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Selection in employer sponsored health insurance☆

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ABSTRACT

This paper examines the extensive margin of selection into employer-sponsored health insurance (ESHI) using data from the Medical Expenditures Panel Survey 2001–2010 and 2014–2016 and the National Longitudinal Survey of Youth'97 in 2010. Controlling for a large set of firm and job characteristics, I find that before the implementation of the Affordable Care Act (ACA) in 2014, workers aged 25–40 who declined ESHI and remained privately uninsured had significantly higher health risk than those who enrolled. No correlation between health and insurance take-up is found in the 41–64 age group. These results are partly explained by differences in income and Medicaid crowding out ESHI for high risk workers. The paper sheds light on the characteristics of uninsured workers, their incentives for declining insurance and the interaction between private and public health insurance. The allocation of ESHI remained unchanged after the ACA was introduced due to the provisions' counteracting effects.

1. Introduction

Employer sponsored health insurance (ESHI) is the primary source of health insurance for working age individuals in the United States. But in 2010, 19.2% of workers were not covered by private health insurance. This fraction was higher among workers aged 25–40, equal to 24.4%. The general belief was that adverse selection led to a relatively large fraction of young, healthy and uninsured individuals.

Testing for risk selection in ESHI is very difficult since it is not possible to distinguish between workers who desire ESHI but cannot obtain a job that offers it, and those who do not desire it and optimally sort into jobs not offering ESHI where wages might be higher.[1] However, the uninsured group also contains a third type of workers who in fact decline ESHI offers. Very little research exists on this group despite it being easily identifiable using survey data and significant in size: 8% of eligible employees aged 25–40 did not enroll in ESHI and remained privately uninsured, accounting for 24% of privately uninsured workers, and for 19% of privately uninsured individuals in this age group.[2]

This paper fills this gap in the literature by studying the extensive margin of selection in health insurance focusing exclusively on workers who are offered ESHI by their

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[1] These two types of workers have been studied in the contexts of job search and wage determination, job mobility, and assessment of the ACA (e.g., Gilleskie and Lutz, 2002; Dey and Flinn, 2005; Brügemann and Manovskii, 2010; Aizawa and Fang, 2015).

[2] Author's statistics using the Medical Expenditures Panel Survey data from 2001 to 2010.

own employer. The main question is whether workers who decline ESHI and remain privately uninsured are significantly higher or lower risk than those who take up ESHI, conditional on insurance costs and the types of health plans offered by employers. While a vast literature has studied the link between health risk and ESHI plan choice conditional on ESHI take up, this paper is the first to study risk selection in the take-up decision itself.[3]

I use the Medical Expenditures Panel Survey (MEPS) and the National Longitudinal Survey of Youth'97 (NLSY97), which allow me to identify employees who were offered ESHI but refused it. The main analysis of the paper is conducted using pre-ACA data from 2001 to 2010, and a separate section analyses the post-ACA period 2014–2016.

I study both *ex ante* and *ex post* selection, examining the relationships between insurance take-up and general health in the same period, risky health behaviors, and medical expenditures. *Ex ante* adverse selection predicts that those who are higher risk are more likely to take up ESHI, everything else equal (Rothschild and Stiglitz, 1976; Wilson, 1977). Moral hazard predicts that those covered by ESHI are more likely to engage in risky health behaviors and have higher demand for medical care due to lower prices. Together, these forces predict a positive correlation between insurance coverage and *ex post* losses (i.e., medical expenditures) (e.g., Chiappori and Salanie, 2000; Finkelstein and McGarry, 2006; Fang et al., 2008; Fang and Wu, 2016).

Testing for selection requires that we compare workers who accept and reject ESHI, conditioning on ESHI premiums and health plans offered. Since these characteristics are not available in the MEPS nor the NLSY97, a crucial part of the analysis is finding suitable proxies. The most important determinants of ESHI out-of-pocket premiums and plan types are individual wages and firm and job characteristics. Fortunately both data sets contain comprehensive sets of variables describing these (e.g., firm size, occupation, industry, hourly wages, hours worked, region and union status).

First, I find that conditional on an extensive list of individual, firm and job characteristics, workers who decline coverage are in significantly worse health than those who take up ESHI among those aged 25–40 in the pre-ACA period. There is no correlation between ESHI take-up and health among older workers aged 41–64. Young workers who take up ESHI also have better health behaviors (i.e., smoking, diet, and sleep) than decliners, indicating overall lower health risk.

Second, I find that those who take up ESHI receive more basic preventive care and have higher total medical expenditures despite having lower health risk *ex ante*. These results are consistent with a combination of advantageous selection and *ex post* moral hazard. Workers who take up ESHI invest more in their health and could demand more preventive care all else equal, leading to higher expenditures. *Ex post* moral hazard works in the same direction since insurance lowers the price of care, increasing utilization.

I build a theoretical framework and explore three main channels that could explain the negative correlation between health risk and ESHI take-up among young workers: (1) differences in demand due to income, where health risk and income are negatively correlated, (2) differences in preferences (e.g., risk aversion negatively correlated with health risk), and (3) Medicaid crowding out ESHI.

Individuals with higher incomes (who are also healthier on average) are more likely to take up ESHI for several reasons. First, due to concavity in preferences over consumption, the utility cost of paying the ESHI premium is lower at high income levels. Second, ESHI premiums can be both income and payroll tax deductible. Those in higher marginal income tax brackets receive a larger tax break due to the progressive income tax code in the U.S. (Jeske and Kitao, 2009). Third, high income workers could be working for better firms that offer more generous ESHI plans at lower costs.

I find that high income groups are indeed lower risk and significantly more likely to take up ESHI. Education (a measure of permanent income), demographics (e.g., household size that affect income per person) and family income account for approximately half of the negative correlation between ESHI take-up and health risk among workers aged 25–40. But the association remains negative and statistically significant revealing that *ex ante* advantageous selection is not entirely explained by the income elasticity of insurance demand or by tax incentives. Only in the 41–50 age group, the association between ESHI take-up and health risk turns positive once controlling for income variables.

Next, risk aversion has been emphasized in previous literature as a key advantageous characteristic, being linked with higher demand for insurance and more precautionary actions that reduce risk (David de Meza, 2001). Using the NLSY97 which contains self-elicited context specific risk preferences, I find that preferences for health risk contribute to advantageous selection, although their contribution is quantitatively very small. Preferences for financial risk are not significantly associated with ESHI take-up.

Lastly, I find that Medicaid crowds out ESHI for low socio-economic status (SES) workers. This plays a crucial role in risk selection since low SES groups have the highest health risk. If we exclude workers covered by public health insurance from the analysis, the negative correlation between ESHI take-up and health risk among young workers is reduced by approximately a quarter. In addition, ESHI decliners who remain completely uninsured have higher probabilities of transitioning to non-employment and receiving Medicaid a year later. This suggests that Medicaid crowds out ESHI demand not only for those who already qualify, but also for those who anticipate to receive it in the future.

Finally, I study how risk selection in ESHI changed with the implementation of the Affordable Care Act. The ACA's key provisions are (i) the employer mandate which requires

[3] Existing literature generally finds that higher risk employees sort into less restrictive and/or more comprehensive health insurance plans (e.g., Cutler and Reber, 1998; Cutler and Zeckhauser, 2000; Einav et al., 2010; Handel, 2013; Bajari et al., 2014). A notable exception is Bundorf et al. (2012).

firms with 50+ employees to offer ESHI or pay a tax penalty; (ii) the individual mandate which requires individuals to buy health insurance or pay a fine; (iii) insurance exchanges where uninsured individuals can buy insurance at group-based premium rates with subsidies for those with low incomes; and (iv) the expansion of Medicaid to a higher income eligibility threshold. These provisions came into effect gradually, with most taking effect on January 1, 2014 (e.g., the Medicaid expansion).

Using the MEPS from 2014 to 2016, I find that the fraction of workers who reject ESHI and remain privately uninsured and their average risk have in fact remained unchanged relative to the pre-ACA period. While the Medicaid expansion could amplify the crowding out effect on ESHI for low SES/high risk workers, the individual mandate largely counteracted this by raising the cost of being privately uninsured.

2. Related literature

Only a small medical research literature has studied the characteristics of ESHI decliners, finding that they are on average more likely to be in poor health but less likely to have high cost medical conditions than those who enroll (i.e., Blumberg and Nichols, 2001; Bernard and Selden, 2006). In contrast, I formally study the extensive margin of selection in ESHI, shedding light not only on the characteristics of workers who decline available ESHI, but also on their incentives.

Existing literature has already shown that Medicaid crowds out private health insurance (e.g., Cutler and Gruber, 1996; Brown and Finkelstein, 2008; Monheit and Vistnes, 2008; Cunningham, 2002). Monheit and Vistnes (2008) show that low incomes and Medicaid eligibility are associated with a lower likelihood of ESHI take-up, and Cunningham (2002) shows that among ESHI eligible workers, low-income persons living in states with more expansive eligibility for Medicaid were more likely to decline ESHI in favor of public coverage. While it is not surprising that low incomes and Medicaid eligibility induce high risk individuals to reject ESHI, it is an open question how these forces balance against adverse selection.

My paper is also related to the growing literature testing for the “positive correlation property” between insurance coverage and *ex post* losses. Contrary to predictions, several insurance markets are found to exhibit either no selection or advantageous selection. Examples include the auto insurance market in France (Chiappori and Salanie, 2000), the U.S. Medigap market (Fang et al., 2008), the US long-term care insurance market (Finkelstein and McGarry, 2006; Cutler et al., 2008) and the supplementary private health insurance market in Australia (Buchmueller et al., 2013; Doiron et al., 2008).

3. Background on employer sponsored health insurance in the US

The average total premium for an ESHI plan in 2010 was $5,049 for single coverage and $13,770 for family coverage. Employers pay on average 81% of the singles premium and 70% of the family premium (Kaiser Family Foundation 2010). These costs are passed on to *all* employees in the form of lower wages (e.g., Dey and Flinn, 2005).[4] Employees can review and change their medical coverage every year during the open enrollment period. ESHI is group insurance and discrimination on the basis on health is prohibited by the Health Insurance Portability and Accountability Act (HIPAA).

ESHI benefits and premiums depend on the pool of employees within firms and on job and firm characteristics. The most important determinants are firm size, industry, region, shares of older and low wage workers, and whether workers are unionized (The Kaiser Family Foundation and the Health Research and Educational Trust, 2010). However, differences in total ESHI premiums across different firms are relatively small. An important difference is that firms with large proportions of low wage workers pay on average a lower share of the total premium (76%) compared to high wage firms (82%). Also, 13% of firms directly vary worker premium contributions by wage level. The out-of-pocket (OOP) ESHI annual premium for singles is approximately $300 higher for low-wage vs high-wage workers. Online Appendix B provides additional information.

4. Model

In this section, I present a theoretical framework that guides the empirical analysis of selection in ESHI. I start with a simple model that predicts the standard adverse selection result. I then build on it by introducing several key features that impact the insurance allocation. I study each feature separately using a graphical approach similar to Einav and Finkelstein (2011).

4.1. Simple model

The model has two periods. Risk averse individuals enter the economy in period one as workers in firms where ESHI is offered. I abstract from selection into jobs with and without insurance. Individuals differ in their initial stock of health h_1, where higher values indicate better health. They earn income y, and make a single binary choice $j \in \{0, 1\}$ to reject or accept the ESHI offer, respectively. If the worker takes up ESHI she pays a fixed total premium θ. For simplicity, borrowing and saving are not allowed, so individuals consume all income minus ESHI premiums when applicable. In the second period, their health is given by $h_2 = k(h_1, \varepsilon)$, where ε is a health shock. Let $k_{h_1} > 0$, $k_\varepsilon < 0$ and $k_{\varepsilon h_1} < 0$. The last condition implies that health shocks have more detrimental effects on h_2 when the stock of health is already low. For simplicity, let $\varepsilon = \xi$ (where $\xi > 0$) with probability ω, and $\varepsilon = 0$ with probability $1 - \omega$.[5] Let β denote the discount factor and let λ be a fixed parameter that determines the degree of risk aversion.

[4] The high fraction of workers declining ESHI suggests that sorting in the labor market is imperfect. Monheit and Vistnes (1999) and Hirth et al. (2006) provide evidence that relatively high fractions of workers are mismatched in terms of jobs offering their desired mix of wages relative to health benefits.

[5] Note that ω does not depend on health risk (h_1), but the total loss in period 2 depends on it since h_1 interacts with the shock ε to determine h_2.

Given the initial health state h_1, the individual solves the problem:

$$V(h_1) = \max_j \left\{ u(y - j\theta) + \beta E_\varepsilon v(j, h_2, \lambda) \right\}. \quad (1)$$

Utility in period 1 is given by the function u that depends only on period 1 disposable income. Utility in period 2 is given by $v(j, h_2, \lambda)$ which implicitly captures the existence of a loss (i.e., a necessary medical treatment cost) that is negatively correlated with h_2. ESHI pays for a fraction of this medical cost, thus lowering out-of-pocket expenses and increasing utility. Preferences satisfy $u' > 0, u'' < 0, v_{h_2} > 0$, and $v(1, h_2, \lambda) > v(0, h_2, \lambda)$, $\frac{\partial}{\partial\lambda}[E_\varepsilon(v(1, h_2, \lambda) - v(0, h_2, \lambda))] > 0$ and $\frac{\partial}{\partial h_2} v(1, h_2, \lambda) < \frac{\partial}{\partial h_2} v(0, h_2, \lambda), \forall (h_2, \lambda)$. The last two conditions ensure that for any given h_2, period 2 utility is higher if ESHI is held and an improvement in h_2 is associated with a larger utility increase if $j = 0$ than if $j = 1$ (i.e., the utility increases by more when the loss is not partly insured).

Given h_1, the optimal decision is to accept ESHI ($j^* = 1$) if:

$$\beta E_\varepsilon[v^{j=1} - v^{j=0}] > u^{j=0} - u^{j=1}, \quad (2)$$

which in this simple case implies:

$$\beta E_\varepsilon[v(1, k(h_1, \varepsilon), \lambda) - v(0, k(h_1, \varepsilon), \lambda)] > u(y) - u(y - \theta). \quad (3)$$

The left hand side of Eq. (2) is the discounted expected benefit of insurance (EBI) in period 2, and the right hand side is the utility cost of insurance (UCI) in period 1. Fig. 1A illustrates the EBI and UCI as functions of h_1, assuming a fixed set of parameters $(y, \theta, \beta, \lambda, \omega, \xi)$. The EBI is downward sloping since $\frac{\partial}{\partial k} v(1, k(h_1, \varepsilon), \lambda) < \frac{\partial}{\partial k} v(0, k(h_1, \varepsilon), \lambda)$.[6] The UCI is constant. The figure depicts the classic case of adverse selection: those with low health in period 1 have the most to gain from buying ESHI since their expected h_2 is low and the benefit of insurance is high. When $h_1 = h_1^*$, health risk is low enough so that the expected benefit exactly equals the utility cost of ESHI, and as health improves further, the expected benefit becomes lower than the cost.[7]

Comparative static exercises with respect to the parameters $y, \theta, \beta, \lambda, \omega$ and ξ are useful at this stage to understand how potential heterogeneity in these across individuals could change the model predictions. From Eq. (3) we can see that an increase in y leads to a downward shift in the UCI. At higher income levels, the utility cost of paying the ESHI premium is lower (since u is concave). As a result, the threshold level h_1^* at which workers reject ESHI increases. This in turn implies that the pool of insured workers is on average healthier at higher income levels. The same comparative static result applies in the case of a decrease in θ. On the other hand, a higher β or a higher λ shift the EBI up while the UCI is unchanged. This shift also leads to a higher threshold level h_1^*. Therefore, if workers differ along these dimensions, the model predicts that the pool of insured workers is healthier among those who discount the future less and those who are more risk averse. Finally, for higher health shock probabilities (ω) or for bigger shocks (ξ), the EBI also shifts up. However, selection remains adverse as long as these parameters are uncorrelated with h_1. This assumption is relaxed in the next sections.

4.2. Income and ESHI supply and demand

Assume that individuals are heterogeneous in income y in addition to initial health. As just seen from comparative static exercises, the average health risk of those who take up ESHI is negatively correlated with income. Therefore, we expect firms employing higher wage workers to offer more attractive ESHI plans to their employees. Total premiums (θ) are likely to be lower and ESHI benefits in period 2 ($v(1, h_2, \lambda)$) are likely to be higher for higher income workers. For clarity of presentation, I abstract from modeling the employee's share of the total premium θ. Previous literature shows that wages in fact adjust to offset employee health benefits, leaving total compensation unchanged (Gruber and Krueger, 1991; Gruber, 1994). I discuss this issue in more detail in Section 6.

Let total ESHI premiums and period 2 insurance benefits be functions of income: $\theta(y)$ where $\theta_y < 0$ and $v(1, h_2, \lambda, y)$ where $v_y(1, h_2, \lambda, y) > 0$ and $v_y(0, h_2, \lambda, y) = 0$. Now, in a comparative static exercise where we increase y, the UCI shifts down and the EBI shifts up by even more than in the simple model.[8] This is a supply induced effect generated by firms offering different types of ESHI plans to different workers.

On the demand side, higher income individuals have a lower utility cost of ESHI due to the concavity in u. Tax incentives amplify this. The ESHI premiums can be both income and payroll tax deductible, and those in a higher marginal tax bracket receive a larger tax break due to the progressive income tax code (Jeske and Kitao, 2009). To capture this, let $f(y - j\theta(y))$ be the after-tax income received by the worker, net of ESHI premiums, where $f' > 0$ and $f'' < 0$. Period 1 utility is now given by $u(f(y - j\theta(y)))$.

These model extensions do not change the classic adverse selection result if income and health risk are uncorrelated. Let us now consider the more realistic case where period 1 income depends on health according to the function $y(h_1)$, where $y' > 0$. Period 1 utility is now

[6] Taking derivatives, we obtain: $\frac{\partial}{\partial h_1}[v(1, k(h_1, \varepsilon), \lambda) - v(0, k(h_1, \varepsilon), \lambda)] = k_{h_1}(h_1, \varepsilon)[v_k(1, k, \lambda) - v_k(0, k, \lambda)] < 0, \forall \varepsilon$. Taking the expectation with respect to ε, we obtain a weighted average of two functions that are both decreasing in h_1. The weighted average is also decreasing in h_1.

[7] I use a graphical approach, plotting the EBI and UCI against h_1 to illustrate how different model features affect the incentives to take up ESHI by different individuals. For simplicity and clarity, I focus only on cases that highlight the mechanisms involved, abstracting from extreme cases where either all workers or no workers buy ESHI. I also generally focus on cases where the EBI and UCI are continuous, monotone and intersect only once, except in a few particular cases.

[8] $\frac{d}{dy} UCI = u'(y) - u'(y - \theta)(1 - \theta'(y))$. Since u is concave and $\theta_y < 0$, this expression is negative. The EBI clearly shifts up with income since $v_y(1, h_2, \lambda, y) > 0$ and $v_y(0, h_2, \lambda, y) = 0$.

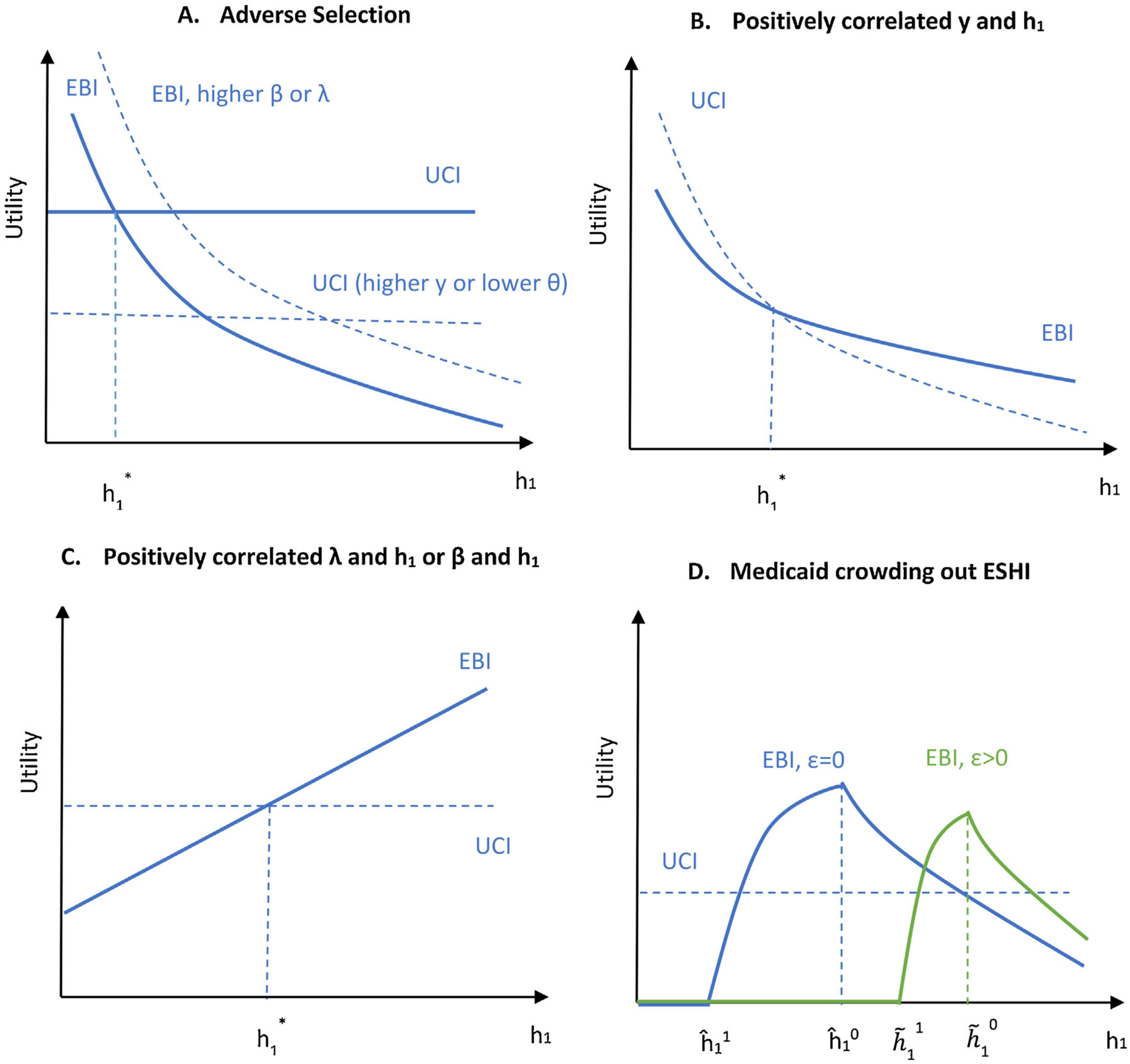

Fig. 1. Expected benefit of insurance (EBI) and utility cost of insurance (UCI) under different scenarios. Notes: The figures illustrate the EBI and UCI as functions of health in period 1 (h_1) where higher values correspond to better health. Panel A illustrates the classic adverse selection result from a model where individuals differ only in terms of h_1. The EBI is higher than the UCI for those with poor health ($h_1 < h_1^*$). A higher time preference β and a higher degree of risk aversion λ are associated with the EBI shifting up. A higher income y and a lower insurance premium θ are associated with the UCI shifting down. Panel B shows a possible scenario arising when individuals are heterogeneous in both income y and health h_1, when these are positively correlated. The UCI becomes downward sloping, possibly intersecting the EBI from above and resulting in advantageous selection. Panel C illustrates the case from a model with individuals heterogeneous in preferences (risk aversion or time preference) and health, where these are positively correlated. The EBI could become upward sloping as depicted, resulting in advantageous selection. Panel D shows the possibility of Medicaid crowding out ESHI for poor health individuals. Whether a health shock does not occur ($\varepsilon = 0$) or does occur ($\varepsilon > 0$), the EBI is zero for low health levels where individuals receive Medicaid regardless of ESHI status. As health improves, the EBI increases since those with ESHI no longer qualify for Medicaid but those without ESHI do. At high levels of health, the EBI is standard downward sloping since individuals never qualify for Medicaid.

given by $u(f(y(h_1) - j\theta(y)))$, and the UCI equals $u(f(y(h_1))) - u(f(y(h_1) - \theta(y)))$. Taking derivative with respect to h_1, we obtain $\frac{d}{dh_1}UCI = y'[u'(f(y(h_1)))f'(y(h_1)) - u'(f(y(h_1) - \theta(y)))f'(y(h_1) - \theta(y))(1 - \theta')]$. Since u and f are concave and $\theta' < 0$, this expression is negative. Therefore, the UCI is no longer flat but decreasing in h_1.

To summarize, a positive correlation between income and health implies that healthier workers have a lower utility cost of ESHI due to: (1) concavity in u, (2) the tax treatment of ESHI premiums, and (3) lower premiums $\theta(y)$ from the supply side. As long as $y' > 0$, strengthening any of the factors (1)–(3) leads to a steeper UCI. Positively correlated income and health also imply a flatter EBI if ESHI plans with more generous benefits are supplied to higher income (healthier) workers. Eventually, the UCI could become steeper than the EBI, in which case, the correlation between ESHI take-up and health risk becomes negative. This case is illustrated in Fig. 1B.

It is important to make a clear distinction between the effects arising from the supply side (i.e., better ESHI plans available to those who are healthier) and those arising from the demand side (i.e., those who are healthier have higher incomes and a lower utility cost of ESHI). To test for selection in ESHI, we need to compare workers who are offered identical ESHI plans, eliminating the supply side effects (Einav and Finkelstein, 2011). This will be a crucial aspect of the empirical analysis where I test for risk selection in ESHI controlling for all available characteristics that could determine the quality of ESHI plans offered.

4.3. Preference heterogeneity: risk aversion and future discounting

The most emphasized "advantageous" characteristic in previous literature is risk aversion (e.g., David de Meza, 2001; Finkelstein and McGarry, 2006). If risk aversion is positively correlated with initial health h_1 (i.e., risk averse individuals are healthier because they take fewer risks), and if this correlation is high, then those with high h_1 are willing to pay higher risk premiums than those with low h_1. If this difference is large enough, the EBI can become upward sloping as depicted in Fig. 1 C, leading to advantageous selection.[9] Similarly, if we allow for heterogeneity in the future discount factor, and if β is positively and strongly correlated with h_1, it can also lead to a positively sloped EBI and advantageous selection. For example, individuals with higher survival probabilities have a higher effective β, invest more in health, and have lower risk as a result (e.g., Murphy and Topel, 2006; Hall and Jones, 2007).

4.4. Social insurance (Medicaid)

Let us consider again the simple model from Section 4.1, with the added feature of a minimum utility floor $v_{\min}$ in period 2 guaranteed by the government.[10] If poor health leads to low productivity and high medical expenditures in period 2, social insurance programs such as food stamps and Medicaid are provided to guarantee a minimum consumption (and hence utility) level. For simplicity, I abstract from social insurance in the first period. The UCI in Eq. (2) remains unchanged, and the EBI is now given by:

$$\beta E_{\varepsilon}[\max\{v(1, k(h_1, \varepsilon), \lambda), v_{\min}\} - \max\{v(0, k(h_1, \varepsilon), \lambda), v_{\min}\}]. \tag{4}$$

Let $\overset{0}{\hat{h}}_1$ be the value of h_1 that satisfies $v(0, k(\overset{0}{\hat{h}}_1, 0), \lambda) = v_{\min}$ and let $\overset{1}{\hat{h}}_1$ be the value of h_1 that satisfies $v(1, k(\overset{1}{\hat{h}}_1, 0), \lambda) = v_{\min}$. Note that ε is set to 0. Given the assumptions on v, $\overset{1}{\hat{h}}_1 < \overset{0}{\hat{h}}_1$. I graph the discounted utility benefit of insurance for the case where $\varepsilon = 0$ in Fig. 1D. For $h_1 < \overset{1}{\hat{h}}_1$, the utility benefit of ESHI is 0 since the individual receives $v_{\min}$ regardless of ESHI status. For $\overset{1}{\hat{h}}_1 < h_1 < \overset{0}{\hat{h}}_1$, period 2 utility increases for those with ESHI, but remains constant at $v_{\min}$ for those without ESHI, so the utility benefit of ESHI increases. Finally, for $\overset{0}{\hat{h}}_1 < h_1$, we are back to the simple case where the benefit of ESHI decreases in h_1 since period 2 utility is always above $v_{\min}$ regardless of ESHI status. The figure also shows the discounted utility benefit of insurance for $\varepsilon = \xi$, in which case the h_1 thresholds satisfy: $v(0, k(\tilde{h}_1^0, \xi), \lambda) = v_{\min}$ and $v(1, k(\tilde{h}_1^1, \xi), \lambda) = v_{\min}$. The total expected benefit is a weighted average of these two curves, and is determined by the probability ω of a health shock.

For our purposes, it is sufficient to see that since the EBI is zero for low values of h_1 and then increases in h_1, the EBI can intersect the UCI for the first time from below. Those with very high health risk reject ESHI because they anticipate poor health in period 2 that qualifies them for social insurance. This leads to advantageous selection in ESHI only locally at relatively low health levels. At high levels of h_1, the EBI could intersect the UCI from above. If social insurance became more generous (i.e., larger $v_{\min}$) the thresholds at which there are positive expected benefits from insurance shift to the right. The highest risk workers would opt out of ESHI.

Low income and high risk workers could also rely on uncompensated care which could explain their low take-up rates even when insurance is heavily subsidized (Finkelstein et al., 2018). Just as with formal public insurance, if these individuals are more likely or more willing to receive uncompensated care in period 2, their EBI could be zero.

4.5. Age

At older ages, individuals face higher probabilities of negative shocks ω and the health shocks are likely to be more severe (higher ξ). Let these be increasing functions of age, where $\omega(age)$, $\omega' > 0$, $\xi(age)$, and $\xi' > 0$. Higher ω and ξ are associated with higher EBI all else equal (i.e., graphically, the EBI shifts up). Assume now that the model is populated by individuals of all working ages. Since age and health are negatively correlated, individuals at the bottom of the health distribution are more likely to be old and have high EBI since their ω and ξ are bigger. Therefore, the EBI becomes steeper as a function of h_1 relative to the simple model. This makes adverse selection more likely since a steeper downward sloping EBI is more likely to cross the UCI from above.

4.6. Summary

We have seen how each model feature can impact the ESHI allocation in isolation, but in reality, these are present together and the effects could reinforce or offset each other. For example, risk preferences that are correlated with health risk might not generate an upward sloping EBI alone, but if the effect from the discount rate reinforced it, they could together lead to advantageous selection. Even if their overall effect is to simply flatten out the downward sloping EBI, this could still generate advantageous selection when the UCI is also downward sloping and relatively steeper due to correlation between health risk and income.

[9] This illustration is similar to Einav et al. (2010) and Einav and Finkelstein (2011) who graph an upward sloping MC curve leading to advantageous selection when risk aversion is negatively correlated with health risk.

[10] This is the standard way of modeling social insurance (including Medicaid) in Macro-Health models (e.g., De Nardi et al., 2010; French and Jones, 2011).

How the different forces balance out is an empirical question I explore in the next sections.

5. Data

Both the MEPS and the NLSY97 data sets contain information on whether ESHI was offered to working respondents and whether they enrolled in it. The advantages of MEPS are that is contains individuals of all working ages, it has a large sample size, and it contains information on medical expenditures. The NLSY97 has the advantage of containing very rich information on personal and family background characteristics as well as context specific risk preferences. I conduct the analysis using sub-samples from the MEPS and NLSY97 that include only ESHI eligible individuals, comparing those who take up their employer's ESHI offer with those who reject it and remain privately uninsured. I exclude workers who reject their employer's offer but have other private health insurance such as from a family member. Online Appendix B provides detailed information on these data sets and on sample and variable construction.

5.1. The Medical Expenditures Panel Survey

The MEPS is a set of large-scale surveys of families and individuals, their medical providers, and employers. The survey uses an overlapping panel design collecting data in a series of five rounds of interviews over a 2 and a half year period. A new panel enters the survey every year. I use the MEPS Household Component which collects data from a sample of civilian non-institutionalized families and individuals drawn from a nationally representative sub-sample of households. I use years 2001–2010 to study the pre-ACA period in the main analysis, and years 2014–2016 to study the post-ACA period.[11]

Sub-sample construction – MEPS. The sub-sample used in the analysis contains individuals aged 25–64 who respond positively when asked whether health insurance was offered through a current main job in Round 1 of interview. They are then categorized as insured if they report having health insurance at their current main job, and uninsured if they do not and have no other private health insurance. All other individuals are excluded.

5.2. The National Longitudinal Survey of Youth 1997

The NLSY97 surveyed a sample of 8,984 American youths born between 1980 and 1984. This cohort has been interviewed annually from 1997 to 2011 and biennially thereafter. I use data from year 2010 when all key variables of interest are available, including the self-reported context specific risk taking preferences.

Sub-sample construction – NLSY97. I keep individuals who were offered ESHI in 2010 by their own employer. They are categorized as insured if they have health insurance in 2010 where the primary source is their own employer. They are categorized as not having insurance if they reported having declined the ESHI that was made available to them, for reasons other than that they were covered by another plan, had a pre-existing condition, or had not worked for this employer long enough. All others are excluded.

In both the MEPS and the NLSY97 sub-samples, I exclude workers who are self-employed, without a valid industry, or in the armed forces. I exclude observations where hourly wages are missing or are lower than half of the minimum wage.

5.3. Key variables

Health insurance. For each round of interview, the MEPS contains variables on private health insurance held. For the current main job, it has separate questions for whether health insurance was offered, held, and whether there was a choice of health plans. Similarly, the NLSY97 contains variables on the respondents' insurance status, the source of insurance, whether they were offered ESHI by each of their employers, whether they accepted or rejected each offer, the reason for rejection, and whether they could have obtained health coverage through their spouse's employer.

General health. I construct a single variable capturing general health by combining information on (1) self-assessed health (on a scale from 1 to 5), (2) BMI, (3) mental health, and (4) the number of chronic health conditions.[12] In both data sets, I perform factor analysis on these four variables using all individuals for whom information is available, using their sampling weights. I obtain a single factor with a mean of zero and standard deviation of one, where higher values indicate worse health. This variable captures health in the same time period as that in which health insurance status is measured.[13]

Health behaviors. The MEPS contains information on smoking, exercise, seat belt use and preventive care. The NLSY97 contains a more extensive list of behaviors, which I group into six areas of interest: smoking, drinking, exercise, diet, sleep, and preventive care (see Online Appendix B). Higher values indicate greater risk. The behaviors are measured in the same time period as the health insurance variable when possible.[14]

Risk preferences. In the MEPS, individuals report how likely they are to take risks relative to an average person on a scale from 1 to 5. In the NLSY97, in 2010 only, respondents report their willingness to take risks in various areas, including health, finances and general, on a scale from 0 to 10. The NLSY97 also contains four standard hypothetical income gamble questions designed to elicit risk preferences. Each question asks respondents to choose between

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[11] Key variables on health, health behaviors and employment are missing before 2001 (e.g., BMI, chronic conditions, and whether the job is temporary).

[12] In the NLSY97, the mental health variable is constructed through factor analysis on variables measuring the frequency the respondent felt downhearted, depressed, nervous, calm and happy. In the MEPS, I use the variable measuring perceived mental health.

[13] However, in the MEPS, BMI and the number of chronic conditions are first available in Round 3. These are unlikely to change much within a year.

[14] In the MEPS, some behaviors are first available only in Rounds 2 or 3 (i.e., smoking, seat belt use, flu shot and the frequency of doctor checkups).

Table 1
Health insurance status, by age group, MEPS.

Age Group	25–30	31–40	41–50	51–64
A. Private Health Insurance (PHI) status, % of total				
No PHI, no ESHI offer	23.3	18.7	15.8	13.0
No PHI, had ESHI offer	5.9	4.1	3.2	2.2
Insured, own ESHI	56.0	56.8	58.2	58.5
Insured, other source	14.9	20.4	22.8	26.4
Total	100.0	100.0	100.0	100.0
B. ESHI Status, % of those offered ESHI				
Rejected, has no PHI	8.7	6.1	4.6	3.3
Accepted	83.5	82.3	83.5	85.2
Rejected, has other PHI	7.8	11.6	11.9	11.6
Total	100.0	100.0	100.0	100.0

Notes: The statistics are calculated using MEPS data from 2001 to 2010, using Round 1 interview information, and using sampling weights. Statistics in Panel A are calculated using all respondents and statistics in Panel B are calculated keeping only workers, not self-employed, not in the military, with a valid industry. Of those who rejected ESHI and have other PHI, only 2.4% have non-group insurance.

two jobs that offer different income streams with different probabilities (see Online Appendix A). The responses to these questions are combined into a single variable that contains four categories, where Category I is the least willing to take risk and category IV is the most willing (e.g., Barsky et al., 1997).

5.4. Descriptive statistics

Table 1, panel B, reports the fraction of ESHI eligible employees who decline the offer and remain privately uninsured, by age group, calculated using the MEPS data from 2001 to 2010. This fraction is highest in the 25–30 age group (8.7%) and declines with age to 3.3% in the 51–64 age group. In the NLSY97, this fraction is 10.0% in 2010, consistent with the MEPS in the same year for ages 26–30.[15]

Tables 2 and 3 provide summary statistics for subsamples of employees from the MEPS and the NLSY97, respectively. Comparing those who take up ESHI (column 1) with those who decline it and remain privately uninsured (column 4 (2) in Table 2 (3)), we observe that the latter group is slightly younger (MEPS), contains substantially higher fractions of Hispanic, black, and single individuals, and has lower personal and family incomes. Large differences are observed in educational attainment, with the latter group containing much higher fractions of low educated workers.

Those who decline ESHI have on average worse general health and worse health behaviors, with the only exception of drinking. However, the average total medical expenditures are higher, approximately double, among those who take up ESHI.

MEPS respondents who take up ESHI report being less likely to take risks in general. In the NLSY97, the relationship varies with the context of the question. Workers who take up ESHI are on average less willing to take health risks, but are more willing to take financial risks (based on both self-elicited preferences and hypothetical lifetime income gamble questions). This contrasts sharply with the highly cited finding in Barsky et al. (1997) that among HRS respondents who are in their late working lives, employees who have health insurance have higher shares in Category I (least willing to take risks) and lower shares in Category IV (most willing to take risks) than employees who do not have insurance. While the finding in Barsky et al. (1997) support the theory that more risk averse individuals (based on income gamble questions) are more likely to have health insurance, the results here indicate the opposite is the case among young individuals.

Online Appendix A presents a detailed analysis of risk preferences. Two features are notable: (1) individuals report the least willingness to take risks in the health context, with large fractions reporting zero willingness, and (2) focal responses to self-elicited risk questions are prevalent.[16]

Tables 2 and 3 also present summary statistics for those who rejected ESHI but have: (a) other group private health insurance (PHI) (MEPS); (b) other non-group PHI (MEPS); (c) Medicaid or other public insurance; and (d) no other insurance.[17] The last columns present statistics for those who did not receive an ESHI offer and are privately uninsured. ESHI decliners who have other group PHI are generally similar to those who take up ESHI, except they are more likely to be female and more risk averse. Decliners who have other non-group PHI (a very small category) are also similar except they have better health and have lower medical expenditures.

ESHI decliners who have Medicaid are the most different from those who accept ESHI: they are much more likely to be young, single, women, with children, black, with low education, low income, and have very high risk in terms of general health and behaviors. Finally, those who decline ESHI and remain completely uninsured are in significantly better health than the "Medicaid" decliners, but in worse health than those who take up ESHI. They stand out as the group with the highest willingness to take health risk and the least likely to use preventive care. This group is fairly similar to those who are not offered ESHI by their employer and have no PHI, except the latter group is on average slightly more disadvantaged in terms of education, income and health.

6. Methodology

I begin by studying the association between *ex ante* health risk and ESHI take-up. I then explore the relationship between ESHI and health behaviors, shedding light

[15] The fraction of ESHI decliners aged 25–30 who remained privately uninsured increased from 6.4% in 2001 to 10.3% in 2010 (source: MEPS).

[16] To address this issue, I conduct two types of sensitivity analysis. First, I group responses into three categories (low risk (0), medium risk (1–5), and high risk (6–10)), which addresses the issue that responses could convey ordinal rather than cardinal information (Finkelstein and McGarry, 2006). Second, I exclude individuals who give focal answers. The results are reported in Online Appendix A. None of the conclusions presented in the paper change.

[17] In the NLSY97, only 13 individuals decline ESHI and have other group coverage and only 20 have non-group coverage. I therefore omit these from Table 3.

Table 2
Descriptive statistics, selected groups of workers, MEPS.

	1	2	3	4	5	6	7
ESHI offered	Yes	Yes	Yes	Yes	Yes	Yes	No
ESHI take-up	Yes	No	No	No	No	No	–
Other PHI (group)	–	Yes	No	No	No	No	No
Other PHI (non-group)	–	No	Yes	No	No	No	No
Public insurance	–	No	No	Yes&No	Yes	No	Yes&No
Observations	30,660	3636	96	2710	402	2308	10,137
Male	0.549	0.357	0.565	0.532	0.239	0.571	0.554
Age	42.536	43.470	41.717	38.929	35.129	39.427	39.207
Hispanic	0.099	0.070	0.085	0.234	0.211	0.237	0.319
Black	0.117	0.079	0.095	0.190	0.319	0.173	0.146
Asian	0.141	0.142	0.145	0.083	0.062	0.086	0.098
White and other	0.644	0.709	0.675	0.493	0.408	0.504	0.438
Married	0.604	0.967	0.524	0.461	0.283	0.484	0.437
Less than high school	0.071	0.055	0.034	0.231	0.225	0.232	0.308
High school	0.283	0.288	0.259	0.372	0.477	0.359	0.355
Some college	0.248	0.271	0.249	0.244	0.227	0.246	0.204
College	0.398	0.385	0.458	0.153	0.071	0.164	0.133
Gross personal income/yr	55,001	51,871	54,129	32,143	21,274	33,565	25,020
Gross Family income/yr	76,195	102,224	73,973	42,071	24,378	44,387	32,012
Total medical exp/yr	3624	3681	2470	1851	3848	1589	1725
General health	−0.165	−0.219	−0.249	−0.007	0.257	−0.042	0.022
Smoking	0.196	0.162	0.140	0.316	0.370	0.309	0.336
Exercise	0.396	0.426	0.367	0.417	0.452	0.413	0.440
Seat belt	−0.025	−0.059	−0.220	0.081	0.151	0.072	0.065
Preventive care	−0.091	−0.208	0.103	0.376	0.041	0.421	0.527
Risk taking							
Group 1 (least risk taking)	0.392	0.459	0.421	0.314	0.393	0.304	0.315
Group 2	0.260	0.261	0.235	0.234	0.185	0.241	0.218
Group 3	0.134	0.126	0.075	0.171	0.215	0.165	0.184
Group 4	0.172	0.125	0.227	0.223	0.174	0.229	0.211
Group 5 (most risk taking)	0.041	0.029	0.042	0.058	0.033	0.061	0.073

Notes: For general health and the four health behaviors, higher numbers indicate worse health and more detrimental behaviors. The statistics are calculated using only employees between 25 and 64, with a valid industry and occupation, not in the armed forces, and not self-employed, using MEPS data from 2001 to 2010. Sampling weights are used. Some variables have slightly lower observations due to missing values.

on *ex ante* moral hazard. Finally, I study the relationship between ESHI and total medical expenditures, discussing the role of *ex post* moral hazard.

I use the theoretical framework from Section 4 as a guide. To study *ex ante* selection in ESHI, I use the following reduced form regression model:

$$health\ risk_i = \beta_0 + \beta^{ESHI} I_i^{ESHI} + \beta^S X_i^S + \beta^{tenure} X_i^{tenure} + \beta^{inc} X_i^{inc} + \beta^{risk} X_i^{risk} + \varepsilon_i, \quad (5)$$

where the dependent variable is the constructed general health variable for individual *i*. I_i^{ESHI} is an indicator for the individual's ESHI status (0 = rejected and 1 = accepted), and β^{ESHI} is the main coefficient of interest. I estimate different versions of this model, gradually adding sets of control variables: X_i^S is a vector of characteristics that affect ESHI quality (prices and benefits), X_i^{tenure} is job tenure, X_i^{inc} is a vector of income related variables, and X_i^{risk} is a vector of risk preferences. The model is estimated using OLS, controlling for years, and is estimated separately for different age groups.

Testing for selection in insurance markets requires that we examine whether among a set of individuals who are offered coverage options at identical prices, those who buy more insurance have higher expected costs than those who do not (Einav and Finkelstein, 2011). The crucial aspect is that in order to identify how workers self-select into ESHI, we need to first eliminate any correlation that arises from the supply side (i.e., plans with higher or lower premiums and/or benefits being offered to different types of workers).

Since the available data does not contain information on ESHI plans offered or premiums, this is achieved by controlling for the set X_i^S which contains all available characteristics that affect pricing (Einav and Finkelstein, 2011; Chiappori and Salanie, 2000). These include an extensive list of individual, job and firm characteristics. In the MEPS, the available variables are: hourly wages, full time or part time status, whether the job is temporary, firm size, industry, union membership, region, and whether there was a choice of ESHI plans offered. In the NLSY97, the available variables are: hourly wages, full time or part time status, firm size, industry, union membership, region, and urban/rural status. In both data sets, I also add occupations in sensitivity analysis.

Several of these characteristics (e.g., wages, FT status) are expected to be negatively correlated with health risk and positively correlated with the quality of the ESHI plans offered. Workers in poorer health are more likely to work for firms that offer less attractive ESHI. As Section 4.2 shows, supply side factors are expected to lead to a steeper UCI and flatter EBI, potentially resulting in a negative correlation between ESHI take-up and health risk as illustrated

Table 3
Descriptive statistics, selected groups of workers, NLSY97.

	1	2	3	4	5
ESHI offered	Yes	Yes	Yes	Yes	No
ESHI take-up	Yes	No	No	No	–
Public insurance	–	Yes&No	Yes	No	Yes&No
Observations	2652	425	78	344	1512
Male	0.539	0.490	0.326	0.524	0.540
Age	28.070	27.902	28.094	27.877	27.820
Hispanic	0.117	0.158	0.166	0.157	0.165
Black	0.114	0.196	0.359	0.160	0.202
Married	0.399	0.247	0.269	0.246	0.205
Has children in HH	0.353	0.463	0.863	0.388	0.417
Less than high school	0.063	0.290	0.333	0.282	0.271
High school	0.183	0.239	0.221	0.242	0.274
Some college	0.233	0.277	0.295	0.273	0.270
College	0.521	0.195	0.151	0.203	0.186
Earnings income	46,324	23,451	19,859	24,136	21,684
Gross family income	86,073	50,449	46,958	51,071	49,682
General health	−0.166	0.163	0.357	0.127	0.190
Behavior: smoking	−0.192	0.211	−0.188	0.285	0.286
Behavior: drinking	0.071	0.059	−0.354	0.136	0.068
Behavior: diet	−0.099	0.226	0.208	0.232	0.220
Behavior: exercise	−0.087	0.056	0.445	−0.015	0.084
Behavior: sleep	−0.120	0.072	0.245	0.040	0.086
Behavior: preventive care	−0.121	0.444	0.140	0.507	0.309
Risk taking					
Health risk taking	3.019	3.273	2.725	3.403	3.150
Financial risk taking	3.990	3.836	3.831	3.848	3.875
Gamble Category					
Category I (least risk)	0.479	0.572	0.623	0.560	0.534
Category II	0.236	0.185	0.167	0.188	0.219
Category III	0.137	0.090	0.097	0.092	0.088
Category IV (most risk)	0.148	0.154	0.113	0.160	0.158

Notes: For general health and the six health behaviors, higher numbers indicate worse health and more detrimental behaviors. Health and financial risk taking variables range from 0 to 10, where higher numbers indicate more willingness to take risks. Gamble category I is the least risk taking and category IV is the most risk taking. Some variables have slightly lower observations due to missing values. All statistics are calculated using 2010 sampling weights.

in Fig. 1B. Controlling for X_i^S is expected to eliminate a negative bias on the coefficient β^{ESHI}.

Wages in particular contribute to selection through several different mechanisms. While in practice total ESHI premiums vary relatively little with wages, there is more significant variation in the employees' shares of this total, leading to differences in out-of-pocket (OOP) premiums (The Kaiser Family Foundation and the Health Research and Educational Trust, 2010). An important consideration is that for all but very low wage workers, theory and evidence suggest that wages in fact adjust to reflect differences in health benefits (e.g., OOP premiums), leaving total compensation unchanged (Gruber and Krueger, 1991; Gruber, 1994). This variation in OOP premiums and wages is unlikely to affect the utility cost of insurance for medium and high income workers because for them, the OOP premiums are a fairly small and stable fraction of total compensation.

A bias in β^{ESHI} is most likely to arise due to the presence of very low wage workers who face on average higher OOP premiums.[18] At the bottom of the wage distribution, these large OOP premiums are much bigger fractions of total compensation, so the utility cost of ESHI is high. This is amplified by the fact that the marginal utility of consumption is high at low incomes. Therefore, we expect a negative bias in β^{ESHI} as a consequence of high OOP premiums for very low wage (high risk) workers.[19]

Including wages in the regression model does not only eliminate the bias on β^{ESHI} arising from the supply side, but eliminates much of the correlation between ESHI take-up and health risk that arises from the income elasticity of insurance demand when income and health risk are correlated (see section 4.2).[20] High income workers (who are also healthier) have a lower utility cost of ESHI due to concavity in u and tax incentives, so they are more likely to take up ESHI. We cannot distinguish between these demand and supply side effects when controlling for wages.

I then add years of job tenure to the model (X_i^{Tenure}). As highlighted in Fang and Gavazza (2011), longer job tenures are associated with stronger incentives to invest in health

[18] Long and Marquis (2001) find that small firms with high shares of low-wage workers have higher employee shares of the premium and plans have less generous benefits. Also, 17% of large firms vary worker premium contributions by wage level (Kaiser 2010 Annual Survey).

[19] In sensitivity analysis, I conduct a separate analysis for very low wage workers.

[20] When we control for wages (in addition to FT/PT status), we effectively control for the workers' earnings which are highly correlated with total household income.

for both employers and employees. Workers with long tenures might be more likely to take up ESHI while at the same time being healthier, partly as a result of having the insurance (Aizawa and Fang, 2015).

Next, I control for a full set of variables X_i^{inc} that capture differences in total household financial resources per person, thus eliminating any remaining effect arising from differences in ESHI demand due to income. I add the following variables: education (a measure of permanent income), demographics related to SES status and household size (sex, marital status, family size, and race), and total current family income. Some of these could themselves be advantageous characteristics for reasons other than through income, or they could be correlated with other aspects (e.g., preference heterogeneity or behavioral biases) that cause correlation between ESHI take-up and risk. For example, higher education could be correlated with a higher degree of patience, which in turn is likely to be positively correlated with good health. Education itself could also be an advantageous characteristic if it leads to better health and better insurance decisions.

The last variables added are preferences (X_i^{risk}). In MEPS there is only one measure of risk and in the NLSY97, I include several context specific risk preferences as well as personal and family background characteristics that could determine preferences (e.g., personality traits, family income in adolescence, parental education and parenting styles).

As these sets of control variables are added to the model, we expect β^{ESHI} to increase. Heterogeneity in these characteristics across individuals changes the positions and slopes of the UCI and EBI curves, possibly leading to scenarios such as those illustrated in Figs. 1B and C where health risk and insurance take-up are negatively correlated. When we control for them, we are moving towards recovering the standard prediction of adverse selection illustrated in Fig. 1A (in the absence of Medicaid). Lastly, to study the effect of Medicaid on ESHI decisions, I re-estimate Eq. (5) using sub-samples where Medicaid recipients are excluded.

I stratify the analysis by age groups since the incentives to buy insurance change over the life-cycle. Older people have higher expected benefits of ESHI since they are more likely to transition to poorer health (see Section 4.5). Older workers close to 65 could be rejecting ESHI and delaying treatment to when they become eligible for Medicare (Card et al. (2008)). The sample of workers offered ESHI could also change with age.

7. Results

7.1. Evidence of selection in ESHI and sources of selection, MEPS

I use the MEPS sub-sample to estimate Eq. (5). Table 4 reports the estimated coefficients β^{ESHI} for different specifications and age groups. The raw correlation between ESHI take-up and health risk is negative and very large at young ages (column 1).

7.1.1. Differences in ESHI plans offered

Column 4 presents the results from the model that includes all the available characteristics (X_i^S) that proxy for the types of insurance plans offered and the premiums faced by workers. In the 25–30 and 31–40 age groups, the coefficients are negative and statistically significant at the 1% confidence level. Those who reject ESHI have 0.20 (0.15) of a standard deviation point worse health than those who take up ESHI in the 25–30 (31–40) age group. However, there is no significant correlation between health and ESHI status in the age groups older than 40.

The inclusion of firm characteristics (firm size, industry, union, region, and whether there was a choice of health insurance) and job characteristics (FT/PT status and temporary job) leads to very small changes in the ESHI coefficients (columns 2 and 3). Even though these have been shown to be important determinants of premiums and type of ESHI plans offered, they are not systematically correlated with both health risk and ESHI take-up. This is an encouraging finding because it indicates that even if we are omitting some unobserved variables that determine the quality of ESHI plans offered, such omission is not likely to generate a large bias in β^{ESHI} (Altonji et al., 2005).

Wages are added separately since they not only proxy for the quality of ESHI plans offered to different employees, but they also control for differences in ESHI demand due to income. Since wages are negatively correlated with health risk, the variation in wages leads to both supply-driven and demand-driven correlation between ESHI take-up and risk. Both push this correlation in the negative direction. It is therefore not surprising that when we include wages, the estimated β^{ESHI} increases significantly (decreases in absolute value) as seen in column 4.

As discussed in Section 6, we cannot know for sure how much of the change in β^{ESHI} when adding wages is attributable to supply vs demand factors, but a negative bias in β^{ESHI} arising from the supply side is most likely to be present due to very low wage workers facing higher OOP premiums and lower ESHI benefits. Otherwise, the change in β^{ESHI} is most likely attributable to the income elasticity of insurance demand. Wages are also highly correlated with ability and education, which have been shown to be advantageous characteristics in other markets (Fang et al., 2008; Buchmueller et al., 2013). Therefore, the specification that includes wages likely underestimates the actual degree of advantageous selection in the ESHI market. However, the fact that the ESHI coefficients remain negative and significant even after controlling for all variables in X_i^S including wages provides strong evidence of *ex ante* advantageous selection among young employees. Given the extensive list of individual, job and firm characteristics used as proxies, it is highly unlikely that the observed negative coefficients in column 4 for young age groups are due to other missing characteristics that are systematically related to the quality of ESHI plans offered and employees' health.[21]

[21] Controlling for 12 occupation groups in addition to industries has no effect on the ESHI coefficients once hourly wages are also included (Online Appendix B).

Table 4
OLS regression results of general health on ESHI status and other controls, MEPS.

Age group	1	2	3	4	5	6	7	8	9
25–30	−0.287***	−0.259***	−0.247***	−0.197***	−0.200***	−0.127***	−0.118***	−0.103**	−0.089**
	(0.040)	(0.043)	(0.043)	(0.043)	(0.044)	(0.044)	(0.044)	(0.044)	(0.046)
31–40	−0.257***	−0.265***	−0.260***	−0.152***	−0.144***	−0.093**	−0.086**	−0.071*	−0.085*
	(0.037)	(0.041)	(0.041)	(0.041)	(0.042)	(0.042)	(0.042)	(0.043)	(0.044)
41–50	−0.095**	−0.074*	−0.062	0.012	0.023	0.056	0.069	0.097**	0.093**
	(0.041)	(0.045)	(0.045)	(0.046)	(0.046)	(0.045)	(0.045)	(0.045)	(0.046)
51–64	−0.164***	−0.165**	−0.156**	−0.069	−0.071	−0.045	−0.023	−0.018	−0.009
	(0.057)	(0.064)	(0.065)	(0.064)	(0.064)	(0.064)	(0.063)	(0.064)	(0.067)
25–64	−0.150***	−0.153***	−0.144***	−0.073***	−0.103***	−0.047**	−0.046*	−0.027	−0.032
	(0.021)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FT or PT, temporary	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hourly wages	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Job tenure	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	No	No	Yes	Yes	Yes	Yes
Demographics	No	No	No	No	No	No	Yes	Yes	Yes
Family income	No	No	No	No	No	No	No	Yes	Yes
Risk attitudes	No	No	No	No	No	No	No	No	Yes

Standard errors in parentheses are robust to heteroscedasticity. Notes: The dependent variable in each regression is general health, where higher values of this variable indicate worse health. The regressions are run separately by the age groups indicated on the left hand side. The reported coefficients are those on the ESHI variable (equal to 1 for those who have ESHI from their employer and 0 for those who declined ESHI and remained privately uninsured) from different specifications with different controls as listed at the bottom of the table. Details on the control variables included are provided in Online Appendix B.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

7.1.2. Job tenure

Adding years of job tenure to the model has little effect on the estimated β^{ESHI} (column 5).[22] However, I find that those who decline ESHI in Round 1 and remain privately uninsured are more likely to be non-employed in Round 5. They are also more likely to have changed jobs by Round 5 (Table 5).[23] This suggests that those who anticipate job changes or non-employment spells in the future could be less likely to take up ESHI. These results are consistent with Fang and Gavazza (2011) who show that shorter job tenures are linked with lower health investments by the employee–employer pair since they do not accrue the full benefits of these investments.

7.1.3. Education and household income

The ESHI coefficients decrease significantly in absolute value when education is added to the model (column 6). Education is positively correlated with ESHI take-up and with good health and is a significant source of advantageous selection at young ages.

In column 7, I also control for other demographics (i.e., sex, race, family size, and marital status). While the coefficients decline slightly further in absolute value, they remain statistically significant among those aged 25–40. This result is important because in principle, personal characteristics such as job tenure, education, sex, and race may be linked to firm wide characteristics such as average turnover, level of productivity, education, and the sex and race composition of all employees, especially in small firms. Therefore, these individual level characteristics could be systematically related to differences in types of plans offered. The fact that the estimated β^{ESHI} remains negative and significant when controlling for these further adds to the strength of the results.

The specification in column 8 adds family income deciles.[24] Negative and significant coefficients persist at young ages, but interestingly, the ESHI coefficient in the 41–50 age group becomes positive and statistically significant. For this age group, the negative correlation between ESHI take up and risk is entirely explained by differences in ESHI plans supplied, education, demographics and income. This heterogeneity could generate a steep UCI curve intersecting the EBI from above as illustrated in Fig. 1B. Once we control for these characteristics, we recover the classic case of adverse selection where the UCI intersects the EBI from below (Fig. 1A).

[22] The effect of tenure could be small at young ages because those with shorter job tenures have on average more years of education due to a later entry into the labor force.

[23] This result is found after controlling for job and firm characteristics in Round 1, job tenure, education, demographics, family income in the first year, and health status in both rounds (see Table 5).

[24] A possible concern is that in principle, employers are allowed to offer "cash in lieu" (CIL) benefits to employees who decline health coverage, in which case family income depends on ESHI take-up. However, in practice, this is unlikely to affect the results. First, CIL benefits are usually offered to workers who can prove they have other private insurance, and I already exclude those who reject ESHI but have other PHI. Second, the CIL payments are relatively small and unlikely to impact the family income decile groups. Third, there are strict compliance rules associated with CIL so many firms do not offer them.

Table 5
Logit regression results of employment transitions and job change from Round 1 to Round 5, ages 25–40, MEPS.

	1	2	3	4	5	6
1. Transition to non-employment						
ESHI (R1)	−0.968***	−0.669***	−0.624***	−0.613***	−0.521***	−0.370**
	(0.145)	(0.161)	(0.162)	(0.163)	(0.162)	(0.175)
2. Job change						
ESHI (R1)	−0.839***	−0.475***	−0.458***	−0.459***	−0.295***	−0.259***
	(0.080)	(0.087)	(0.088)	(0.088)	(0.089)	(0.093)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	Yes	Yes	Yes	Yes	Yes
FT or PT, temporary	No	Yes	Yes	Yes	Yes	Yes
Hourly wages	No	Yes	Yes	Yes	Yes	Yes
Health and age (R1)	No	No	Yes	Yes	Yes	Yes
Health (R5)	No	No	No	Yes	Yes	Yes
Job tenure	No	No	No	No	Yes	Yes
Education	No	No	No	No	No	Yes
Other demog. + fam. inc.	No	No	No	No	No	Yes

Standard errors in parentheses. Notes: The first row presents estimates from a logit regression of transition to non-employment. The dependent variable is a dummy equal to 1 if the respondent is not employed in Round 5 and equal to 0 otherwise. Observations: 12,296 for all specifications. The second row presents estimates from a logit regression of job change, keeping only individuals employed in both Rounds 1 and 5. The dependent variable is a dummy equal to 1 if the respondent has a different job in Round 5 than in Round 1, and equal to 0 otherwise. Observations: 11,908 for all specifications. In both rows, the reported coefficients are those on the ESHI indicator variable (measured in Round 1) from different specifications. Family income is measured in the first interview year (which includes Round 1, but not Round 5).

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

7.1.4. Preferences

Finally, I add risk attitudes to the model (column 9). The effects on the ESHI coefficients are small and differ in direction across age groups, indicating that these self-reported general risk preferences are not very important in explaining ESHI selection. Since the NLSY97 data contains much richer information on risk preferences, I examine this issue in more detail when discussing the NLSY97 results.

The MEPS does not contain information on the rate of time preference. However, education and income likely already capture such variation since better educated and higher income individuals live longer, have a higher effective β, and invest more in health (e.g., Murphy and Topel, 2006; Hall and Jones, 2007; Ozkan, 2014).

7.1.5. Sensitivity analysis

In Online Appendix B, I conduct sensitivity tests using separate measures of health: self-reported health, the number of chronic conditions, obesity and mental health. I find that controlling for the set X_i^S, poor self-reported health and poor mental health are both negatively correlated with ESHI take-up at ages 25–40.[25] In the case of self-reported health, this is also the case in the 51–64 age group. There is no significant association between the number of chronic conditions and ESHI take up among employees 25–40 year old, but I do find that among those 41-64 year old, those who take up ESHI have *more* chronic conditions, consistent with adverse selection. The probability of being obese is negatively correlated with ESHI take-up, but this association is not statistically significant once we control for X_i^S.

I also re-estimate Eq. (5) dividing the MEPS sub-sample as follows: (1) separating those with job tenures shorter and longer than 3 years; (2) separating individuals with low family incomes under $30,000; (3) separating workers with wages lower than $10/hour; (4) separating workers in small and large firms; and (5) separating full time workers. All results are presented in Online Appendix B, and are in general qualitatively the same.

The most notable result is that advantageous selection is especially strong in the low wage and low income sub-samples at ages 25–40 (section 5.11 in Online Appendix B). The estimated β^{ESHI} coefficients in these sub-samples also decrease very little in absolute value with the inclusion of additional controls. On the other hand, in the medium to high income groups, we observe advantageous selection only at ages 25–30, and no significant relationship between ESHI take-up and risk at older ages (after we control for X_i^S). These findings are consistent with the scenario illustrated in Fig. 1D where advantageous selection only occurs among the least healthy (low SES) groups due to Medicaid crowding out. Higher SES groups not affected by Medicaid are unlikely to display advantageous selection after controlling for the relevant variables.

Finally, a possible concern regarding causality is that workers with ESHI could be in better health as a result of better access to medical care associated with insurance. But insurance contracts have a duration of only one year, and in the analysis, health is measured in approximately the same time period as ESHI availability and take-up. Therefore, the negative ESHI coefficients reflect a selection effect rather than reverse causality, as workers can change their ESHI take-up decisions every year. Moreover, evidence of advantageous selection is found even in the sub-sample of workers with job tenures shorter than 3

[25] Bolhaar et al. (2012) also find that poor mental health is negatively correlated with supplementary PHI take-up in Ireland.

Table 6
OLS regression results of general health on ESHI status and other controls, NLSY97.

	1	2	3	4	5	6	7	8	9	10	11
ESHI indicator	−0.321***	−0.316***	−0.291***	−0.203***	−0.212***	−0.136**	−0.108	−0.094	−0.202***	−0.217***	−0.236***
	(0.062)	(0.063)	(0.066)	(0.068)	(0.069)	(0.068)	(0.070)	(0.067)	(0.069)	(0.069)	(0.071)
Firm characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hourly wages	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job tenure	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	No	No	Yes	Yes	Yes	No	No	No
Demog and fam inc	No	No	No	No	No	No	Yes	No	No	No	No
Additional Controls	No	No	No	No	No	No	No	Yes	No	No	No
Health risk taking	No	No	No	No	No	No	No	No	Yes	No	No
Financial risk taking	No	No	No	No	No	No	No	No	No	Yes	No
Income gambles	No	No	No	No	No	No	No	No	No	No	Yes
Observations	2703	2703	2703	2703	2703	2703	2703	2703	2695	2697	2636

Standard errors in parentheses are robust to heteroscedasticity. Notes: The dependent variable in each regression is general health, where higher values of this variable indicate worse health. The reported coefficients are those on the ESHI indicator from different specifications with different controls as listed at the bottom of the table. Details on the control variables included are provided in Online Appendix B.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

years where any causal effect of insurance on health is less likely.[26]

7.2. Evidence of selection in ESHI and sources of selection, NLSY97

Table 6 reports the results from similar regression models using the NLSY97. The results are qualitatively very similar to those found using the MEPS data in the 25–30 age group.[27] The ESHI coefficient is negative and statistically significant when controlling for X_i^S and remains so when adding job tenure (in weeks) and education.

The NLSY97 also contains a richer set of personal and family background characteristics that could affect preferences and attitudes towards insurance. I find that the inclusion of the following variables to the model lowers the ESHI coefficient in absolute value by a small amount: cognitive ability in 1999 (i.e., ASVAB math/verbal scores), personality traits reported in 2002 (i.e., organized, thorough and conscientious traits), mother's and father's education, family income decile in 1997, the father's parenting style reported in 1997, and views towards discipline reported in 1997.

7.3. Risk preferences and selection in health insurance

Risk preferences have been found to be important sources of advantageous selection in other markets, including the U.S. long term care market and the Australian supplementary health insurance market (Cutler et al., 2008; Buchmueller et al., 2013). But empirical evidence has been limited by the sparse information on risk preferences available, as the only direct measure available in most surveys is from hypothetical lifetime income gamble questions, which capture most closely the concept of financial risk aversion. Most studies in the selection literature take an indirect approach and proxy for risk tolerance using observed behaviors such as smoking, drinking, exercise, and preventive health care, which reflect most closely health risk aversion (e.g., Cutler et al., 2008; Doiron et al., 2008; Buchmueller et al., 2013). However, their use as proxies is potentially problematic since these directly affect health and medical expenditures.

In theory, risk preferences are unambiguously advantageous characteristics only if there exists a single risk taking trait that governs both health behavior and insurance decisions. But health behavior might be determined mainly by preferences for health risk, while insurance decisions might be determined mainly by preferences for financial risk, and the existing literature is inconclusive on whether these preferences are highly context specific.[28]

A priori, a lower willingness to take health risk (WHR) is expected to lead to better health, but its relationship with insurance demand depends on the institutional environment. If health insurance provides insurance mainly against the financial risk associated with bad health, then conditional on financial risk attitudes, a lower WHR should be associated with *lower* insurance demand because people who take health precautions are less likely to need medical care. But if health insurance provides access to medical ser-

[26] I also estimate probit models of ESHI take-up on general health, adding the same set of controls. The results are consistent across these different specifications (see Online Appendix B).

[27] The coefficients are not directly comparable with those in Table 4 because the health variable in MEPS is standardized in a sample of individuals aged 25–65, while in the NLSY97 it is standardized in a sample of individuals aged 26–30. Health has a smaller s.d. among those aged 25–30 in the MEPS than in the NLSY97, explaining why the estimated coefficients are smaller (in absolute value).

[28] Dohmen et al. (2011) find evidence supporting a common underlying risk taking trait, but literature from psychology and behavioral economics generally find that risk preferences are highly domain specific (e.g., Weber et al., 2002). Online Appendix A provides an in depth analysis of risk preferences in different contexts, discussing related literature (e.g., Dohmen et al., 2011; Einav et al., 2012).

vices that cannot be purchased by paying out of pocket, or if a well-functioning social safety net does not exist, then health insurance would also be valued for its role in keeping and restoring good health (i.e., as an input into one's health production function). This description likely applies to ESHI in the pre-ACA environment since uninsured individuals risked being refused costly treatments in hospitals, and the Medicaid system was unlikely to cover certain groups such as single men (The Kaiser Family Foundation, 2015). In this case, a lower WHR could lead to *higher* insurance demand.

On the other hand, a lower willingness to take financial risk (WFR) should be associated with a higher demand for insurance, but its relationship with health is uncertain. A lower WFR could lead to more health precautions since illness can have serious financial consequences even when insured (e.g., lower productivity and possible job loss). But good health could also lead to higher WFR since financial losses are more easily recovered when healthy and productive and since medical expenditure risk is smaller.[29]

7.3.1. Evidence: risk preferences and selection in ESHI

The NLSY97 data allows me to study explicitly how health and financial risk preferences relate to health behavior and insurance demand. First, I note that the rank correlation coefficients between all risk preferences considered (health, financial, and those derived from income gambles) are positive and significant (see Online Appendix A for a detailed analysis). However, the correlation coefficients between the WHR and WFR are 0.34 for men and 0.32 for women, and the coefficients between the WHR and the lifetime income gamble categories are only 0.18 for men and 0.08 for women, indicating that there is a relatively high degree of context specificity in these risk preferences.

The last three columns in Table 6 present the coefficients on the ESHI indicator from regressions of general health that control for firm and job characteristics plus each of the following risk taking variables separately: the WHR, the WFR, and risk categories derived from the standard hypothetical income gambles. The ESHI coefficient decreases in absolute value relative to column 5 only when the WHR is added, and only by a small amount. On the other hand, the inclusion of the WFR and the lifetime income gamble risk preferences lead to slightly lower (more negative) coefficients, although the differences are not statistically significant.[30]

In Online Appendix A, I show that a higher WHR is associated with worse health, riskier behaviors, and worse health transitions. It is also associated with a lower probability of taking up ESHI. Therefore, the WHR is an advantageous characteristic. On the other hand, a higher WFR is associated with **better** health, better diet and more exercise, and better health transitions. No statistically significant relationship exists between the WFR and ESHI take-up, so the WFR does not contribute to selection in ESHI. Risk preferences derived from income gamble questions also play no role as they have no significant relationships with health nor ESHI take-up when including the usual set of controls.

These results suggest that ESHI is valued as a health investment rather than as insurance against the financial risks of bad health. In older populations, Barsky et al. (1997) and Fang et al. (2008) find that individuals who are less likely to take risks in hypothetical lifetime income gambles are more likely to have insurance. This is not observed at younger ages likely because the financial risk of health shocks is much smaller.

Table 7
Logit regression results of becoming Medicaid recipient in Round 5, ages 25–40, MEPS.

	1	2	3	4
ESHI (R1) – all	−1.590***	−1.444***	−0.990***	−0.677***
	(0.175)	(0.187)	(0.221)	(0.225)
ESHI (R1) – men	−1.855***	−1.693***	−1.690***	−1.132**
	(0.319)	(0.335)	(0.467)	(0.506)
ESHI (R1) – women	−1.551***	−1.405***	−0.900***	−0.373
	(0.212)	(0.229)	(0.252)	(0.276)
Year dummies	Yes	Yes	Yes	Yes
Health (R1 and R5) and age	No	Yes	Yes	Yes
Firm characteristics	No	No	Yes	Yes
FT or PT, temporary	No	No	Yes	Yes
Hourly wages	No	No	Yes	Yes
Job tenure	No	No	No	Yes
Education	No	No	No	Yes
Demog. and fam. income	No	No	No	Yes
Risk attitudes	No	No	No	Yes

Standard errors in parentheses. Notes: The dependent variable is a dummy variable equal to 1 if the respondent has Medicaid in Round 5 and equal to 0 otherwise. The reported coefficients are those on the ESHI indicator variable (measured in Round 1) from different specifications. All those who received Medicaid in Round 1 are excluded from the sub-sample on which this analysis is conducted. The family income is from the first interview year (which includes Round 1, but not Round 5). The three rows present results from separate regressions, including both genders, men only, and women only.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

7.4. Medicaid crowd out

Medicaid has been shown to crowd out private insurance, especially among women (Cutler and Gruber, 1996). Those who qualify for Medicaid have little or no incentives to take up ESHI, while at the same time being higher risk due to low SES status. In the MEPS, 24.6% of women and 5.9% of men aged 25–40 who decline ESHI and remain privately uninsured have Medicaid in Round 1, while in the NLSY97, 26.9% of women and 9.1% of these have Medicaid, respectively.

I re-do the entire analysis excluding all those who have Medicaid when they decline the available ESHI. The results

[29] Using the Health and Retirement Study, Rosen and Wu (2004) find that respondents in good health are more likely to hold risky financial assets. However, they do not find that health is related to risk attitudes as measured by the lifetime income gamble questions. Using German data, Dohmen et al. (2011) find no statistically significant relationship between the WFR and subjective health status.

[30] Qualitatively, the results are the same when the regressions also include the full set of controls, but the ESHI coefficients are not statistically significant.

Table 8
Relationship between health behaviors and ESHI take up, 25–40 age group, MEPS.

Behavior	1	2	3	4	5	6	7	8
Smoking	−0.706***	−0.604***	−0.628***	−0.399***	−0.386***	−0.192**	−0.305***	−0.293***
	(0.077)	(0.085)	(0.086)	(0.087)	(0.088)	(0.089)	(0.093)	(0.094)
Exercise	−0.198***	−0.120	−0.127*	−0.078	−0.093	−0.028	−0.014	−0.035
	(0.068)	(0.074)	(0.075)	(0.076)	(0.077)	(0.078)	(0.080)	(0.083)
Seat belt use	−0.120***	−0.0762*	−0.0825**	−0.0267	−0.0310	0.0103	−0.0216	−0.0236
	(0.0418)	(0.0396)	(0.0403)	(0.0411)	(0.0412)	(0.0413)	(0.0418)	(0.0434)
Preventive care	−0.434***	−0.317***	−0.318***	−0.288***	−0.285***	−0.246***	−0.237***	−0.236***
	(0.0327)	(0.0352)	(0.0354)	(0.0358)	(0.0360)	(0.0366)	(0.0365)	(0.0373)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FT or PT, temporary	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Hourly wages	No	No	No	Yes	Yes	Yes	Yes	Yes
Job tenure	No	No	No	No	Yes	Yes	Yes	Yes
Education	No	No	No	No	No	Yes	Yes	Yes
Demog. + fam. income	No	No	No	No	No	No	Yes	Yes
Risk attitudes	No	No	No	No	No	No	No	Yes

Standard errors in parentheses. Notes: The dependent variables are the health behaviors listed on the left hand side, where higher values indicate more detrimental health behaviors. For smoking and exercise, I estimate logit models of these behaviors on an ESHI indicator and additional controls. For seat belt and preventive care, I estimate OLS models. The reported coefficients are those on the ESHI indicator from different specifications with different controls as listed at the bottom of the table.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

are reported in Online Appendix B. Using both data sets, I still find evidence of *ex ante* advantageous selection among employees 25–40 year old. However, the estimated coefficients β^{ESHI} are approximately 23% smaller in absolute value, indicating that Medicaid contributes significantly to the observed selection.

Employees might decline ESHI not only because they have Medicaid at the time the decision is made, but because they anticipate qualifying for it in the future if health deteriorates. Using the MEPS, I study whether individuals aged 25–40 who declined ESHI and remained both privately and publicly uninsured in Round 1 are more likely to have Medicaid insurance in Round 5 than those who took up ESHI. Excluding all those with public insurance in Round 1, I estimate a logit model of an indicator equal to one if the individual has Medicaid insurance in Round 5 on the ESHI indicator (from Round 1) and various controls (Table 7). I also do this separately for men and women since women are more likely than men to qualify for Medicaid due to pregnancy.[31]

Clearly, since those who decline ESHI are less healthy in Round 1, and since a lack of insurance can further deteriorate their health by Round 5, they are more likely to qualify for Medicaid in Round 5. But I find that even controlling for health in both Rounds 1 and 5 and for the exact age in addition to firm and job characteristics, those who decline ESHI in Round 1 are significantly more likely to become Medicaid recipients in Round 5 (column 3).[32] This relationship is much stronger for men than for women.

[31] Women in this sub-sample are 3.2 times more likely than men to receive Medicaid in Round 5.

[32] In this restricted sub-sample, 26% of those who had Medicaid in Round 5 were not employed in this round. This is consistent with Pashchenko and Porapakkarm (2016) who find that 23% of Medicaid recipients did not work in order to be eligible.

7.5. Risky health behaviors

In this section, I explore the relationship between ESHI take-up and risky health behaviors: smoking, drinking, diet, exercise, sleep, seat belt use, and preventive care. *Ex ante* moral hazard predicts that workers who enroll in ESHI take fewer health precautions. On the other hand, *ex post* moral hazard increases medical care utilization of the insured since prices are lower, predicting a positive association between ESHI take-up and preventive care.

Using the same sub-samples of ESHI eligible workers, I estimate OLS or probit models of these behaviors on an ESHI indicator variable, gradually adding the same controls to the model as in Section 4 .[33] Higher values indicate more risky behaviors. In the MEPS, I restrict the analysis to those aged 25–40. Tables 8 and 9 present the results.

Controlling for X_i^S, I find that those who take up ESHI have significantly less risky behaviors in terms of smoking, diet, sleep and preventive care compared to decliners. No statistically significant associations are found for exercise, seat belt use, or drinking. These results indicate that those who enroll in ESHI are expected to *remain* lower risk. This evidence is also consistent with previous literature that finds that *ex ante* moral hazard in the health insurance context is not very important (e.g., Newhouse and Group, 1993; Courbage and De Coulon, 2004). On the other hand, the positive correlation between ESHI take-up and preventive care is consistent with both *ex ante* advantageous selection and *ex post* moral hazard.

[33] Smoking and lack of exercise are binary variables in the MEPS. All other behavior variables are standardized and are treated as continuous.

Table 9
Relationship between health behaviors and ESHI take up, NLSY97.

	1	2	3	4	5	6	7	8	9	10
Smoking	−0.402***	−0.331***	−0.269***	−0.255***	−0.092	−0.124*	−0.124*	−0.116	−0.128*	−0.106
	(0.067)	(0.070)	(0.071)	(0.071)	(0.074)	(0.074)	(0.073)	(0.073)	(0.073)	(0.075)
Drinking	0.009	0.037	0.017	0.023	−0.015	−0.066	−0.069	−0.055	−0.065	−0.051
	(0.066)	(0.071)	(0.072)	(0.073)	(0.073)	(0.071)	(0.071)	(0.071)	(0.072)	(0.073)
Poor diet	−0.331***	−0.335***	−0.273***	−0.291***	−0.153**	−0.115*	−0.112*	−0.105	−0.111*	−0.118*
	(0.058)	(0.064)	(0.066)	(0.066)	(0.064)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)
Exercise	−0.144**	−0.099	−0.076	−0.096	−0.032	−0.002	−0.002	0.005	0.001	−0.007
	(0.064)	(0.069)	(0.070)	(0.070)	(0.071)	(0.072)	(0.072)	(0.072)	(0.072)	(0.073)
Sleep	−0.191***	−0.205***	−0.170***	−0.165**	−0.112*	−0.071	−0.074	−0.075	−0.083	−0.090
	(0.060)	(0.064)	(0.064)	(0.065)	(0.068)	(0.067)	(0.067)	(0.067)	(0.067)	(0.069)
Preventive care	−0.575***	−0.534***	−0.506***	−0.485***	−0.431***	−0.421***	−0.406***	−0.406***	−0.404***	−0.400***
	(0.062)	(0.064)	(0.066)	(0.067)	(0.069)	(0.068)	(0.069)	(0.069)	(0.069)	(0.071)
Firm + job character.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hourly wages	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job tenure	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Demog and Fam. inc.	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Health risk taking	No	No	No	No	No	No	No	Yes	No	No
Financial risk taking	No	No	No	No	No	No	No	No	Yes	No
Income gambles	No	No	No	No	No	No	No	No	No	Yes

Standard errors in parentheses. Notes: The dependent variables are the behaviors listed in the first column. For all health behaviors, higher values indicate more detrimental behaviors. The reported coefficients are those on the ESHI indicator from different specifications with different controls as listed at the bottom of the table.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

7.6. Total medical expenditures

I use the MEPS to study the relationship between ESHI take-up and the *ex post* realization of loss (total medical expenditures). Using the sub-sample of ESHI eligible individuals, I estimate an OLS model of total annual medical expenditures (in year 1 of interview) on the ESHI indicator (constructed for Round 1), adding the same set of control variables as in previous analysis. Controlling for X_i^S, I find that those who enroll in ESHI have substantially higher total medical expenditures in the age groups older than 30 than those who decline ESHI and remain privately uninsured (Table 10, column 2). Expenditures are $974 higher in the 31–40 age group, despite the fact that those who take up ESHI are healthier and have less risky behaviors.[34] Controlling for health status, the relative expenditures of those who take up ESHI increase (to $1208) in the 31–40 age group (column 3). Differences in medical expenditures remain statistically significant when controlling for job tenure, demographics, family income and risk preferences, although the size of the coefficient declines.

Several forces affect the correlation between ESHI and medical expenditures in different directions. *Ex ante* advantageous selection in ESHI among young age groups predicts that those who take up ESHI should have lower medical expenditures since they are healthier and have less risky health behaviors. However, *ex post* moral hazard acts in the opposite direction since those who take up ESHI face lower prices and demand more care. There could also be selection on moral hazard, meaning that individuals whose health care utilization increases more sharply in response to insurance coverage are more likely to take up the insurance offer (Einav et al., 2013).[35]

Another possible mechanism is that workers who value health more highly are more likely to take up ESHI and also have a higher demand for preventive care given everything else equal. At young ages, preventive care accounts for a large share of medical expenditures.[36] Viewed in this way, medical expenditures are a form of health investment rather than a realization of loss.

The findings on risky health behaviors and medical expenditures persist in the restricted sub-samples where Medicaid recipients are excluded, and differences are in general larger. Interestingly, ESHI decliners covered by Medicaid have very similar preventive care and medical expenditures as those who take up ESHI (Online Appendix B).

7.7. Analysis of the ESHI Allocation After the Affordable Care Act (ACA)

I use data from the MEPS for years 2014–2016 to study the post-ACA period. An interesting question is whether

[34] The significant coefficients in the 31–40 age range arise due to differences in the extensive margin of medical utilization and are driven by women (see Online Appendix B).

[35] Systematic differences in access to care and/or the types of treatments received could also contribute to differences in medical expenditures across groups.

[36] Fang and Gavazza (2011) and Ozkan (2014) are examples of dynamic models where those who value health more have higher medical expenditures when young due to higher demand for preventive care.

Table 10
OLS regression results of total medical expenditures on ESHI status, MEPS.

Age group	1	2	3	4	5
25–30	813.4***	651.6*	845.1**	463.1	583.4*
	(274.8)	(339.8)	(340.0)	(351.8)	(347.7)
31–40	1201.6***	973.9***	1208.1***	842.2***	982.8***
	(224.1)	(263.5)	(264.5)	(290.4)	(288.3)
41–50	1358.3***	1524.9***	1438.6***	1323.4***	1125.8***
	(311.1)	(382.9)	(376.3)	(431.9)	(418.4)
51–64	3081.1***	2835.9***	2757.8***	2782.5***	2625.1***
	(370.7)	(443.6)	(457.1)	(499.2)	(514.0)
25–64	1792.0***	1544.8***	1465.5***	1193.5***	1192.6***
	(145.1)	(176.9)	(175.1)	(192.1)	(190.1)
Year dummies	Yes	Yes	Yes	Yes	Yes
Firm and job characteristics	No	Yes	Yes	Yes	Yes
Health and age	No	No	Yes	No	Yes
Tenure, educ., inc., demog., risk att.	No	No	No	Yes	Yes

Standard errors in parentheses are robust to heteroscedasticity. Notes: The dependent variable is total annual medical expenditures in 2010 U.S. dollars. The reported coefficients are those on the ESHI indicator variable from different specifications. The regressions are run separately by the age groups indicated on the left hand side. Note that medical expenditures are measured at the annual level while most other variables, including insurance status, are measured at the interview round level (Round 1).

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 11
Descriptive statistics, selected groups of workers, MEPS 2014–2016.

Statistics	1	2	3	4	5	6	7
ESHI offered	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ESHI take-up	Yes	No	No	No	No	No	No
Other group PHI	–	Yes	No	No	No	No	No
PHI from exchange	–	No	Yes	No	No	No	No
Other PHI (non-group)	–	No	No	Yes	No	No	No
Public insurance	–	No	No	No	Yes&No	Yes	No
Observations	8882	1056	86	26	965	273	692
% ESHI decliners (2014–2016)	–	49.51	4.03	1.22	45.22	12.80	32.44
% ESHI decliners (2008–2010)	–	52.42	–	1.35	46.23	7.19	39.04
Male	0.539	0.418	0.367	0.445	0.507	0.253	0.582
Age	43.564	43.985	40.532	37.668	39.349	37.837	39.801
Married	0.598	0.937	0.390	0.505	0.422	0.309	0.456
Less than high school	0.048	0.040	0.050	0.053	0.199	0.145	0.219
High school	0.258	0.217	0.282	0.380	0.362	0.502	0.312
Some college	0.233	0.295	0.229	0.399	0.267	0.248	0.274
College	0.462	0.449	0.438	0.168	0.171	0.104	0.195
Gross personal income/yr	58,503	55,585	30,761	47,131	31,013	21,194	33,945
Gross family income/yr	89,363	121,739	43,999	69,837	50,409	30,075	56,482
Total medical exp/yr	3775	4652	2269	921	2200	3226	1894
General health	−0.147	−0.241	0.030	−0.365	0.041	0.265	−0.026
Smoking	0.135	0.093	0.293	0.190	0.294	0.338	0.280
Exercise	0.463	0.474	0.618	0.613	0.421	0.458	0.410
Seat belt	−0.151	−0.163	0.057	0.014	−0.010	0.033	−0.023
Preventive care	−0.329	−0.384	−0.144	−0.100	0.041	−0.326	0.157
Risk taking							
Group 1 (least risk taking)	0.405	0.458	0.382	0.320	0.350	0.401	0.333
Group 2	0.267	0.251	0.273	0.414	0.233	0.260	0.225
Group 3	0.144	0.147	0.176	0.015	0.177	0.180	0.176
Group 4	0.149	0.122	0.146	0.250	0.185	0.099	0.213
Group 5 (most risk taking)	0.035	0.021	0.023	0.000	0.055	0.060	0.053

Notes: For general health and the four health behaviors, higher numbers indicate worse health and more detrimental behaviors. The statistics are calculated using only employees between 25 and 64, with a valid industry and occupation, not in the armed forces, and not self-employed, using MEPS data from 2014 to 2016. Sampling weights are used. Some variables have slightly lower observations due to missing values. Note that the fraction of ESHI eligible workers who accept the offer is 0.93 both before and after the ACA.

the establishment of insurance exchanges or the Medicaid expansion had effects on the ESHI allocation. Table 11 shows summary statistics for those who accept ESHI and for those who reject it and have (i) other group PHI not from the Exchanges, (ii) PHI bought on the Exchanges, (iii) other non-group PHI, (iv) public insurance (Medicaid), and (v) uninsured.

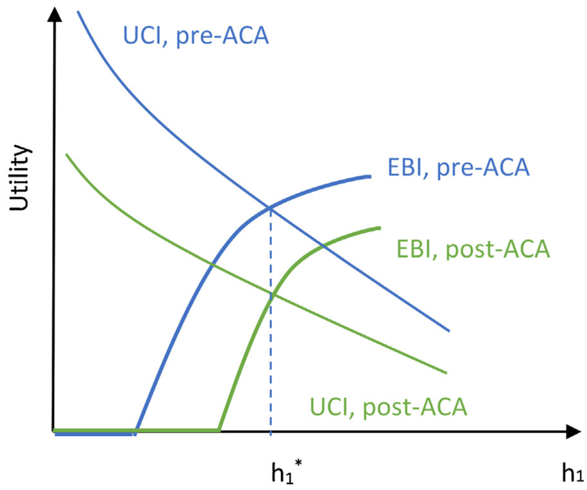

Fig. 2. Scenario Consistent with the Effects of the Affordable Care Act (ACA). Notes: The figure shows the expected benefit of insurance (EBI) and utility cost of insurance (UCI) as functions of health, before and after the ACA. It depicts a possible scenario that is consistent with the observed effects of the ACA where the average risk of those who decline employer sponsored health insurance and remain uninsured remains constant. The UCI shifts down due to tax penalties imposed on individuals who do not buy insurance. The EBI shifts to the right due to Medicaid expansion. The EBI is shown only for low health levels to illustrate the incentives for the relatively high risk individuals.

The fraction of ESHI eligible workers who accept the offer is 0.93 after the ACA, identical to the pre-ACA period 2008–2010. However, the distribution of ESHI decliners changed significantly compared to the pre-ACA period (Table 11).[37] The fraction of decliners who remain completely uninsured decreased from 39% to 32%, while the fraction of those with Medicaid increased from 7% to 13%. These changes roughly offset each other, so the fraction of ESHI decliners without PHI was only reduced by 1 percentage point to 45.2%. Only 4% of decliners bought insurance on the Exchanges.[38] These individuals are more likely to be single and have low incomes compared to those who take up ESHI. They also have significantly higher levels of health risk in all dimensions. Comparing those who buy insurance on the Exchanges with those who remain privately uninsured, we notice that they are remarkably similar, the only exception being that those who remain uninsured have much lower education levels. With respect to other groups, the patterns remain consistent with those found in the pre-ACA period (Table 2).

The average health risk of those who decline ESHI and remain privately uninsured increases only slightly (from −0.009 to 0.042) compared to the pre-ACA period 2008–2010 and the average risk of those insured decreases very slightly (from −0.121 to −0.138). Using the theoretical model, a possible scenario consistent with the observed effects of the ACA is illustrated in Fig. 2. Medicaid expansion shifts the EBI to the right at low h_1 levels (high risk) as explained in the model Section 4.4. However, the UCI shifts down due to the tax penalties imposed on those who remain uninsured. Overall, the threshold level of h_1 where workers start buying ESHI remains approximately constant, leaving the fractions of insured and uninsured unchanged.

[37] I use data from years 2008 to 2010 as the pre-ACA period for this comparison. After the 2007–2008 recession, many employers reduced the scope of health benefits or increased cost sharing and many also increased the share of the premium the worker had to pay (The Kaiser Family Foundation and the Health Research and Educational Trust, 2010).

[38] Under the ACA, employees who decline ESHI coverage considered affordable and adequate do not qualify for government subsidies to purchase individual health insurance on the Exchanges. Only a small fraction of workers offered ESHI is eligible.

8. Conclusion

Using data from the MEPS and the NLSY97, this paper studies the extensive margin of selection in ESHI, evaluating whether insurance take-up is correlated with *ex ante* health risk and measures of *ex post* health spending. It shows that among eligible employees 25–40 years old, health risk is *negatively* correlated with ESHI take-up, while no correlation exists for age groups older than 40. *Ex post*, those who enroll in ESHI use more preventive care and have higher total medical expenditures. The results are consistent with a mix of advantageous selection among young employees and *ex post* moral hazard. In particular, I find that the *ex ante* advantageous selection among young employees is driven mainly by differences in income, education, and Medicaid crowd out of ESHI. Risk preferences play only a very small role.

The extensive margin of selection in ESHI is important when evaluating the effects of reforms such as the ACA. Changes in this margin can have redistributional effects since the premiums faced by different groups depend on the type of risk selection. The theoretical framework presented here and the results highlight that it is important to consider the interactions between various factors that affect the ESHI allocation, in particular the interplay between private and public insurance. In the case of the ACA, the expansion of Medicaid and the individual insurance mandate worked together in a way that left the extensive margin of selection in ESHI roughly unchanged. Despite the fact that ESHI availability was expanded, ESHI insurance pools did not absorb higher fractions of high risk workers. As in the pre-ACA period, many high risk workers opted to stay privately uninsured, but higher fractions are covered by Medicaid in the post-ACA period.

CRediT authorship contribution statement

Elena Capatina: Conceptualization, Methodology, Software, Validation, Formal analysis, Data curation, Writing - original draft, Visualization, Investigation, Writing - review & editing.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jhealeco.2020.102305.

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