Good health was found to have a small negative effect on PHI demand in models that included individual fixed effects. Earlier work by Propper *et al*. (2001) found that the number of senior doctors employed by the public sector negatively affected PHI demand. Socio-demographic characteristics such as age and income also increased PHI demand. King and Mossialos (2005) also using data from the UK, found that education, income, age, and political affiliation affected PHI demand. Health was not found to be a significant determinant of PHI demand. Consistent with other work from the UK, waiting times and the supply of private surgeons was found to increase PHI demand.

Several studies on German PHI exploit the somewhat different institutional structure of the German health insurance market, where individuals are covered by either public or private health insurance. Unlike Ireland, in Germany private health insurance premiums are risk rated, and individuals below a specified income threshold are covered by public health insurance. In this context, Polyakova (2016) found no evidence of advantageous selection in PHI: healthier individuals were no more likely have PHI than sicker individuals. This study found evidence that heterogeneity of preferences affected purchase of PHI; individuals with preferences for convenience chose PHI. In contrast, Bünnings and Tauchmann (2015), Grunow and Nuscheler (2014) and Panthöfer (2016) found evidence of advantageous selection into PHI.

A strand of literature from the US that investigates the purchase of optional long-term care insurance and Medicare add-on plans also investigates issues of selection in health insurance purchase. For instance, Finkelstein and McGarry (2006) investigated the effect of preferences on long-term care insurance, while Fang *et al*. (2008) found evidence of advantageous selection into Medicare add-on plans.

To sum up, empirically, the evidence on adverse selection has been mixed. While a few studies on PHI have found evidence of adverse selection (for instance, Cutler and Zeckhauser, 2000), several others have found quite the opposite – advantageous selection, where individuals with poor health are found to be less likely to purchase insurance (Bolhaar *et al*., 2012; Finkelstein and McGarry, 2006; Fang *et al*., 2008).

Understanding and modelling PHI demand is intrinsically tied to the institutional structure of public health insurance availability and quality. Further-more, PHI regulations such as community rating and premium regulations are also likely to affect PHI demand. For this reason, results from the international literature may not necessarily apply to the Irish context. Results from studies conducted in other countries should be compared with caution to the results from Irish studies.

IV DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The Health Insurance Authority (HIA) has commissioned biannual nationally representative surveys of the Irish population. The Authority is the statutory regulator of the Irish private health insurance market. The Authority is independent in the exercise of its functions, and the surveys are designed to provide information on health insurance coverage, attitudes, affordability, and related areas of policy relevance. Interviews were conducted face-to-face, and to ensure a representative sample of the adult population in the Republic of Ireland (aged 18+), quotas were

set around gender, social class and region. This study uses data from 2009, 2011, 2013, 2015 and 2017. Data for the years 2011 to 2017 were collected by Millward Brown; data from 2009 were collected by Red C. Descriptive statistics and charts based on these data are published on the HIA website (HIA 2010; 2012; 2014; 2016; 2017).[10] The survey instrument and variables of interest are very similar across years, and so we have combined data from 2009 to 2017 to construct a repeated cross-sectional analysis dataset. The combined sample consists of 7,758 individuals.[11] The surveys do not interview the same individuals across years, so it is not possible to match individuals longitudinally.

The HIA surveys contain detailed information on demographics, including age, gender, marital status, occupational class, family structure, and country of birth. Self-reported health status was also collected. This question asks individuals to choose one of the following statements about their health:

- I am generally healthy and rarely make visits to the doctor
- I am generally healthy but sometimes make visits to the doctor
- I have some health problems and therefore regularly make visits to the doctor
- I have some health problems that sometimes require visits to the hospital, either for day care or overnight.

We classified individuals who identified in each of these four groups as Very Healthy, Healthy, Unhealthy, and Very Unhealthy.

Individuals were also asked to report private health insurance coverage and whether they were covered by a Medical Card. A set of questions that aimed to ascertain individuals' attitudes towards private health insurance was also included. Individuals were to state how much they agreed or disagreed with the following statements:

- Private health insurance is a necessity not a luxury
- I will always have private health insurance
- Private health insurance is good value for money
- There is no need for private health insurance, public services are adequate
- Having private health insurance means always getting a better level of health care service
- Private health insurance is only for the wealthy
- Having private health insurance means you can skip the queues
- Only old people and sick people need private health insurance.

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[10] The descriptive statistics on the HIA website are produced on an annual basis, and do not pool multiple years of data. No multivariate analysis of PHI coverage based on pooled data are available. This paper pools the data across multiple years and conducts multivariate analyses based on these data.
[11] The sample sizes for 2009, 2011, 2013, 2015 and 2017 were 1,002, 1,011, 2,022, 1,832 and 1,891 individuals respectively.

Responses to all these questions were captured by a 5-point Likert scale, with 5 representing an answer of 'strongly agree' and 1 representing an answer of 'strongly disagree'.

4.2 Empirical Methodology

The multivariate analyses in this paper use probit models to isolate the key determinants of PHI. A probit model, with PHI as the dependent variable, is an appropriate choice for these analyses since PHI is a binary variable. We estimated several probit models, building on the set of explanatory variables included in each successive model. Each of these models, and the rationale for the inclusion of the explanatory variables, is described below. All analyses conducted using these data are weighted using survey weights to be nationally representative.

Model 1 simply includes a set of year dummy variables as explanatory variables to capture the effect of the economy on private health insurance coverage.[12] Model 1 does not include any additional control variables and provides an unconditional estimate of total effect of annual variations in the economy. While year dummies are a somewhat blunt measure of economic conditions, we do not have access to geographic identifiers that would allow us to link in local economic conditions. The year dummies may also capture annual variations in premium levels. We expect that higher unemployment rates and lower disposable incomes during the recessionary period will result in lower PHI coverage. However, it is also possible that there is a counter-veiling influence of the economy on PHI, where the worsening status of the public health system during the recessionary period increased the desirability of PHI for those who could afford it. PHI could potentially provide better quality care and faster access to outpatient and inpatient services. This improved access and quality may be particularly valuable if public health care quality was worsening during the recessionary period (Keegan *et al.*, 2013).

From 2015 onwards, the implementation of Lifetime Community Rating may also have affected PHI demand. Any effects of this policy would also be captured by the year dummies for 2015 and 2017. Lifetime Community Rating should increase PHI demand among individuals just below the age 34 threshold who are seeking to avoid the premium loading penalty. For individuals over the age of 35, the effects are more complex. PHI holders may be more likely to retain PHI to avoid the premium loading penalty that they would incur if they dropped PHI. But PHI becomes more expensive for PHI non-holders over the age of 35 due to the premium loading, potentially discouraging take-up. However, each additional year without coverage for individuals over the age of 35 at initial take-up increases the premium loading by an additional 2 per cent, and this effect may encourage these individuals to take up insurance sooner to avoid escalating premium loading factors.

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[12] National unemployment rate was also used as alternative measure of the state of the economy.

Model 2 supplements the simple year dummy specification of Model 1 with a full set of socio-economic explanatory variables. We expect that socio-demographic factors are likely to be correlated with the demand for PHI. Model 2 includes age, gender, marital status, occupational class, the presence of children in the household, Medical Card status, and health status as explanatory variables. Age is represented by a full set of age categories capturing if the respondent is between ages 18 to 34, 35 to 44, 45 to 54, 55 to 64, or 65 plus (Age 35 to 44 is the reference category).[13] Controlling for all other factors, individuals who are older should be more likely to hold PHI. Health expenditures increase sharply with age, and so we would expect the demand for PHI to increase with age as well. Occupational class is captured by indicators for Professional, Skilled, Unskilled, Lower-Middle and Farming (Professional Occupation is the reference category). Since we do not have data on family income or education, the occupational class variables serve as proxies for these socio-economic variables. Furthermore, given the recession had a large effect on the construction industry, we may expect unskilled individuals to have suffered a large drop in income, and as a result these individuals may be most likely to drop PHI. Medical Card status is also included in Model 2. Individuals who hold Medical Cards are less likely to purchase PHI since they have an alternative source of comprehensive insurance. Furthermore, most Medical Card holders gain eligibility based on their low-income status, and as result, should be less likely to afford PHI. Model 2 also includes a set of health status indicators; Very Healthy, Healthy, Unhealthy, and Very Unhealthy (Very Healthy is the reference category). Individuals who are in poorer health should be more likely to demand PHI if there is adverse selection in the market. However, if there is advantageous selection, we would see the opposite effect.

We also include a set of demographic control variables to capture demographic and family composition effects that are likely to be correlated with the other explanatory variables of interest. We do not have theoretical predictions for these variables and view them mainly as control variables. These control variables are an indicator for a female respondent, an indicator for whether there are children in the household, and marital status. Marital status is captured by the following indicators: partnered but not married, single, and divorced/separated (married is the reference category).

Model 3 adds in a full set of health insurance attitudinal variables in the multivariate model presented above. Individuals who rate the importance of PHI along the various attitudinal dimensions highly are expected to be more likely to have PHI. In the media, queue skipping and access to care have been widely publicised as being important reasons for PHI purchase, so evaluating the importance of individual's attitudes to these issues as drivers of PHI demand is of

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[13] The survey data available to us report age in these specific categories, so we are restricted to using these age groups.

interest (Mullahy, 2016). Furthermore, previous research has shown that attitudes and preferences are important drivers of PHI purchase (Polyakova, 2016). While these attitudinal variables are likely to be endogenous, we think their inclusion provides some suggestive findings that may clarify PHI take-up. We interpret the results with caution given that we cannot assign causality to these variables.

Lastly, in Model 4, we report results from a probit model that includes country of origin variables. Indicators for country of birth include UK, EU, and non-EU (Irish is the reference category). This model is estimated using data from 2009 to 2015 only, since country of origin information is not available for 2017. Foreign born residents have been shown to view the Irish health system more positively than Irish residents (Schneider and Devitt, 2018). It is possible that this positivity may result in a lower demand for PHI, if satisfaction with public provision of services decreases PHI demand. Country of origin may also proxy for socio-economic status. Immigrants tend to have higher unemployment rates and lower incomes than the Irish, and this may translate into lower demand for PHI (McGinnity *et al*., 2018).

The goal in estimating a set of multivariate models that successively add explanatory variables is to explore whether the yearly variations estimated in Model 1 can in turn be explained by socio-demographic or other factors in Models 2, 3 and 4. We know that the yearly changes in the economy have been associated with a fall in PHI; however, we would like to explore how much of this fall is accounted for by changes in socio-demographic factors, health, Medical Card status, and attitudes. In addition to simply comparing coefficient values between models, we explore an alternative method to determine the relative contribution of socio-economic characteristics and attitudes to health insurance to the change in the magnitude of the year dummy coefficients between the models. We use Gelbach's (2016) method for decomposing the change in the year effects.[14] The advantage of this decomposition is that we can account for the share of explanatory power due to socio-economic characteristics and attitudes, using a method that is robust to the order in which these variables are included in the model.

As an extension to main empirical analysis, we examine if the effect of the explanatory variables on PHI varies by year. Essentially, we ask if the role of demographics and occupational class has changed over time. We focus on two main sets of explanatory variables; age and occupational class. We expect that the effect of age on PHI varies by year for several reasons. Lifetime community rating placed premium loadings on individuals over 34 taking out PHI for the first time after 2015, so we may expect that the age groups just under 34 may be more likely to have PHI after 2015. Furthermore, GP visit cards were universally granted to over 70s after 2015, so this may reduce the appeal of PHI for individuals in these age groups.

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[14] We use an Ordinary Least Squares (OLS) model to conduct this decomposition.

The impact of occupational class on PHI demand is also likely to vary by year. Some occupations were particularly hard hit by recession; skilled manual workers, operatives, and individuals in elementary/unskilled occupations showed large employment falls (Nolan and Voitchovsky, 2015). For this reason, we would expect individuals in these occupational classes to drop PHI at greater rates during the recessionary period. The empirical work determines the importance of these time-varying effects.

V DESCRIPTIVE RESULTS

The percentage of individuals who reported having private health insurance coverage dropped from 46 per cent in 2009 to 40 per cent in 2013, and then recovered to 43 per cent in 2017. Figure 1 shows the trend in health insurance coverage, unemployment, and health expenditure between 2009 and 2017. These changes in PHI may be brought on by changes in the economy. Unemployment was 12.6 per cent in 2009, 15.4 per cent in 2011, and dropped to 6.7 per cent in 2017 (CSO, 2018). However, it is also possible that HIA survey methodology variations may explain some of the differences that we see from year to year. Note that the HIA survey was conducted by a different company in 2009 compared to later years, so some caution in interpreting year-to-year differences is important. As a percentage of GDP, health expenditure was relatively stable between 2009 and 2013, but then fell somewhat in 2015.

Figure 1: PHI, Unemployment Rate, Health Expenditure by Year

PHI, Unemployment Rate, Health Expenditure by Year

■ PHI   ■ Unemployment Rate   ■ Health Expenditure as % GDP
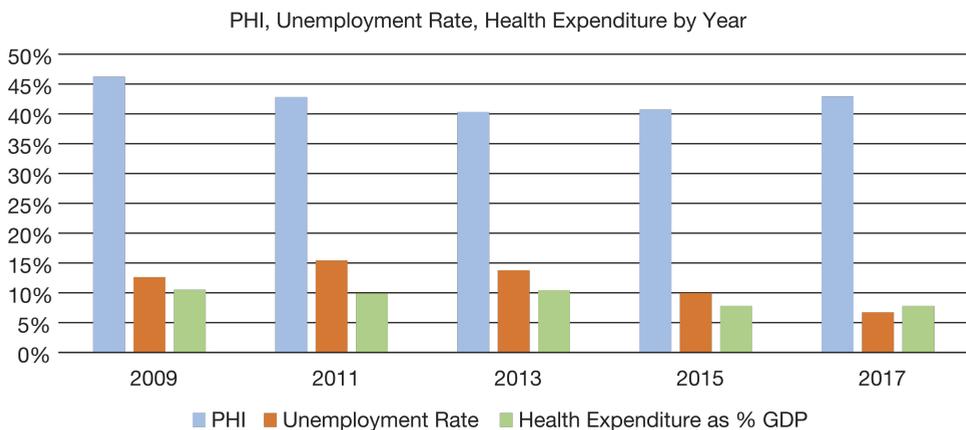
Source: PHI calculated from HIA survey data. Unemployment rate and Health Expenditures obtained from CSO (2018).

Table 1: Percentage of Individuals with Health Insurance by Group

Variable	All Years	2009	2011	2013	2015	2017
Full Sample	42%	46%	43%	40%	41%	43%
Age Categories						
Age 18 - 34	30%	36%	32%	29%	28%	30%
Age 35 - 44	43%	50%	42%	40%	41%	46%
Age 45 - 54	47%	58%	45%	47%	43%	49%
Age 55 - 64	52%	56%	51%	50%	54%	49%
Age 65 plus	51%	46%	58%	52%	50%	49%
Country of Origin*						
Irish	44%	47%	45%	42%	42%	–
Non-Irish	24%	34%	14%	23%	26%	–
UK	37%	–	–	–	–	–
EU	17%	–	–	–	–	–
Non-EU	25%	–	–	–	–	–
Occupational Class						
Professional	76%	76%	80%	75%	72%	79%
Lower Middle	55%	56%	57%	52%	56%	57%
Skilled	35%	39%	35%	33%	35%	33%
Unskilled	18%	26%	16%	16%	13%	20%
Farming	51%	53%	49%	51%	49%	55%
Health Status						
Very Healthy	42%	47%	42%	41%	39%	43%
Healthy	43%	49%	44%	41%	42%	43%
Unhealthy	36%	40%	37%	34%	36%	36%
Very Unhealthy	48%	46%	48%	43%	53%	48%
Total Number of Individuals	7,758	1,002	1,011	2,022	1,832	1,891

Source: Author's calculations based on HIA survey data.
*Note: Sample Sizes by Year for UK, EU, Non-EU by Year are too small and have been consolidated. Country of Origin data are not available for 2017. Means for 'All Years' are based on 2009-2015.

Table 1 reports the percentage of individuals with PHI in key sub-groups of analytic interest.[15] Means for the full 2009-2017 sample are reported in the first column. The next five columns report means for each survey year separately. All means are weighted.

PHI coverage increases with age, varying from 30 per cent for 18 to 34-year-olds to 52 per cent for 55 to 64-year-olds. PHI coverage over time varies dramatically by age group. Between 2009 and 2015, PHI dropped by 8 percentage points for 18 to 34-year-olds, 9 percentage points for 35 to 44-year-olds, and

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[15] Appendix Table 1 reports descriptive statistics for all analytic variables by year.

15 percentage points for 45 to 54-year-olds. In contrast, over the same period, PHI increased by 4 percentage points for the over 65-year-olds. This change in age profile in PHI holders skewed the insured distribution towards individuals who are likely to have higher health costs, suggesting that adverse selection may be an increasing concern in the market. In 2017, the youngest three age groups showed a small to moderate recovery in PHI coverage, reversing some of the downward trend of the previous six years.

Only 24 per cent of the non-Irish have PHI compared to 44 per cent of the Irish. This is consistent with the possibility that the non-Irish may be from a lower socioeconomic or age group, or that they may be more satisfied with the public health system than the Irish. The erosion of PHI coverage between 2009 and 2015 is larger for the non-Irish than the Irish. PHI fell by 5 percentage points for the Irish compared to 8 percentage points for the non-Irish.

Table 1 also reveals differences in PHI by Occupational class. The unskilled class displays large swings in PHI coverage compared to the other occupations. In 2009, 26 per cent of the Unskilled had PHI. By 2015, this percentage had fallen to only 13 per cent; however it rose to 20 per cent in 2017. These changes may have been a result of the economic downturn that particularly affected individuals in the construction industry.

The possibility that adverse selection is a concern for the PHI market is reinforced by the increasing percentage of the 'Very Unhealthy' group with PHI coverage between 2009 and 2015 (46 per cent in 2009 to 53 per cent in 2015) in contrast to the falling PHI percentage among the healthier sub-groups.

VI MULTIVARIATE RESULTS

The descriptive analysis provides a useful picture of the characteristics associated with PHI and how these characteristics have changed over time. We expect, though, that a number of these characteristics are correlated with each other, and we wish to isolate the key determinants of PHI using a multivariate model to control for the effect of all potential explanatory variables. For instance, we know that the yearly changes in the economy have been associated with a fall in PHI; however, we would like to explore whether these yearly variations can in turn be explained by socio-demographic or other factors. The multivariate analysis presented in this section aims to isolate the key factors associated with PHI. A caveat to the analysis is that many of the explanatory variables used are arguably endogenous, so we cannot assert that our estimates are causal.

Table 2: Determinants of PHI (Marginal Effects from Probit Models)

	Model 1		Model 2		Model 3		Model 4	
	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score
Year (2009 base category)								
Year: 2011	-0.034	-1.44	-0.024	-0.90	-0.011	-0.33	-0.008	-0.24
Year: 2013	-0.058	-2.95**	-0.055	-2.52*	-0.018	-0.65	-0.018	-0.67
Year: 2015	-0.054	-2.76**	-0.041	-1.87	-0.012	-0.44	-0.004	-0.14
Year: 2017	-0.033	-1.72	-0.022	-0.99	0.008	0.31	–	–
Gender (Male base category)								
Female			0.025	1.85	0.016	1	0.028	1.53
Age Categories (Age 35-44 base category)								
Age 18 - 34			-0.073	-3.63**	-0.094	-4.19**	-0.085	-3.33**
Age 45 - 54			0.080	3.72**	0.083	3.32**	0.090	3.01**
Age 55 - 64			0.195	7.65**	0.190	6.21**	0.176	4.91**
Age 65 plus			0.354	12.46**	0.308	8.41**	0.332	7.62**
Marital Status (Married base category)								
Partnered, not married			-0.139	-5.72**	-0.103	-3.61**	-0.115	-3.71**
Single			-0.086	-4.66**	-0.081	-3.75**	-0.088	-3.60**
Divorced/Separated			-0.138	-4.97**	-0.125	-3.45**	-0.135	-3.07**
Occupational Class (Professional base category)								
Lower Middle			-0.163	-7.42**	-0.138	-5.41**	-0.142	-4.97**
Skilled			-0.315	-15.05**	-0.263	-10.80**	-0.244	-8.62**
Unskilled			-0.420	-19.65**	-0.359	-14.10**	-0.350	-12.26**
Farming			-0.226	-7.69**	-0.196	-5.25**	-0.202	-4.66**
Other Variables								
Children in household			0.020	1.12	0.017	0.84	0.011	0.45
Medical Card			-0.403	-25.89**	-0.321	-16.80**	-0.342	-14.84**

Table 2: Determinants of PHI (Marginal Effects from Probit Models) (Contd.)

	Model 1		Model 2		Model 3		Model 4	
	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score
Health Status (Very healthy base category)								
Healthy			0.028	1.67	0.014	0.70	0.016	0.71
Unhealthy			−0.023	−1.06	−0.021	−0.80	−0.029	−0.94
Very Unhealthy			0.105	4.15**	0.090	2.99**	0.081	2.30*
Attitudes to PHI								
PHI is necessity					0.036	4.92**	0.037	4.37**
I will always have PHI					0.213	29.12**	0.206	24.07**
PHI is good value					0.014	1.85	0.006	0.75
There is no need for PHI					−0.056	−7.58**	−0.052	−6.19**
PHI means better care					0.006	0.82	0.009	1.04
PHI only for wealthy					−0.061	−9.48**	−0.061	−8.36**
PHI enables queue skipping					−0.003	−0.42	−0.010	−1.10
PHI only for old and sick					−0.007	−0.91	−0.009	−1.06
Country of Origin (Irish base category)								
UK							0.002	0.03
EU							−0.173	−3.70**
Non-EU							−0.107	−1.93
Pseudo R-Squared	0.001		0.252		0.495		0.5009	
Number of Individuals	7,758		7,758		7,758		5,867	

Source: Author's calculations based on HIA survey data.
Note: Country of Origin data are not available for 2017. Model 4 is estimated on data from 2009-2015.
* denotes statistical significance at the 5% level. ** denotes statistical significance at the 1% level.

6.1 Determinants of PHI.

As described in the Empirical Methodology section, we estimated several probit models, building on the set of explanatory variables included in each successive model. Table 2 reports results from three different models, each with a larger set of explanatory variables. The first column under each model heading reports the marginal effect, and the second column reports the Z-score.

Model 1 essentially replicates the results of the simple descriptive statistics of health insurance coverage by year. A set of year dummy variables are included as explanatory variables to capture the effect of the economy on private health insurance coverage.[16] Marginal effects from the probit model show that compared to the base category of 2009, individuals in 2011 were 3.4 percentage points less likely to have PHI, however this difference is not statistically significant. Individuals in 2013 were 5.8 percentage points less likely to have PHI, and individuals in 2015 were 5.4 percentage points less likely to have PHI than in 2009, and these differences are statistically significant. Furthermore, the year indicators included in the model are jointly statistically significant (p<0.05). Lifetime Community Rating was implemented in 2015. However, there is no evidence that the year effects for 2015 or 2017 are statistically different from the year effect in 2013. It is possible that the sample sizes for this survey do not provide the requisite power to find an effect for this policy.

In Model 2, we supplement the simple year dummy specification with a full set of socio-economic explanatory variables. The first interesting result is that the year indicators for 2011, 2013, 2015, and 2017 have all dropped in magnitude and statistical significance after the inclusion of the socio-demographic and other control variables. Only in 2013 is PHI coverage statistically significantly lower than in 2009. Furthermore, the year indicators are no longer jointly significant showing that economic conditions as captured by the year indicators are no longer as important in explaining PHI coverage as they were before the inclusion of the additional explanatory variables.

The results for Model 2 show that female respondents are 2.5 percentage points more likely to report PHI, but this result is statistically significant only at the 10 per cent level. The age indicators reveal a steep age trajectory in PHI coverage. As expected, older individuals are more likely to have PHI, with individuals who are 65 or over being 35 percentage points more likely to have PHI than individuals who are 35 to 44. The youngest age group (18 to 34) are 7 percentage points less likely to have PHI than individuals who are 35 to 44. This steep age profile is not as dramatic when examining the descriptive statistics. The age profile becomes starker after controlling for the role of other socio-economic characteristics, highlighting the importance of multivariate analysis in this context.

Marital status plays an important role in PHI coverage as well, with individuals who are partnered, single, divorced, or separated being between 8 and 14 percentage

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[16] A measure of the national unemployment rate was statistically insignificant in all models.

points less likely to have PHI coverage than individuals who are married. We also see evidence of the effect of occupational class on PHI. Compared to individuals in the professional class, individuals in the skilled class, the unskilled class, the farming class were 31, 42, and 22 percentage points less likely to have PHI. These are large and statistically significant differences. Not surprisingly, individuals with a Medical Card are 40 percentage points less likely to have PHI. We also see some evidence of a varying demand for health insurance based on medical need. Individuals who report their health as 'very unhealthy' are 10 percentage points more likely to have PHI than individuals who report their health as 'very healthy'. Even those who consider themselves 'healthy' are more likely to have PHI than those who report themselves 'very healthy', but this result is only significant at the 10 per cent level. However, there is no statistically significant difference between the unhealthy and the very healthy, or between the healthy and unhealthy. It is important to note that the HIA survey's measure of health status is closely linked to expected health care utilisation, unlike the self-reported health status measures commonly used in most other surveys.[17] Individuals who are classified as 'Very Unhealthy' in the HIA survey agree with the statement that they have 'some health problems that sometimes require visits to the hospital, either for day care or overnight.' Given the wording of this survey question, the indicator for 'Very Unhealthy' is likely to be a good measure of high health care demand.

Next, we include a full set of health insurance attitudinal variables in the multivariate model presented above. We interpret the results with caution given that we cannot assign causality to these variables. Model 3 presents results with the attitudinal variables included in the multivariate model. Most of the attitudinal variables line up with our a priori expectations on their role in PHI. Individuals who agree more strongly with statements that they will always have health insurance or that health insurance is a necessity are 4 and 21 percentage points respectively more likely to have PHI. Individuals who think that there is 'no need for private health insurance' or that PHI is 'only for the wealthy' are 5 and 6 percentage points respectively less likely to have PHI. Believing that PHI is 'good value' or that PHI means 'better care' or that PHI means you can 'skip the queue' or that health insurance is 'only for the old and sick' are not statistically significantly associated with being more likely to have PHI. In the media, queue skipping and access to care have been widely publicised as being important reasons for PHI purchase; however, the empirical results do not support this view (Mullahy, 2016).

It appears that, as expected, individuals whose stated preferences highlight the importance of PHI are more likely to have PHI coverage. While this may be unsurprising, it is interesting to note the effect of controlling for attitudinal variables on the other variables in the model. The effect of the year indicators diminishes

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[17] Most surveys use a measure of self-reported health status that asks individuals to state if they consider their health status to be Excellent, Very Good, Good, Fair, or Poor.

sharply, with none of the year indicators being individually or jointly statistically significant. It appears that individuals' attitudes towards health insurance are correlated with year indicators, and the effect of the changing economy has been reflected in attitudes. As a result, attitudes are more strongly correlated with PHI than the year indicators when both these sets of variables are included in the same model. The effect of occupational class and health also drops somewhat in magnitude when attitudinal variables are added to the model, although for the most part they continue to be sizeable and statistically significant. In contrast, the effect of age is largely similar despite the inclusion of attitudinal variables, suggesting that the attitudinal variables are not strongly correlated with age, and that age retains its direct independent effect on PHI coverage. In terms of explanatory power, Model 3 explains just under 50 per cent of the variation in PHI compared to only 25 per cent for Model 2.[18]

Lastly, in Model 4, we report results from a probit model that includes country of origin variables. Indicators for country of birth include UK, EU, and non-EU (Irish is the reference category). This model is estimated using data from 2009 to 2015 only, since country of origin information is not available for 2017. We see that country of origin affects PHI coverage. Compared to the Irish-born, individuals born in EU countries (other than the UK) are 17 percentage points less likely to have PHI, and individuals born in non-EU countries are 11 percentage points less likely to have PHI.[19] There is no statistically significant difference between UK-born respondents and Irish-born respondents.

6.2 Decomposition of Year Effects

The results in Table 2 show that the effect of the year dummies falls in magnitude and statistical significance after controlling for socio-economic characteristics and attitudes to health insurance. In this section, we explore the relative contribution of socio-economic characteristics and attitudes to health insurance to this change in the magnitude of the year dummy coefficients. We use Gelbach's (2016) method for decomposing the change in the year effects between Model 1 and Model 3.[20]

We conduct this decomposition for 2013 and 2015 since these two years had large and statistically significant coefficients in Model 1, but smaller statistically insignificant coefficients in Model 3.[21] We find that attitudes to health insurance

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[18] We use the Pseudo-R Squared to measure explanatory power.

[19] Results from a probit model that excludes the attitudinal variables yield larger and more statistically significant estimates for country of origin. Compared to the Irish-born, individuals born in EU countries (other than the UK) are 20 percentage points less likely to have PHI and individuals born in non-EU countries are 16 percentage points less likely to have PHI, with both results statically significant at the 5 per cent level. This suggests that differential attitudes to PHI by country of origin partly explain the difference in PHI take-up.

[20] We use an Ordinary Least Squares (OLS) model to conduct this decomposition. OLS estimates are virtually identical to the Probit estimates reported in the tables.

[21] We do not focus on Model 4 since it is estimated on a subset of the data.

account for 74 per cent of the change in the 2013 coefficient and for 73 per cent of the change in the 2015 coefficient. All the other variables in the model, including socio-economic status, occupational class, health, and family characteristics account for the remaining 26 per cent for 2013 and 27 per cent for 2015. Thus, it appears that attitudes to health insurance play a substantial role in explaining the effect of annual variations in the economy on PHI demand.

6.3 Do the Determinants of PHI change over Time?

In the next set of models, we examine if the effect of the explanatory variables on PHI shown in Table 2 varies by year. Specifically, we determine if the role of age and occupational class has changed over time. We estimate a model that includes a full set of interactions of the occupational and age categories with the year indicators.[22] Each age category and occupational category was tested for statistical difference by year, with each interaction with year being tested against all other years. This model is cumbersome, so we prune this model by dropping the year interactions for variables which are found to have a similar effect on PHI from year to year. Only interactions for those variables that were found to have estimates that varied statistically significantly by year are retained. For the remaining variables, a single estimate that is constant for all years is estimated.[23] Table 3 reports a selected set of estimates from this model. Essentially only the variables that have statistically significant interactions with year are reported; all the others are retained in the model but are not reported in Table 3 for brevity. Like in Table 2, the results in Table 3 show that older individuals are more likely to have PHI; however, individuals who are over age 65 are substantially more likely to have PHI in 2011, 2013, 2015 and 2017 than they were in 2009. The interactions of age 65 with the year indicators for 2011, 2013, 2015, and 2017 are not statistically different from each other. Despite the implementation of Lifetime Community Rating in 2015, we found no evidence of a statistically different effect for the younger age cohorts after 2015. The 18-34 and the 35-44 age categories were tested for statistical difference by year to determine if the PHI demand changed after 2015; however, there was no evidence of a change. This may reflect the lack of power due to limited sample sizes.

Occupational class appears to a statistically different effect on PHI in later years compared to 2009 as well. Individuals in the unskilled occupational class are about 13 percentage points less likely to have PHI in 2011 and 2015, compared to 2009. However, the 2011 interaction is statistically significant at 10 per cent level rather than the 5 per cent level. A caveat in interpreting these findings is that the HIA survey methodology may have differed in 2009 compared to later years due to a

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[22] Appendix Table A.2 reports a full set of models estimated by year. An alternative model estimated using data from 2011-2017 provides very similar results.

[23] A larger exploratory model with a full set of interactions was also estimated. The results from this model show that most of the key explanatory variables have similar effects on PHI over time.

Table 3: Determinants of PHI – Interaction Models (Probit Marginal Effects)*

	Interaction Model	
	Effect	*Z-Statistic*
Year (2009 base category)		
Year: 2011	–0.026	–0.86
Year: 2013	–0.057	–2.26*
Year: 2015	–0.039	–1.54
Year: 2017	–0.026	–1.03
Age Categories (Age 35-44 base category)		
Age 18 - 34	–0.072	–3.59**
Age 45 - 54	0.080	3.72**
Age 55 - 64	0.193	7.52**
Age 65 plus	0.221	3.93**
Age-Year Interactions		
Age 65 plus & Year 2011	0.197	2.27*
Age 65 plus & Year 2013	0.140	2.09*
Age 65 plus & Year 2015	0.187	2.78**
Age 65 plus & Year 2017	0.128	1.98*
Occupational Class (Professional base category)		
Lower Middle	–0.162	–7.42**
Skilled	–0.315	–15.12**
Unskilled	–0.362	–9.67**
Farming	–0.224	–7.62**
Occupational Class-Year Interactions		
Unskilled & Year 2011	–0.127	–1.94
Unskilled & Year 2013	–0.080	–1.60
Unskilled & Year 2015	–0.138	–2.77**
Unskilled & Year 2017	–0.065	–1.31
Number of Individuals	7,758	

Source: Author's calculations based on HIA survey data.
Note: * Selected Estimates from the full model.

change in survey provider. For this issue to have affected these findings, it would have to be the case that the survey methodology systematically altered the relationship between PHI and socio-demographic characteristics. While this is possible, it does not seem likely; however, we interpret these findings with caution. In summary, it appears that most variables have a relatively stable relationship with PHI over time. The only exceptions are for unskilled individuals and for individuals over the age of 65. The unskilled appear to be somewhat less likely to have PHI over time, while the over 65 appear to be progressively more likely to have PHI over time.

The interactions discussed above are statistically significant using the conventional 5 per cent threshold for statistical significance. However, if we use the Bonferroni correction for multiple hypothesis testing, the threshold for statistical significance is 0.001, since 62 explanatory variables were included in the full model (age categories and occupational categories interacted with four-year indicators). Using this more stringent Bonferroni correction threshold for statistical significance, none of the interactions are statistically significant. The Bonferroni correction is viewed as being very conservative; however, given the concern with multiple hypothesis testing, the interaction effects should be interpreted with caution.

VII LIMITATIONS

This analysis has several limitations. Given that it relies on survey data and self-reported measures of socio-economic status, health, and attitudes, it is important to be cautious in assigning causality to the associations found in the analysis. While the attitudinal variables are interesting, they are endogenously determined. The analytic work also would have benefitted from better measures of income and geographical location. Our ability to pin down the role of the recession was limited by the fact that we had a limited time series of data before the recession, and that our measures of recession are quite blunt. Our analysis examines the yearly variations in the data, by age group, to examine if there is evidence of the effect of the Lifetime Community Rating policy. We find that there is no statistically significant difference between 2015 and 2017 in health insurance coverage, even among the under 35 age group. That said, the survey data have limited power to identify this effect. An analysis of administrative data (with larger sample sizes) may be more fruitful for this question.

Our analysis on the determinants of PHI reveals results that are important for policy. For instance, the finding of the presence of adverse selection suggests that it is important to continue to monitor the stability of the PHI market. However, our analysis does not directly comment on several interesting and important areas of health policy. The growth of PHI coverage in Ireland raises questions about the implication of the increase in coverage on the public system. Theoretically, the effect on public health waiting lists and quality is ambiguous; an increase in PHI could, for instance, reduce the pressure on the public system and improve quality. Alternatively, if the PHI system and the public system are competing for staff resources, and especially if the PHI system allows individuals to skip public waiting lists, as is the case in Ireland, quality in the public system is likely to suffer and waiting lists in public system are likely to lengthen. Empirical studies from the UK and Germany have found somewhat mixed results; however, the weight of the evidence suggest that PHI can have negative consequence for the public health system (Stabile and Townsend, 2014). Our study is limited in its ability to comment

on implications for the public health system; however, assessing the implications of PHI in Ireland on the public health system is an important and interesting avenue for future research.

VIII CONCLUSION

This paper investigates the importance of economic conditions, socio-demographic factors, and health in explaining the demand for PHI in Ireland. We estimate multivariate models that reveal several interesting findings. Year-to-year variations, captured by year indicators in a multivariate model, initially appear to play an important role in explaining PHI demand. However, their magnitude and statistical significance diminishes when we control for socio-demographic factors and individual preferences. Individual preferences appear to play an important role in explaining PHI demand. Clearly, preferences themselves are endogenous, and may respond to economic conditions. Our results on the importance of preferences are consistent with previous research in the US and Germany (Finkelstein and McGarry, 2006; Polyakova, 2016).

Socio-demographic factors are important in explaining PHI coverage. Not surprisingly, older individuals are far more likely to have PHI. Furthermore, over 65s are significantly more likely to hold PHI over time. This effect is stark in the multivariate models, compared to the raw data, highlighting the importance of controlling for the effect of other socio-economic characteristics. Despite worsening economic conditions, over 65s appear to prioritise maintaining PHI coverage. This result is to be expected in a community rated system where it is rational for over 65s who can afford health insurance to have it. It is also possible that some of the age profile in PHI coverage incorporates cohort-based differences. For instance, in 2007, only 12 per cent of PHI holders were over 65 and 13 per cent of PHI holders were between 55 and 64. By 2015, these percentages had increased to 21 per cent and 19 per cent respectively. It is possible that preferences for PHI are higher among current cohorts who are at age 65 plus, compared to other cohorts (HIA, 2008).

PHI demand also reflects a strong occupational gradient, that does not diminish despite controls for attitudes and other economic factors. Professionals are more likely to have PHI than all other occupational classes. The unskilled are substantially less likely to have PHI and this disparity has increased over time. The demand by unskilled for health insurance appears to be sensitive to the big swings in the economy from 2009 to 2017. During the high growth phase up to 2008, there was a substantial increase in this group, especially high paid construction workers. But the 2009 to 2012 recession caused a disproportionate number of these workers to lose their jobs and give up health insurance. In 2017, the partial recovery of demand for PHI among the unskilled is consistent with the recovery of construction jobs. Country of origin also appears to be an important determinant of PHI demand,

with the Irish born being more likely have PHI than the non-Irish born (except for the UK).

Our results show some evidence for the presence of adverse selection in PHI in Ireland. The 'very unhealthy' are about 10 percentage points more likely to have PHI than the 'very healthy', after controlling for the influence of socio-demographic characteristics and preferences.[24] Since PHI is community rated in Ireland, individuals in poor health do not face higher premiums than those in good health, so theoretically they are expected to have a higher demand for PHI. However, previous research has not found consistent support for this effect, with several studies finding evidence for advantageous selection instead (Harmon and Nolan, 2001; Finn and Harmon, 2006; Bolhaar *et al*., 2012). The results on adverse selection in health combined with the increasing demand for PHI from the oldest age group suggest that the PHI market will continue to attract groups that have a high expected demand for health care. Our study did not find any evidence that Lifetime Community Rating affected the PHI market; however, this may be due to the small sample sizes in the affected age subgroups. Future research on the role of Lifetime Community Rating in stemming potential adverse selection issues in the Irish PHI market will be useful.

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[24] Not all health indicators differences showed support for adverse selection. For instance, we found no statistical difference between the healthy and the unhealthy, or between the very healthy and the unhealthy.

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APPENDIX

Table A.1: Descriptive Profile from 2009 to 2017

Variable	All Years	2009	2011	2013	2015	2017
Private Health Insurance	42.1%	46.2%	42.8%	40.3%	40.7%	42.9%
Gender						
Male	49.1%	50.0%	49.0%	49.0%	49.0%	49.0%
Female	50.9%	50.0%	51.0%	51.0%	51.0%	51.0%
Age Categories						
Age 18 - 34	32.2%	37.0%	34.2%	34.0%	30.0%	29.0%
Age 35 - 44	20.3%	19.0%	19.8%	20.0%	21.0%	21.0%
Age 45 - 54	17.1%	16.0%	17.0%	17.0%	18.0%	17.0%
Age 55 - 64	14.1%	13.0%	13.6%	13.0%	14.0%	16.0%
Age 65 plus	16.3%	15.0%	15.4%	16.0%	17.0%	17.0%
Marital Status						
Married	53.8%	50.5%	55.2%	53.0%	54.7%	54.8%
Partnered, not married	7.6%	8.5%	6.8%	7.0%	7.5%	8.1%
Single	28.9%	30.5%	28.8%	31.0%	28.8%	26.1%
Divorced/Separated	9.7%	10.5%	9.2%	9.0%	9.0%	11.0%
*Country of Origin**						
Irish	91.6%	94.1%	92.7%	91.5%	89.9%	–
UK	2.0%	1.9%	1.5%	2.4%	1.7%	–
EU	4.0%	2.5%	3.1%	4.1%	5.3%	–
Non-EU	2.4%	1.5%	2.8%	2.0%	3.1%	–
Occupational Class						
Professional	12.0%	12.9%	10.3%	10.9%	12.6%	13.0%
Lower Middle	28.7%	28.1%	30.2%	29.1%	28.4%	28.0%
Skilled	25.7%	23.8%	29.1%	28.6%	26.6%	21.0%
Unskilled	26.9%	26.2%	23.1%	24.4%	26.4%	32.0%
Farming	6.8%	9.0%	7.3%	7.0%	6.0%	6.0%
Health Status						
Very Healthy	50.2%	55.9%	50.2%	47.6%	49.2%	50.9%
Healthy	27.1%	26.2%	29.3%	28.7%	27.6%	24.4%
Unhealthy	13.0%	13.6%	11.7%	13.2%	12.2%	13.8%
Very Unhealthy	9.7%	4.1%	8.9%	10.6%	11.0%	10.9%
Other Variables						
Children in household	35.0%	35.8%	30.7%	31.0%	39.0%	37.3%
Medical Card	39.4%	31.0%	38.5%	38.9%	43.9%	40.3%
Attitudes to PHI (Average on 5 point Likert Scale)						
PHI is necessity	3.53	3.78	3.52	3.44	3.52	3.52
I will always have PHI	2.95	3.09	2.95	2.89	2.94	2.96
PHI is good value	2.64	2.88	2.78	2.42	2.60	2.72
There is no need for PHI	2.32	2.52	2.17	2.22	2.42	2.32
PHI means better care	3.53	3.77	3.54	3.42	3.49	3.55

Table A.1: Descriptive Profile from 2009 to 2017 (Contd.)

Variable	All Years	2009	2011	2013	2015	2017
PHI only for wealthy	3.01	2.89	2.92	3.06	3.04	3.04
PHI enables queue skipping	3.61	3.75	3.56	3.67	3.53	3.56
PHI only for old and sick	2.12	2.29	1.94	2.00	2.14	2.20
Number of Individuals	7,758	1,002	1,011	2,022	1,832	1,891

Source: Author's calculations based on HIA survey data.
*Note: Country of Origin data are not available for 2017. Means for 'All Years' are based on 2009-2015.

Table A.2: Determinants of PHI by Year (Marginal Effects from Probit Models)

	2009 Effect	2009 Z-Score	2011 Effect	2011 Z-Score	2013 Effect	2013 Z-Score	2015 Effect	2015 Z-Score	2017 Effect	2017 Z-Score
Gender (Male base category)										
Female	0.006	0.14	0.054	1.11	0.029	0.9	0.042	1.4	-0.023	-0.75
Age Categories (Age 35–44 base category)										
Age 18 - 34	-0.083	-1.35	-0.133	-2.14*	-0.075	-1.56	-0.076	-1.82	-0.102	-2.13*
Age 45 - 54	0.092	1.17	0.041	0.57	0.102	1.95	0.083	1.68	0.032	0.72
Age 55 - 64	0.099	1.02	0.170	2.03*	0.156	2.43*	0.212	3.65**	0.184	3.07**
Age 65 plus	0.135	1.45	0.311	2.52*	0.404	5.5**	0.355	5.03**	0.192	2.93**
Marital Status (Married base category)										
Not Married	-0.082	-1.53	-0.070	-1.24	-0.122	-3.09**	-0.117	-3.34**	-0.099	-2.58**
Occupational Class (Professional base category)										
Lower Middle	-0.123	-1.62	-0.121	-1.64	-0.126	-2.56*	-0.138	-3.04**	-0.121	-2.29*
Skilled	-0.163	-2.07*	-0.288	-4.09**	-0.202	-4.16**	-0.277	-6.36**	-0.308	-6.51**
Unskilled	-0.182	-2.25*	-0.405	-5.78**	-0.315	-6.6**	-0.399	-8.64**	-0.372	-6.89**
Farming	-0.158	-1.61	-0.265	-2.16*	-0.131	-1.96*	-0.200	-3.13**	-0.151	-2.12*
Other Variables										
Children in household	0.048	0.88	0.066	1.13	0.000	-0.01	-0.035	-0.94	0.046	1.1
Medical Card	-0.337	-5.6**	-0.307	-5.16**	-0.422	-10.79**	-0.271	-7.69**	-0.265	-7.63**
Health Status (Very healthy base category)										
Healthy	-0.043	-0.74	-0.044	-0.76	0.031	0.84	0.076	1.95	0.010	0.26
Unhealthy	-0.019	-0.26	-0.100	-1.32	0.036	0.66	-0.078	-1.59	0.008	0.16
Very Unhealthy	-0.010	-0.07	-0.007	-0.08	0.102	1.86	0.124	2.15*	0.125	2.21*

Table A.2: Determinants of PHI by Year (Marginal Effects from Probit Models) (Contd.)

	2009		2011		2013		2015		2017	
	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score	Effect	Z-Score
Attitudes to PHI										
PHI is necessity	0.042	1.88	0.045	2.03*	0.029	2.25*	0.040	2.76**	0.035	2.32*
I will always have PHI	0.279	11.49**	0.247	12.11**	0.189	13.37**	0.184	13.52**	0.233	16.38**
PHI is good value	−0.008	−0.35	−0.030	−1.31	0.000	0.02	0.032	2.24*	0.036	2.57**
There is no need for PHI	−0.089	−4.22**	−0.005	−0.27	−0.053	−3.71**	−0.055	−4.03**	−0.069	−4.44**
PHI means better care	−0.009	−0.31	0.011	0.51	0.022	1.60	0.004	0.29	0.003	0.20
PHI only for wealthy	−0.048	−2.36*	−0.067	−3.59**	−0.072	−6.10**	−0.059	−5.00**	−0.067	−4.86**
PHI enables queue skipping	−0.053	−2.05*	−0.011	−0.51	0.006	0.46	−0.007	−0.54	0.013	0.81
PHI only for old and sick	0.004	0.22	−0.012	−0.52	−0.025	−1.71	−0.003	−0.26	−0.001	−0.09
Country of Origin (Irish base category)										
Non-Irish	−0.124	−1.35	−0.253	−3.42**	−0.132	−2.51*	−0.050	−0.89		
Number of Individuals	1,002		1,011		2,022		1,832		1,891	

Source: Author's calculations based on HIA survey data.
Note: * denotes statistical significance at the 5% level. ** denotes statistical significance at 1% level.