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# The Affordable Care Act After a Decade: Its Impact on the Labor Market and the Macro Economy

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## Abstract

The Affordable Care Act (ACA) is one of the most important reforms of the US health insurance system since the introduction of Medicare. Because employment is a main source of health insurance for the working-age population in the USA, this sweeping health insurance reform has also had important implications for the labor market and the macro economy. In this article, we review the prototype models that are used in the macro and labor literature, extended to integrate health and health insurance, to study the short- and long-run consequences of the ACA. We also suggest open areas for future research.

## 1. INTRODUCTION

The Affordable Care Act (ACA), signed into law by President Barack Obama in March 2010, represents the most significant reform to the US health insurance and health care markets since the establishment of Medicare in 1965.<sup>1</sup> This health care reform was driven partly by the twin problems faced by the US health care system. First, a large fraction (more than 15.2% in 2009) of the US population did not have health insurance, while all the other OECD countries have national health insurance. Second, the USA spent a much larger share of national income on health care than the other OECD countries (health care accounted for approximately 18% of US GDP in 2009; for a comparison between the health care systems of the USA and the other OECD countries, see the OECD health data at [www.oecd.org/health/healthdata](http://www.oecd.org/health/healthdata)).

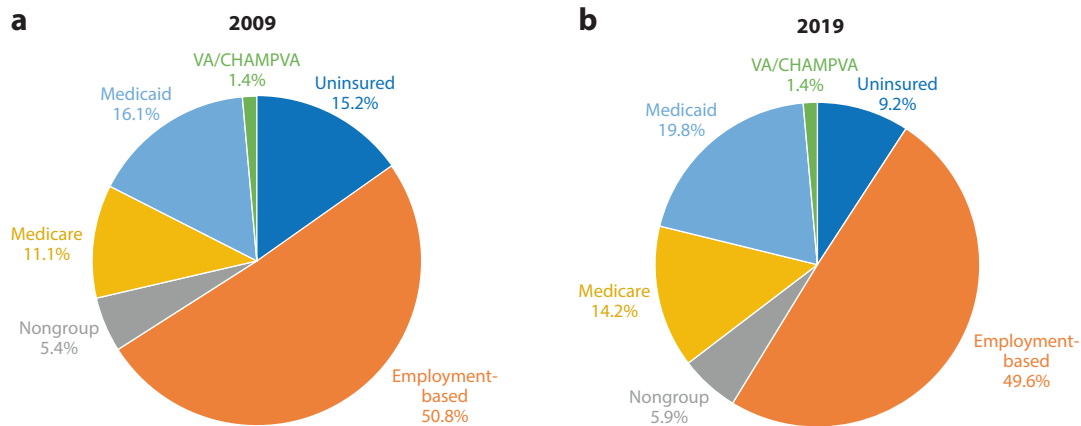
Even though the ACA adopted an incremental approach that maintained the existing combination of publicly provided health insurance through Medicare and Medicaid, private employer-sponsored (group) health insurance (ESHI), and private individual health insurance, it is nonetheless a sweeping reform of the US health insurance system. Among the many provisions, the most important components include the extension of young adults' coverage under their parents' ESHI to age 26, the individual mandate, the employer mandate, the establishment of community-rated health insurance exchanges, the Medicaid expansion, and the federally funded premium subsidies for eligible individuals who purchase their health insurance from the exchange (see Section 2 for more details).

The ACA is mainly a reform of the health insurance system. However, it has also had a large impact on the labor market, the macro economy, and public health, for several reasons. First, the health care sector accounts for approximately 18% of US GDP (CMS 2021); moreover, out-of-pocket health care cost shocks remain one of the most significant risks faced by American households (Fang 2016) and cause approximately 26% of personal bankruptcies among low-income households (Gross & Notowidigdo 2011). Thus, reforms to the health insurance system affect individual consumption, saving, and labor supply decisions, all of which are, once aggregated across all households, important for macroeconomic analysis. Second, as we discuss further in Section 4.1, there is a strong nexus between the health insurance market and the labor market in the USA. **Figure 1a** shows that in 2009 more than half of the US population had employment-based health insurance. In addition, as is well documented in the empirical literature, firm size, wages, health insurance offerings, and worker turnover are strongly correlated. For example, firms that do not offer health insurance are more likely to be small firms, to pay low wages, and to experience a higher rate of worker turnover. Furthermore, workers in firms that do offer health insurance are more likely to self-report better health than those in firms that do not (e.g., Brown & Medoff 1989, Aizawa & Fang 2020). Third, public insurance programs such as Medicare and Medicaid are key government expenditure programs, providing insurance to 11.1% and 16.1% of the US population, respectively, in 2009. Moreover, the tax exemption for the ESHI is the largest tax expenditure program of the US tax code.<sup>2</sup>

The main goal of the ACA is to address the first of the twin problems of the US health care system by increasing the rate of health insurance coverage. **Figure 1** compares the population health insurance status in 2009 and in 2019. It shows that the rate of uninsured dropped from 15.2% to 9.2%, which means that approximately 20–24 million more Americans were covered by health insurance in 2019 than in 2009. The sources of insurance expansion stems from the

<sup>1</sup>The ACA includes both the Patient Protection and Affordable Care Act and the amendment in the Health Care and Education Reconciliation Act of 2010.

<sup>2</sup>The US Treasury (2021) forecasts that in the decade from 2021 to 2030, tax expenditure on the exclusion of the ESHI premium will be more than US\$2.8 trillion.



**Figure 1**

Health insurance status of the population in (a) 2009 versus (b) 2019. Abbreviations: CHAMPVA, Civilian Health and Medical Program of the Department of Veterans Affairs; VA, Department of Veterans Affairs. Data from Kaiser Family Found. (2019).

increase in Medicaid (around 3.7 percentage points), and the increase in Medicare coverage (around 3.1 percentage points). The nongroup (i.e., individual) private health insurance rate increased by only 0.5 percentage points, while the employment-based insurance rate decreased by 1.2 percentage points.<sup>3</sup> Although **Figure 1** provides the overall distribution of health insurance status in the population, it does not reveal the possibly important changes in the enrollees in the nongroup individual market, nor does it inform us about the potential changes in the population covered by ESHI. Note also that the Medicaid expansion is an important part of the ACA as it was initially enacted (see Section 2). Even though the provision was later ruled unconstitutional by the Supreme Court, as of 2022, 39 states (including the District of Columbia) have expanded their Medicaid eligibility. **Figure 1** also shows that the fraction of the population covered by Medicare has increased by 3.1 percentage points, reflecting the impact of the Baby Boomer generation entering retirement in droves. Because the key components of the ACA involve income-contingent individual mandate penalties and premium subsidies as well as a size-dependent employer mandate penalty, studying these distributional impacts of the ACA necessarily requires models that incorporate individual and firm heterogeneity and allow for potential substitution among different health insurance options.<sup>4</sup>

<sup>3</sup>According to the Centers for Medicare and Medicaid Services, approximately 11.4 million consumers selected or were automatically reenrolled in an exchange plan during the 2019 open enrollment period in the 50 states plus the District of Columbia (CMS 2021).

<sup>4</sup>Some economists have made dire predictions about the potential impacts of the ACA on the labor market, as exemplified by Gallen & Mulligan (2018) and Mulligan (2013, 2015) (also see Mulligan 2014). These predictions are based on models that do not explicitly account for worker and firm behavior, or for health evolution and medical expenditures, and thus are not well suited for a full welfare analysis of the ACA. Empirical studies have largely failed to find any significant effect of the ACA on employment. For example, Kaestner et al. (2017) found that the Medicaid expansions had little effect on work effort despite the substantial changes in health insurance coverage; if anything, the evidence is that the expansions increased work effort, although not significantly. Using tax return data, Kucko et al. (2017) did document bunching in the income distribution around the notch, reflecting the new Medicaid income eligibility cutoffs of 138% of the federal poverty level (FPL) among filers with self-employment income; however, their analysis of tax data linked to labor supply measures from the American Community Survey suggests that this bunching likely reflects a change in reported income

There is a growing literature that analyzes the impact of the ACA on the labor market and the macro economy, consisting of both purely empirical studies and model-based quantitative evaluations. Our focus in this review is on studies that use structural-quantitative models to perform (counter)factual policy analysis. As we discuss below, each paper in the literature often focuses on a subset of the ACA components and simplifies in other dimensions. To structure our discussion, in Section 3 we describe a canonical class of models employed in the quantitative macroeconomics literature that envision a frictionless, competitive labor market in which workers are paid according to their marginal productivity. Individuals make labor supply decisions along the intensive and extensive margins and make consumption/savings choices, as well as health insurance and possibly health expenditure choices. A key simplification in this class of models is that the availability of an ESHI option is exogenous. These models are not designed to study firm responses to the ACA, because there is simply a representative firm operating an aggregate constant returns to scale production function and hiring perfectly substitutable workers who supply (potentially heterogeneous) labor efficiency units, rather than a well-defined notion of an individual firm with a certain number (or measure) of workers. The strengths of this strand of literature are that it can incorporate rich heterogeneity of households by income, wealth, and health (and shocks to these variables) and that it permits a detailed analysis of dynamic consumption/savings choices, and possibly health care expenditure and health investment decisions.

The other strand of literature, which we describe in Section 4, is based on an equilibrium frictional labor market model, which extends the classical paper by Burdett & Mortensen (1998) by incorporating health and health insurance. In this class of models, workers with different health statuses search for jobs, including when they are on the job, and decide whether to accept offers to leave unemployment or to switch to another job; firms with heterogeneous productivity endogenously decide on compensation package offerings, recognizing that the compensation packages they offer will affect their size in the steady state. Thus, an attractive feature of frictional labor market models is that there is a coherent notion of firm size, which is desirable to study the size-dependent employer mandate, and it also has a notion of unemployment, which allows us to study the extensive margin impact of the ACA on the labor supply. Moreover, this class of models features the match between workers and firms; therefore, the ACA can potentially influence overall productivity not only from changes in population health but also from changes in the sorting between workers and firms. As such, they allow for a meaningful discussion of “job lock.”

In both strands of the literature, the private health insurance market pre-ACA is allowed to be individual rated but is required to be community rated post-ACA, with equilibrium premiums determined by the break-even condition. In other words, the premium is equal to the expected health care costs of the enrollees, plus potentially a loading factor determined by the legally regulated medical loss ratio. While the macro and labor literature rightly abstracts away from many aspects of the health insurance market (e.g., insurers’ attempts at product differentiation and risk selection, enrollees’ behavioral biases), it emphasizes the risk corridor between the health insurance exchange and other insurance options. That is, such models recognize that the risk characteristics of people who enroll in the health insurance exchange are part of the equilibrium of the economy. Specifically, these are the individuals who either choose not to work or are not offered ESHI options by their employers, but rather decide to purchase individual insurance from the exchange, possibly driven by both the “carrot” of the federal premium subsidy and the “stick” of the individual mandate penalty. In contrast, the industrial organization (IO) literature tends to treat

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rather than a change in true labor supply. Garrett et al. (2017) found that the ACA did not lead to cutbacks in workers’ hours to below 29 hours per week by employers attempting to avoid employer mandate penalties (i.e., a reduction in labor demand).

the risk pool of those in the health insurance exchange as divorced from the labor market; as a consequence, the IO literature tends to ignore the “jointness” of the optimal regulations for the labor market and for the health insurance market (for a review of the IO literature on the health insurance exchange, see Handel & Kolstad 2022).

It has been a decade since the enactment of the ACA, and it has survived numerous court challenges and several repeal-and-replace attempts. Absent a politically viable alternative, the ACA is likely here to stay for years to come. In Section 5, we provide a brief discussion about where we see potential gaps in the literature on the longer-run and less direct impact of the ACA on issues related to labor markets, public finance, and the macro economy.

## 2. THE KEY PROVISIONS OF THE AFFORDABLE CARE ACT

There are many provisions in the ACA whose implementation was phased in over several years, with some of the most significant changes taking effect in 2014. The most important provisions of the ACA are described in the following subsections.

### 2.1. Young Adult Dependent Coverage Extension

Prior to the ACA, ESHI benefits for dependents could be exempted from federal income taxes only if the dependent was either under age 19 or under age 24 and a full-time student. The ACA requires plans and issuers that offer dependent child coverage to make the coverage available until the adult child reaches the age of 26. If a parent’s plan covers children, the parent can add or keep his/her children on health insurance policy until they turn 26 years old, regardless of whether the children are married, living with the parent, attending school, or eligible to enroll in their own employer’s plan.<sup>5</sup> This provision in the ACA went into effect on September 23, 2010.

### 2.2. Individual Mandate

The ACA requires that all individuals have health insurance that meets the law’s minimum standards or face a penalty (2.5% of income or \$695, whichever is higher) when filing taxes for the year. These penalties were implemented fully from 2016 on. In 2014 the penalty was 1% of income or \$95, and in 2015 it was 2% of income or \$325, whichever is higher. Cost-of-living adjustments were made annually after 2016. If the least expensive policy available costs more than 8% of one’s monthly income, no penalties will apply; hardship exemptions will be permitted for those who cannot afford the cost. The individual mandate was controversial, and numerous lawsuits challenged its constitutionality. It was one of the core issues in the Supreme Court case *National Federation of Independent Business v. Sebelius* (2012), in which 26 states, several individuals, and the National Federation of Independent Business challenged the constitutionality of the individual mandate and the Medicaid expansion. On June 28, 2012, the Supreme Court upheld the constitutionality of the individual mandate in a 5-to-4 decision. The Tax Cut and Jobs Act of 2017 effectively repealed the individual mandate penalty for not having health insurance starting in 2019, which is the current status quo.

### 2.3. Employer Mandate

Employers with 50 or more full-time employees are required to provide health insurance or pay a fine of \$2,000 per worker each year if they do not. The fines apply to the entire number of full-time-equivalent employees minus an allowance of 20.

<sup>5</sup>Moreover, when children lose coverage on their twenty-sixth birthday, they qualify for a special enrollment period.

The employer mandate in the ACA has been very contentious, and its implementation was twice delayed. The first delay, in 2014, exempted all firms from the employer mandate penalty; the second delay, in 2015, exempted all employers with 50 to 99 workers from the employer mandate penalty.

#### 2.4. Health Insurance Exchanges

State-based health insurance exchanges (or marketplaces) where the unemployed, the self-employed, and workers who are not covered by ESHI can purchase insurance have been established. Importantly, the premiums for individuals who purchase their insurance from the insurance exchanges are based on the average health expenditure of those in the exchange risk pool (i.e., they are community rated), and insurance companies cannot deny or price health insurance on the basis of enrollees' preexisting conditions. This is in stark contrast to the private individual health insurance market prior to the ACA, in which all health insurances were individually rated and insurance companies could deny coverage on the basis of preexisting conditions. Thus, even though the fraction of the US population with individual health insurance increased by only 0.5 percentage points overall from 2009 to 2019 (**Figure 1**), this modest increase belies the drastic changes that occurred in the individual market after the ACA.

States that opt not to establish their own exchanges are pooled in a federal health insurance exchange. Insurance companies that want to participate in an exchange need to meet a series of statutory requirements in order for their plans to be designated as qualified health plans.

#### 2.5. Medicaid Expansion

All adults in households with income under 138% of FPL are eligible to receive Medicaid coverage with no cost sharing. This represented a significant expansion of the pre-ACA Medicaid system because, prior to ACA, many states' Medicaid covered adults with children only if their income was considerably lower, and they did not cover childless adults at all. However, on June 28, 2012, the Supreme Court ruled unconstitutional the law's provision that if a state does not comply with the ACA's new Medicaid expansion requirements, it may lose not only the federal funding for those requirements but all of its federal Medicaid funds (*National Federation of Independent Business v. Sebelius* 2012). This ruling allows states to opt out of ACA's Medicaid expansion, leaving each state's decision to participate in the hands of its governor and state leaders. Most states, including all the Democratic-leaning ones (plus the District of Columbia) and some Republican-leaning ones, expanded their Medicaid coverage (see <http://kff.org/health-reform> for an updated list of states that expanded Medicaid coverage).

#### 2.6. Premium Subsidies in the Health Insurance Exchange

For individuals and families whose income is between 138% and 400% of the FPL, subsidies are provided toward the purchase of health insurance from the exchanges, provided that they do not have access to ESHI from their own or their spouses' employers.<sup>6</sup> Whether individuals in states that do not establish their own exchanges who purchase insurance from the federal health insurance exchange can receive the premium subsidies was challenged in the Supreme Court case *King v. Burwell* (2015). On June 25, 2015, in a 6-to-3 decision, the Court ruled to allow all subsidies,

<sup>6</sup>In addition to the premium subsidies, households with income below 250% of the FPL receive so-called cost-sharing reduction (CSR) subsidies if they enroll in a silver plan. The CSR subsidies allow eligible households to have a lower copay, coinsurance, deductible, and out-of-pocket maximum. We abstract away from this part of the subsidy. The Trump Administration terminated CSR payments to insurers in October 2017, however (see Zhang 2021 for a study on the market response to the termination of the CSR).

regardless of whether the insurance was purchased from the state or the federal health insurance exchange.

The ACA has faced significant political and legal challenges ever since its enactment. Some of the policy proposals have considered repealing and replacing the ACA, such as the American Health Care Act (2017), which passed in the House of Representatives but failed to pass in the Senate by a single vote. Other, smaller-scale policy changes have modified part of the ACA. An example is the eventually successful repeal of the individual mandate in the Tax Cuts and Jobs Act of 2017, which has spurred active policy debates on its long-run consequences. Another example is the attempt to reduce subsidies to health insurance premiums.

### 3. MACROECONOMICS: A PROTOTYPICAL STYLIZED FRAMEWORK

In this article, we focus on the literature that uses structural, microfounded models to analyze the short-run and predict the long-run impact of the ACA reforms (for a summary of the empirical literature investigating the short-run impact of the ACA on health insurance coverage, accessibility to health services, and health outcomes, see, e.g., Baicker & Sommers 2020). For a massive reform such as the ACA, one would not expect the long-run effects of the policy reform to have materialized empirically by early 2022, and structural modeling can provide a useful tool to make predictions about the long run. In addition, it can be used to evaluate policy alternatives that were not taken, and it allows one to introduce the different components of the ACA into the model separately, in order to decompose the overall effect of the reform into its different provisions. This decomposition analysis would be very hard to do with purely empirical tools, because in the data the different aspects of the reform were announced and, to some degree, implemented at the same time. Finally, once one takes a stance on the objective function of households and policy makers, a normative model-based analysis of the ACA becomes feasible.

As discussed above, the main objective of the ACA was to reduce the share of the population without health insurance. In the USA, individuals obtain health insurance through their employers, through individual private insurance, and through tax-financed public insurance via Medicaid and Medicare. In addition, a significant share of the population has no health insurance coverage. The key provisions of the ACA reformed the private health insurance markets and expanded access to publicly provided insurance while keeping the employer-sponsored market largely unchanged.<sup>7</sup> Therefore, a model that seeks to capture the economy-wide consequences of the ACA requires, in our view, the following elements. First, it allows for health insurance choices and permits all four options (individual private, public, employer-based, and remaining uninsured). Modeling health insurance includes spelling out the health risks individuals face as well as the impact that expenditures on health have on the evolution on health. Second, because the ACA expanded access to publicly financed insurance, a macroeconomic analysis needs to capture the impact on taxes induced by the reform; that is, it needs to include an (intertemporal) government budget constraint. Third, because the ACA reformed the private health insurance market, the environment needs to include at least a rudimentary model for the private supply of health insurance.

Finally, even though the ACA left ESHI largely unchanged, a model of the entire economy also needs to capture, at least in reduced form, the fact that approximately half of the population in 2009 obtained insurance through their employer (or the employer of a family member) (**Figure 1**).

<sup>7</sup>Orzag & Rekhi (2020) discuss why the ACA maintained the current mixed system of private (individual and group) and public (Medicare and Medicaid) insurance rather than move to a single-payer system. Analyses of universal health care systems and their reform using quantitative life-cycle models are performed by, e.g., Hsu & Lee (2013), Ozkan (2017), and Fehr & Feldman (2021).

In this section we treat employer health insurance as exogenous; we think of this as a plausible assumption, at least for the short run. In the medium run, the ACA is likely to have an impact on the ways employers compete for workers through benefit provision and, thus, on the operation of the labor market, which is the focus of Section 4. Therefore, in this section we adopt a frictionless, competitive labor market where individual wages equal individual labor productivities, whereas the next section explicitly spells out model(s) with labor market frictions and employer–employee interactions.

### 3.1. The Environment

We now describe a prototypical macroeconomic model with a health sector in which heterogeneous individuals make health insurance choices and in which a government supplies a public option to a subset of the population which it finances through taxes. To focus on the main qualitative mechanisms, we first restrict our attention to a two-period life-cycle model, then review quantitative results from the literature derived from multiperiod extensions of this model.

Individuals are born as one of several types  $s \in S$  with population distribution  $\Psi(s)$ , where types are distinguished by their earnings potential, their initial health and health risks, and their initial assets.<sup>8</sup> They live for two periods, which we denote by  $y$  (for young individuals) and  $o$  (for older individuals). Individuals face idiosyncratic income risk and health risk in the second working period of their lives.<sup>9</sup> The income shock  $\varepsilon$  is distributed according to  $G(\varepsilon; s)$ , and the health shock  $\eta$  is distributed according to  $H(\eta; s)$ . Thus, an individual's type  $s$  can influence the distribution of both idiosyncratic shocks.

Individuals have preferences over consumption  $c^y$  and labor supply  $l$  when young and over consumption  $c^o$  and health  $b$  when old, given by

$$u(c^y, l) + \beta v(c^o, b). \quad 1.$$

The dependence of second-period utility on health also captures, in a reduced form, the impact of health around retirement on remaining life expectancy and thus the value of life (as in Hall & Jones 2007). Individuals maximize expected lifetime utility (where expectations are taken with respect to the idiosyncratic income and health shocks). Note that the second period of life is not meant to capture retirement but rather working age in the prime earning years.<sup>10</sup>

In the first period of their lives, individuals make a standard consumption/savings choice, a labor supply choice, and a health insurance choice. In the second period, conditional on the realization of the shocks and their health insurance status, they decide how much of their income to allocate to the purchases of health goods  $m$  and how much to other consumption goods. Labor productivity when young is given by  $z^y(s)$ , and labor income when old,  $z^o(s, \varepsilon, b)$ , is affected by the

<sup>8</sup>Empirically, a type may be defined by educational attainment, initial health status, and other characteristics relevant for the evolution and distribution of earnings and health over the remainder of the life cycle. We assume that  $s$  is observable.

<sup>9</sup>In this way, we subsume all heterogeneity in young age in  $s$  while retaining a precautionary savings motive for individuals. We do not explicitly model the retirement stage, but individuals will value good health in old(er) ages.

<sup>10</sup>A large literature studies the importance of health expenditures, health status, and health insurance reform in old age—and Medicare specifically—on private savings and retirement behavior as well as public finances. A subset of this literature is concerned with the impact of population aging on the need for health care reform (see French 2005, Attanasio et al. 2010, De Nardi et al. 2010, French & Jones 2011, Galama et al. 2013, Hansen et al. 2014, Zhao 2014, Jung & Tran 2017, Braun & Koreshkova 2017, Conesa et al. 2018, Jones & Li 2018). Here, our focus is more narrowly on the ACA, which reformed the health insurance market primarily for individuals of working age.



idiosyncratic income shock  $\varepsilon$  and health status  $b$ . Health in the second period is a function of the health shock  $\eta$  and depends on medical expenditures as well as household type, which captures aspects such as acquired or genetic differences in initial health:

$$b = f(s, m, \eta). \tag{2}$$

Individuals can choose among four options for health insurance,  $i \in \{no, pr, gr, me\}$ , where  $i = no$  indicates that the individual remains uninsured,  $i = pr$  represents private individual health insurance coverage,  $i = gr$  stands for ESHI, and  $i = me$  indicates coverage through Medicaid. The health insurance premium for choice  $i$  is given by  $\phi(s, i)$  (where  $\phi(s, no) = \phi(s, me) = 0$ ), and the out-of-pocket expenditures associated with health expenditures  $m$  for an individual with health insurance choice  $i$  are determined by the function  $\kappa(m, i; \eta, \varepsilon, p)$ , where  $p$  is the price of health goods, relative to the consumption good. We mostly use the form  $\kappa(m, i; \eta, \varepsilon, p) = \gamma(i)pm$ , in which case out-of-pocket expenditures of an individual with health insurance  $i$  are a fraction  $\gamma(i)$  of every dollar spent on health.

The health insurance choice is further constrained by institutional features in the health insurance system. Whereas any individual can choose to remain uninsured or obtain private insurance (if she can afford the premium), Medicaid coverage is available only to individuals with income below a threshold  $\bar{y}^{me}$ . In contrast, we assume that, in order to qualify for ESHI, individuals have to work a minimal number  $\underline{l}$  of hours and have to work in sectors of the economy that offer health insurance benefits. In this section we approximate this feature by assuming that only types  $s \in S^{gr} \subset S$  qualify for ESHI; recall that type  $s$ , among other things, captures education and thus is related to the types of occupations and sectors an individual is qualified to work in.

The government affects private choices by taxing labor income according to a differentiable function  $T(\cdot)$ , by providing tax-financed public health insurance through Medicaid for eligible individuals, and by subsidizing and regulating the private and ESHI market, as outlined below. We first describe the household decision problem prior to the ACA, then discuss how the ACA affects that decision problem and the associated aggregation across households. When discussing the normative properties of policy reforms, we often assume that the government aggregates the expected lifetime utility  $V(s)$  of the different types  $s$  according to a social welfare function of the form

$$W = \int \Gamma(V(s))d\Psi(s), \tag{3}$$

where  $\Gamma(\cdot)$  is a concave function that captures the degree of inequality aversion in society. If  $\Gamma$  is linear, then the government has a utilitarian social welfare function. If  $\Gamma$  values only the type with the lowest lifetime utility, then this corresponds to a Rawlsian social welfare criterion. Note that we can alternatively interpret Equation 3 as the ex ante expected utility of an individual, prior to her type  $s$  being realized. Finally, when quantifying the welfare impact of a policy reform such as the ACA for a specific type  $s$ , we often report consumption-equivalent variation, which is the percentage increase in consumption in all periods of an individual's life in the no-reform scenario that makes this type indifferent to living under the reform scenario.

### 3.2. Household Maximization

We can now state the household maximization problem:

$$V(s) = \max_{c^y, l, a', c^o, b, m \geq 0, i} u(c^y, l) + \beta E_{\varepsilon, \eta} v(c^o, b), \quad \text{such that} \tag{4}$$

$$c^y + a' + \phi(s, i)i \leq z^y(s)l + (1 + r)a(s) - T(z^y(s)l - \phi(gr)\mathbf{1}_{i=gr}), \tag{5}$$

$$c^o + \kappa(m, i; \eta, \varepsilon, p) = z^o(s, \varepsilon, b) + (1 + r)a', \tag{6}$$

$$b = f(s, m, \eta), \tag{7}$$

$$i \in I(l, s),$$

$$m \in M(\eta).$$

Here,  $r$  is the risk-free interest rate. The set  $I(l, s)$  captures the constraints imposed on health insurance choices: The type of an individual  $s$  and her labor supply  $l$  determine her income  $y = z^y(s)l + r \times a(s)$  and thus her Medicaid eligibility, as well as the availability of ESHI. The last constraint restricts the choices for medical spending; depending on the model, one might want to require that a life-threatening emergency must be treated. Alternatively, if for each  $\eta$  the set  $M(\eta)$  is a singleton, then medical expenditures are stochastic but exogenous, and so is the stochastic evolution of health  $b$ .

For group health insurance through the employer, we note that the premium paid by the employee is tax deductible and that there is premium pooling; thus,  $\phi(s, gr) = \phi(gr)$  for all types  $s \in S^{gr}$ . In practice, employers cover a fraction of the health insurance premium, but with perfect competition among firms they will have to lower wages correspondingly to break even. Therefore, we assume here that employees directly pay the entire premium rather than do so indirectly through lower wages.

Households pay taxes on labor income  $z^y(s)l$  net of the premium for ESHI. For ease of exposition, we assume here that capital income is not taxed.<sup>11</sup>

### 3.3. Health Insurance Companies

Insurance companies observe the type  $s$  of an individual and, prior to the implementation of the ACA, can charge type-specific insurance premiums  $\phi(s; pr)$ . Perfect competition implies that insurance companies make zero expected profit from the insurance contract offered to a given type  $s$ , implying the following relationship among the health insurance premium, the optimally chosen health expenditure policy function of the household  $m(\cdot)$ , and the out-of-pocket expenditure function stipulated by the contract,  $\kappa(\cdot)$ :

$$\phi(s; pr) = (1 + r)^{-1} \int_{\varepsilon} \int_{\eta} (pm(s, \varepsilon, \eta) - \kappa(m, i; \eta, \varepsilon, p)) dG(\varepsilon; s) dH(\eta; s). \tag{8}$$

In group health insurance markets, government regulation requires that neither the premium nor the out-of-pocket expenditure requirements can depend on household type. Furthermore, no type can be denied coverage. Of course, individuals can choose not to take up the offered group health insurance. The competitively provided group health insurance contract then has to break even in expectation over household types that are being offered and decide to accept group health insurance. The zero-profit condition then becomes<sup>12</sup>

$$\phi(gr) = \frac{\int_{s \in S^{gr}} \int_{\varepsilon} \int_{\eta} (pm(s, \varepsilon, \eta) - \kappa(m, i; \eta, \varepsilon, p)) \mathbf{1}_{i=gr}(s) dG(\varepsilon; s) dH(\eta; s) d\Psi(s)}{(1 + r) \int_{s \in S^{gr}} \mathbf{1}_{i=gr}(s) d\Psi(s)}. \tag{9}$$

<sup>11</sup>This assumption delivers sharper analytical results in Section 3.6.1 but is relaxed in the studies discussed in Section 3.7.

<sup>12</sup>In practice, the insurance company's zero-profit condition is complicated by the three additional provisions of the ACA—risk adjustment, reinsurance, and risk corridors, commonly known as the 3 Rs—that were intended to protect against the negative effects of adverse selection and risk selection and also work to stabilize premiums, particularly during the initial years of ACA implementation (for a discussion, see Cox et al. 2018).

The set  $S^{gr}$  captures the fact that only a certain share of the population is offered ESHI. The indicator function  $\mathbf{1}_{i=gr}(s)$  enters this zero-profit condition because only a subset of the population that is offered this insurance takes it, despite its associated tax subsidy. This is especially true for healthy types (those with a favorable health shock distribution) who subsidize less healthy types.<sup>13</sup>

### 3.4. The Government Budget Constraint

The government collects income taxes from households and uses them to pay for exogenous government spending as well as health care expenses, net of possible copays for those covered by Medicaid. Thus, the government budget constraint reads as

$$\begin{aligned}
 G + (1+r)^{-1} \int_s \int_\varepsilon \int_\eta \left( pm(s, \varepsilon, \eta) - \kappa(m, i(me); \eta, \varepsilon, p) \right) \mathbf{1}_{i=me}(s) dG(\varepsilon; s) dH(\eta; s) d\Psi(s) \\
 = \int_s T(z^y(s)l(s) - \phi(s, gr) \mathbf{1}_{i=gr}(s)) d\Psi(s),
 \end{aligned}
 \tag{10}$$

where  $G$  is the present discounted value of government spending. Note that the copay function  $\kappa$  can differ among private, group, and public insurance (since it is indexed by  $i$ ).

### 3.5. Aggregation and Equilibrium

Households take prices as given when solving their maximization problem. We treat the interest rate  $r$  and wages, as well as the relative price  $p$  of health goods, as exogenous parameters. The typical approach to endogenizing aggregate wages and interest rates in a stationary general equilibrium is to posit an aggregate constant return to scale production function,

$$Y = AF(K, L), \tag{11}$$

operated by a representative firm (as in Aiyagari 1994 and many other quantitative macro papers with household heterogeneity). With competitive labor and asset markets, the equilibrium interest rate  $r$  and wage rate  $w$  per labor efficiency units are given by the standard first-order conditions

$$w = AF_L(K, L), \tag{12}$$

$$r = AF_K(K, L) - \delta, \tag{13}$$

where  $\delta$  is the capital depreciation rate. The labor market clearing conditions would then equate aggregate labor demand  $L$  to the integral over idiosyncratic labor productivity, multiplied by labor supply of the young,  $z^y(s)l(s)$ , plus inelastic labor supply of the old,  $z^{o, \varepsilon, b}(s)$ , integrated over types  $s$  and shocks. The capital market clearing condition would equate the capital demand  $K$  to aggregated asset holdings across all households. Note that one can always choose the productivity parameter  $A$  such that wages in a stationary equilibrium are equal to one, as the household problem above has already assumed.

Endogenizing the relative price of health goods requires us to specify a production function for health goods. The most straightforward approach is to assume a linear (in labor) production

<sup>13</sup>Because there is no within-type heterogeneity in the first period of life, either all or no members of a given type obtain group health insurance. In order to avoid this arguably extreme outcome, much of the literature has modeled stochastic access to group health insurance and/or preference shocks over health, health expenditures, or insurance directly to generate heterogeneity of take-up within household types.

technology with productivity parameter  $A_b$ , in which case the equilibrium price for health goods is given by  $p = 1/A_b$ .

### 3.6. Optimal Choices and Mechanisms

In order to characterize the main impacts of health insurance reform on household behavior, we now characterize optimal individual choices. The optimal choice variables in the first period are functions of  $s$  and thus  $c^y(s)$ ,  $l(s)$ ,  $a'(s)$ , and  $i(s)$ . The second period choices also depend on the realization of both the income and the health shocks, namely  $c^o(s, \varepsilon, \eta)$ ,  $b(s, \varepsilon, \eta)$ , and  $m(s, \varepsilon, \eta)$ . We assume that suitable Inada conditions are in place such that the optimal consumption choices are always interior. In contrast, we permit the nonnegativity constraints on assets  $a'$ , hours  $l$ , and medical spending  $m$  to potentially be binding.

We first describe the optimal consumption, labor, and health allocation choices conditional on a given health insurance choice, then discuss the optimal health insurance choice and how it interacts with the other household choices. Note that if the choice set for health insurance  $I(l, s)$  is independent of labor supply, then the household decision problem can indeed be solved in two stages. In the first stage, optimal allocations of labor, assets, consumption, and health spending are determined as a function of health insurance choice  $i$ , and in the second stage, the optimal health insurance choice is chosen among one of the four alternatives. If the set  $I(l, s)$  depends on labor supply (because the availability of ESHI or the eligibility for Medicaid does), then one should keep in mind that the fully optimal household choices have to be determined jointly.

Combining the first-order conditions gives rise to three key optimality conditions. The standard intratemporal optimality condition reads as

$$-\frac{u_l(c^y(s), l(s))}{u_c(c^y(s), l(s))} \geq z^y(s) \left( 1 - T'(z^y(s)l - \phi(gr)\mathbf{1}_{i=gr}(s)) \right), \quad 14.$$

with equality if  $l(s) > 0$ . The intertemporal Euler condition is also standard and takes the form

$$u_c(c^y(s), l(s)) \geq (1+r)\beta \int \int v_c(c^o(s, \varepsilon, \eta), b(s, \varepsilon, \eta)) dG(\varepsilon; s) dH(\eta; s), \quad 15.$$

with equality if  $a'(s) > 0$ . Finally, the optimality condition governing medical expenditures reads as

$$\kappa_m(m(s, \varepsilon, \eta), i; \eta, \varepsilon, p) \geq f_m(s, m, \eta) \left[ (z_b^o(s, \varepsilon, b) + \frac{v_b(c^o(s, \varepsilon, \eta), b(s, \varepsilon, \eta))}{v_c(c^o(s, \varepsilon, \eta), b(s, \varepsilon, \eta))} \right], \quad 16.$$

with equality if  $m > 0$ . This last equation equates the out-of-pocket cost of a marginal dollar spent on health goods  $\kappa_m$  to the marginal benefit. The marginal benefit is the marginal impact  $f_m(s, m, \eta)$  of spending  $m$  on health  $b$ , times the impact of better health on earnings  $z_b^o(s, \varepsilon, b)$ , plus the impact of better health on utility  $v_b(c^o, b)$ , translated from utils to resource units by the marginal utility of wealth  $v_c(c^o, b)$ . The marginal utility of health in this simple model approximates both the direct impact of health on well-being and a potentially longer lifetime due to better health. If the marginal cost at zero spending exceeds the marginal benefits in state  $(\varepsilon, \eta)$  of the world, then optimal health spending is zero in that state.

In general, the optimal choices are jointly characterized by these three optimality conditions and the three constraints (the budget constraints in Equations 5 and 6 and the health constraint in Equation 7) and are jointly determined with the optimal health insurance choice. This typically requires numerical solutions, especially in multiperiod extensions of these types of models. We now briefly discuss some analytical insights and then turn to results from the quantitative literature on ACA reform.

**3.6.1. Optimal labor supply.** For the purpose of this subsection, we assume that the first-period utility function is of the Greenwood et al. (1988) variety, which assumes away income effects on labor supply. We also assume that the tax function obeys the functional form proposed by Benabou (2002) and Heathcote et al. (2014).

**Assumption 1.** Assume that the first period utility function is given by

$$u(c^y, l) = \log \left( c - \varphi \frac{l^{1+\frac{1}{\chi}}}{1 + \frac{1}{\chi}} \right), \tag{17}$$

where the preference parameter  $\chi \geq 0$  measures the Frisch labor supply elasticity. Assume that the disutility parameter satisfies  $\varphi = 1$  and that the tax schedule is given by

$$T(y) = y - \theta_0 y^{1-\theta_1}. \tag{18}$$

The tax policy parameters ( $\theta_0$  and  $\theta_1$ ) capture, respectively, the level and the progressivity of the income tax system. With this tax system, after-tax income is a strictly concave function,  $\theta_0 y^{1-\theta_1}$ , of taxable income  $y$ , under the restriction that  $\theta_1 \in (0, 1)$ . The larger  $\theta_0$  is, the larger is the share of pretax income an individual gets to keep; we can interpret  $1 - \theta_0$  as a measure of the level of tax rates. The larger  $\theta_1$  is, the more progressive is the tax function;  $\theta_1 = 0$  represents a proportional tax system.

With these assumptions, the optimality condition becomes

$$l^{\frac{1}{\chi}} = z^y(s)(1 - \theta_1)\theta_0 [(z^y(s)l - \phi(gr)\mathbf{1}_{i=gr}(s))]^{-\theta_1}. \tag{19}$$

First suppose that the individual does not have access to ESHI (or does not find it optimal to enroll in it if offered). Then optimal labor supply is given by

$$l(s) = ((1 - \theta_1)\theta_0)^{\frac{1}{\frac{1}{\chi} + \theta_1}} (z^y(s))^{\frac{1-\theta_1}{\frac{1}{\chi} + \theta_1}}. \tag{20}$$

We observe that hours are strictly increasing in labor productivity  $z^y(s)$ ; thus, individual wages are strictly decreasing in the level of taxes  $1 - \theta_0$ . This effect is stronger as labor supply becomes more elastic (i.e., the larger is  $\chi$ ). A more progressive tax system (a larger  $\theta_1$ ) reduces the dispersion of hours across productivity types.

Turning to the impact of health insurance and its reform through the ACA, one readily sees from Equation 20 that if an expansion of tax-financed Medicaid leads to higher average tax rate (a reduction in  $\theta_0$ ) to balance the government intertemporal budget, then it results in a decline in labor supply, an effect that, again, is stronger the larger is  $\chi$ . Of course, if preferences exhibit income effects on labor supply, then this effect is correspondingly weaker (and might be overturned if these income effects are sufficiently strong). For individuals who have access to and choose to take up employer-provided health insurance labor [ $\mathbf{1}_{i=gr}(s) = 1$ ], although labor supply cannot be solved in closed form, the impact of a reduction in  $\theta_0$  on labor supply is qualitatively similar to the case without. In addition, as Equation 19 shows, the tax deductibility of the premium reduces the marginal tax rate on labor income with a progressive tax system ( $\theta_1 > 0$ ) and thus increases labor supply.

Thus far, we have ignored the impact that labor supply choice might have on the set  $I(s, l)$  of feasible health insurance choices, and we have ignored the possibility of an operative extensive margin. As long as the marginal disutility of labor at zero hours is zero (as it is with the preferences given in Assumption 1) and marginal tax rates are less than one (as in the tax function from Assumption 1), households optimally choose to work positive hours. However, if the income tax function were to include means-tested income transfers, or if the utility function incorporates income effects on labor supply, this need not be guaranteed.

More relevantly for the purpose of this review, because individuals are eligible for Medicaid only if  $z^y(s)l + ra(s) \leq \bar{y}^{me}$ , household types with productivity  $z^y(s)$  and assets  $a(s)$  that, absent the Medicaid means test, would choose optimal labor supply (characterized by the optimality condition above) such that income exceeds  $\bar{y}^{me}$  might find it optimal to decrease their hours to reduce income below the threshold. Depending on the level of assets  $a(s)$ , doing so might entail not participating at all. Furthermore, an expansion of Medicaid eligibility by increasing the income threshold  $\bar{y}^{me}$  could lead to not only a reduction of hours of individuals with incomes originally close to but above the new threshold but also a potential increase in labor supply of those with optimally chosen incomes just below the old Medicaid threshold.

Finally, types who work in occupations offering ESHI ( $s \in S^g$ ) might find it optimal to supply  $l(s) = \underline{l}$  hours to gain access to a job with tax-favored and health risk-pooled (across  $s$  types) group health insurance when, in the absence of such insurance opportunities (or for types  $s \notin S^g$ ), optimal labor supply given by Equation 20 satisfies  $l(s) < \underline{l}$ . For the impact of employment-based health insurance on macroeconomic outcomes, see, for instance, Chivers et al. (2017) and Feng & Zhao (2018).

**3.6.2. Optimal intertemporal consumption and saving.** The intertemporal optimality condition in Equation 15 governing consumption/savings choices is standard in models with idiosyncratic income and thus consumption risk, and it gives rise to a precautionary saving motive as long as the utility function exhibits prudence (i.e., has a positive third derivative).<sup>14</sup> However, as the right-hand side of Equation 15 reveals, the extent of precautionary saving will be affected by the extra source of risk, health risk  $\eta$ , in addition to income risk  $\varepsilon$ . To make this more transparent, let us make the following assumption.

**Assumption 2.** Assume that the first period utility function is given by

$$u(c^y, l) = \log(c^y) \tag{21}$$

(i.e.,  $\varphi = 0$  in Assumption 1), and assume that the time endowment constrains labor supply to  $l \leq 1$ . Furthermore, assume that

$$v(c^o, b) = \log(c^o) + v(b), \tag{22}$$

where  $v(\cdot)$  is an increasing function of health. Finally, assume that  $M(\eta) = \{\eta\}$  (i.e., an individual receiving a health shock  $\eta$  must spend  $m = \eta$  on health goods) and that

$$\kappa(m, i(me); \eta, \varepsilon, p) = \gamma^i pm. \tag{23}$$

Effectively, these assumptions make health shocks into exogenous health expenditure shocks, a share  $1 - \gamma^i$  of which is covered by health insurance of type  $i$ . This assumption is made, in some variants, in a large literature that integrates health spending risk into quantitative life-cycle and macro models with idiosyncratic risk. Using the budget constraints (and plugging in the health equation) yields the optimality condition (for now, we ignore the nonnegativity constraint):

$$1 = (1 + r)\beta \int \int \frac{z^y(s)l + (1 + r)a(s) - T(z^y(s)l - \phi(g^y)\mathbf{1}_{i=g^y}) - \phi(s, i)i - a'}{z^o(s, \varepsilon, f(s, \eta, \eta)) - \gamma^i p\eta + (1 + r)a'} dG(\varepsilon; s)dH(\eta; s). \tag{24}$$

The optimal savings choice is the solution  $a' = a'(s)$  to this nonlinear equation. Idiosyncratic consumption risk emanates from the risk in income net of health expenditures,

<sup>14</sup>In multiperiod extensions of the model, potentially binding future borrowing constraints might also induce precautionary saving behavior, even when the utility function is quadratic and thus has zero third derivative (Deaton 1992).

$yn(\varepsilon, \eta) = z^o(s, \varepsilon, f(s, \eta)) - \gamma(i)p\eta$ , and the extent of precautionary saving is determined by total income risk, which in turn stems from both labor income risk and health expenditure risk.<sup>15</sup> Thus, under these assumptions, the standard theory of idiosyncratic income risk goes through completely unchanged, with health expenditure risk simply being an additional source of net income risk, whose magnitude is partially controlled by health insurance contracts and choices [summarized by  $(\phi(s, i), \gamma(i))$ ].

A reduction of the number of uninsured through the reforms of the ACA, either through the expansion of Medicaid eligibility or by incentivizing the purchase of private health insurance, *ceteris paribus*, reduces net income risk for a subset of the population, thereby lowering aggregate precautionary saving. If private asset accumulation is tied to the rate of return  $r$  in general equilibrium, as spelled out in Section 3.5, then, *ceteris paribus*, the reduction in precautionary savings leads to a lower long-run capital stock and aggregate wages, as well as a higher interest rate.

**3.6.3. Optimal medical spending and health.** When health expenditures are endogenous, the distribution of net income risk is endogenous as well, and the net income risk potentially interacts with the cross-sectional distribution of health (if its evolution is endogenous) and thus earnings. Therefore, the impact of health insurance and its reform on private saving, capital accumulation, and factor prices is more complex. We now study the optimal allocation of health expenditures in our stylized model.

**Assumption 3.** Assume that the out-of-pocket expenditure requirement is the same as in Assumption 2, that is,  $\kappa(m, i(m\varepsilon); \eta, \varepsilon, p) = \gamma(i)pm$ ; that the health production function is given by

$$b = f(s, m, \eta) = \bar{b}(s) + m - \eta; \tag{25}$$

and that labor productivity (income) in the second period is determined as

$$z^o(s, \varepsilon, b) = \gamma^o(s)b^\alpha + \varepsilon. \tag{26}$$

Finally, assume that  $v(c^o, b) = \log(c^o)$ ; that is, health does not directly affect utility/longevity and affects labor productivity/income in the second period in a concave fashion, with  $\alpha \in [0, 1]$  and with type-specific productivity factor  $\gamma^o(s)$ .

Under this assumption, the health expenditure optimality condition reads as

$$\gamma(i)p \geq \alpha\gamma^o(s)(\bar{b}(s) + m - \eta)^{\alpha-1}, \tag{27}$$

with equality if  $m > 0$ . A social planner that can freely reallocate consumption across individuals equates the cost of spending one unit of resources on health,  $p$ , to the marginal societal benefit in the form of more production,  $\alpha\gamma^o(s)(\bar{b}(s) + m - \eta)^{\alpha-1}$ . Thus, the socially efficient level of health expenditures is given by

$$m^{SP}(s, \eta) = \max \left\{ 0, \eta - \bar{b}(s) + \left( \frac{\alpha\gamma^o(s)}{p} \right)^{\frac{1}{1-\alpha}} \right\}. \tag{28}$$

Health spending is increasing in the health shock  $\eta$  and in the health impact on labor productivity  $\gamma^o(s)$ , and it is decreasing in the initial health condition and in the relative price of health goods  $p$ . If the former is low or the latter high, it is inefficient to spend anything on health care in the

<sup>15</sup>This discussion abstracts from health shocks of a size that do not permit positive consumption and, thus, require the household to default on health expenditure bills. The household finance literature studying personal bankruptcy decisions points to medical bills as a major driver of household personal bankruptcy decisions (e.g., Chatterjee et al. 2007).

current period, and  $m^{SP}(s, \eta) = 0$ . In contrast, for an individual with health insurance  $i$  and thus a copay requirement  $\gamma(i)$ , it is optimal to spend

$$m(s, \eta) = \max \left\{ 0, \eta - \bar{b}(s) + \left( \frac{\alpha \gamma^o(s)}{\gamma(i)p} \right)^{\frac{1}{1-\alpha}} \right\}. \quad 29.$$

Comparing the optimal household choice with the socially efficient health expenditure allocation, we find that as long as the individual has health insurance with less than a 100% copay [ $\gamma(i) < 1$ ], she will overspend on health:  $m(s, \eta) \geq m^{SP}(s, \eta)$ , with strict inequality if  $m^{SP}(s, \eta) > 0$ .<sup>16</sup> This result is the well-known moral hazard problem in health spending in the presence of health insurance: Because the individual internalizes only the  $\gamma(i)$  part of the social resource cost of her health spending, the consumption of health goods is suboptimally high in the competitive equilibrium, relative to the fully efficient level. To the extent that the ACA expands health insurance coverage to previously uninsured individuals or leads to more generous coverage [ $\gamma(me)$  or  $\gamma(pr)$  falls], this moral hazard problem might be exacerbated in the aggregate, leading to larger (and potentially suboptimally large) medical spending.

Note, however, that this argument relies on a comparison of the equilibrium allocation with an unconstrained planner that can costlessly transfer resources across households and thus insure household consumption against  $\eta$  shocks. In the absence of such direct consumption, insurance medical spending offsets part of the idiosyncratic health and thus consumption risk, especially if binding borrowing constraints prevent the adjustment of privately financed health expenditures. These insurance benefits are strengthened by direct utility benefits from better health, that is, when  $v_b(c^o, b) > 0$ .

Furthermore, because individual health, and thus the future population health distribution, is endogenous in this class of models, individual health spending might positively affect the aggregate labor income tax base and reduces public spending on health, a fiscal externality that individuals do not take into account. By the same argument, if wages and interest rates are endogenously determined in general equilibrium, then endogenous health expenditures, by changing future aggregate labor supply, carry a pecuniary externality; therefore, medical spending might be inefficiently high or low in competitive equilibrium (for an analysis of optimal tax policy in the presence of such fiscal and pecuniary externalities, see Davila et al. 2012, Krueger et al. 2021). Positive health externalities in aggregate production (as in Lucas 1988 for general human capital), of course, strengthen the normative argument for an expansion of health expenditures encouraged by wider insurance coverage in the population.

**3.6.4. Optimal health insurance choice.** Finally, households choose among the four health insurance options,  $i \in \{no, pr, gr, me\}$ . The principal objective of the ACA was to increase health insurance coverage within the population, that is, move individuals from  $i = no$  to  $i \in \{pr, gr, me\}$ . From the perspective of the model outlined thus far, reducing the number of uninsured is of course not the ultimate goal per se; rather, the government seeks to maximize the social welfare function (Equation 3) when choosing how to reform health care.

The focus of the current model is on the choices  $i \in \{pr, me\}$  versus  $i = no$ . An individual eligible for Medicaid will never find it optimal to remain uninsured (but might find it optimal to choose private insurance if the latter provides more generous coverage). A main question, then, is how the change in the regulation of the private health insurance market [enforcing premium pooling  $\phi(s; pr) = \phi(pr)$  to provide social insurance against being born a bad (health) type  $s$  and encouraging

<sup>16</sup>Both spending levels might be zero, or the individual might find it optimal to have positive health care expenditures when the socially optimal level is zero.



participation through subsidies and penalties] affects private insurance choice. Because good health types will potentially face higher premiums,  $\phi^{\text{ACA}}(pr) > \phi(s; pr)$ , even accounting for subsidies and penalties, they might opt to remain uninsured (or adjust labor supply to become eligible for Medicaid), worsening the private insurance pool and increasing  $\phi^{\text{ACA}}(pr)$ . This, in turn, might induce further types to leave the private insurance market. Quantifying the magnitude and welfare impact of this potential adverse selection spiral is an important component of the quantitative literature evaluating the ACA discussed below.

### 3.7. Modeling the Affordable Care Act Reform(s)

The key provisions of the ACA are discussed in Section 2. The model in this section is not suitable for analyzing the employer mandate, because it has no meaningful model of firms. We return to this issue in Section 4. Furthermore, an analysis of the expansion of dependent coverage requires a model with different generations of the same family interacting and, therefore, is also beyond the scope of this section.

The remaining provisions can be broadly divided into items that enhance redistribution toward lower-income individuals and families and items that regulate the individual health insurance market. Within the context of the model, these provisions can be introduced as follows.<sup>17</sup>

- New regulation of the individual health insurance market:
  - Community rating. The private health insurance premium is now pooled across all household types choosing to sign up for private insurance. That is,  $\phi(s, pr) = \phi(pr)$ . In equilibrium, this premium is determined by an equation similar to Equation 9, where the integration is over all household types choosing private (as opposed to group) health insurance.<sup>18</sup>
  - Individual mandate and penalties. Individuals who choose  $i = no$  and remain uninsured now pay a premium,  $\phi(y(s), no) > 0$  [since the penalty depends on income  $y(s) = z^y(s)l(s) + ra(s)$ , something the individual takes into account when making labor supply decisions], instead of facing no cost of remaining uninsured,  $\phi(s, no) = 0$ . Revenues from penalties paid in equilibrium enter the government budget constraint (Equation 10).
- Increased redistribution toward lower-income individuals:
  - Medicaid expansion. The threshold  $\bar{y}^{me}$  for income is  $y(s) = z^y(s)l(s) + ra(s)$ , below which individuals are eligible for Medicaid increases to  $\bar{y}^{me'}$ .
  - Premium subsidies for private health insurance. In the same way as with penalties from the individual mandate, premium subsidies are introduced by making the premium for private insurance income dependent,  $\phi(y(s), pr) \leq \phi(s, pr)$ , where  $\phi(s, pr)$  is given by Equation 8.

**3.7.1. The Affordable Care Act in a model with exogenous health expenditures.** The first generation of heterogeneous agent macro models used to predict and quantitatively evaluate the positive and normative consequences of the main provisions of the ACA models health expenditures as exogenous idiosyncratic shocks, much as a large literature in macroeconomics and life-cycle consumption studies, following Bewley (1986), Imrohoroglu (1989), Huggett (1993), and Aiyagari (1994), had previously modeled idiosyncratic labor income shocks or labor productivity shocks. Whereas the literature incorporating exogenous health shocks into quantitative macro

<sup>17</sup>We fully acknowledge that the institutional details of the implementation of the ACA are more complex than represented in this necessarily stylized model.

<sup>18</sup>In full life-cycle models, the private premium is also allowed to depend on age.

**Table 1** Comparison of pre- and post-ACA steady states<sup>a</sup>

Variable	Pre-ACA	Post-ACA
Employment	89.7	89.1
Capital (assets)/output	3.00	2.92
Insured by ESHI (%)	64.4	62.5
Individually insured (%)	7.3	18.5
Publicly insured (%)	8.6	10.1
Uninsured (%)	19.7	8.9

<sup>a</sup>The table shows selected steady-state statistics (based on Pashchenko & Porapakkarm 2013, table 4). Pashchenko & Porapakkarm (2013) focus on household heads of working age and show that the initial model steady state accords well with health insurance rates in the MEPS data prior to the adoption of the ACA.

Abbreviations: ACA, Affordable Care Act; ESHI, employer-sponsored health insurance; MEPS, Medical Expenditure Panel Survey.

models is by now quite sizable, the set of papers that use this class of models to actually evaluate (parts of) the ACA is more limited.<sup>19</sup>

An important early contribution by Pashchenko & Porapakkarm (2013) evaluates the impact of the key provisions of the ACA on the number of uninsured and on societal welfare. These authors focus specifically on whether the increase in redistribution (through the Medicaid expansion and the subsidization of private health insurance premiums) or the regulatory changes in the private health insurance market (the penalties associated with the individual mandate and the enforced community rating) is more important for these outcomes. They employ a model that is a multiperiod extension of the one outlined thus far, and with a richer description of the public tax-transfer system. The key model input, the stochastic health expenditure process, is calibrated using data from the Medical Expenditure Panel Survey (MEPS), and then the model is subjected to the ACA reform with the introduction of subsidies and penalties, the mandatory pooling of health insurance premiums in the individual health insurance market, and an increase of the Medicaid income eligibility threshold to 138% of the FPL. As is common in the macroeconomic literature, the reform is assumed to be completely unexpected by the private sector (i.e., it is a so-called MIT shock) but is expected to be permanent once implemented. Because private wealth (and private health as well as the aggregate capital stock, if these are endogenous) adjusts slowly over time in response to a reform, the economy undergoes a transition path from its prereform steady state to a final, postreform steady state. The positive consequences of the reform change over time, and for its normative implications, the explicit consideration of the transitional welfare effects are important.

**Table 1** displays the key long-run consequences of the reform, comparing the old (pre-ACA) and the new long-run post-ACA steady state. The first line shows that the aggregate share of the population that is working does not change much. This observation, however, masks very substantial heterogeneity in the labor supply response in the population: Those types who have relatively low earnings potential and vulnerability to bad health shocks (and thus value health insurance strongly) previously could work only a little or not at all to qualify for Medicaid. The Medicaid expansion allows them to work without losing their eligibility. In contrast, those types who have higher earnings potential (proxied by college education) and strongly valuing health

<sup>19</sup>Important papers in this genre that do not focus on health insurance reform include those by Palumbo (1999) and Capatina (2015), and publications that study health insurance and its reform but do not focus specifically on the ACA include those by Jeske & Kitao (2009), Zhao (2017), and De Nardi et al. (2020).

**Table 2** Welfare consequences of different versions of ACA reforms<sup>a</sup>

Type of reform	All	Low $s$	High $s$
Only community rating, penalties	-0.11	-0.07	-0.12
Only redistribution	0.50	1.36	0.35
Only Medicaid expansion	-0.02	0.32	-0.08
Only subsidies	0.43	1.19	0.29
Full reform	0.64	1.43	0.51

<sup>a</sup>The table shows average welfare gains of type  $s$ , and averages within types are taken over all individuals alive at the time of the reform. It therefore includes the impact of the transition. Measurements are in terms of consumption-equivalent variation (percent). Data are from Pashchenko & Porapakkarm (2013, table 7).

insurance (because their current health status, captured by  $s$ , signals large future health expenditures) previously had to work at least  $l$  to qualify for ESHI. The expanded availability of Medicaid (or premium subsidies for private health insurance for lower income levels) induces these groups of households to either work less or not work at all. In fact, even though the ACA does not directly change the ESHI market (aside from introducing the employer mandate, discussed in greater detail in Section 4), the changes in Medicaid and premium subsidies induce previously ESHI-insured individuals to select out of this market, primarily by changing their labor supply (as discussed in Section 3.6.1; see the third row of **Table 1**).<sup>20</sup> The table also shows the reduction in private asset accumulation (and, thus, the aggregate capital stock if the model is cast in general equilibrium) induced by the reduction in health expenditure risk associated with a reduction of the population that is uninsured, as discussed analytically in Section 3.6.2.

Turning to the predictions of the model with respect to health insurance coverage, we see that in the long run the ACA reform is successful in cutting the share of the uninsured population roughly in half (see the last row of **Table 1**). The table shows that a significant share of the population remains uninsured. These are individuals with incomes that make them ineligible for Medicaid and premium subsidies, and their good health type (low expected future health expenditures) makes signing up for individual or group health insurance suboptimal at the pooled health insurance premium, despite the penalty they face for not adhering to the individual mandate. This share would of course increase in the model if the individual mandate and the penalties associated with them are removed. Finally, the model predicts that, in the long run, most of the reduction in the uninsured stems from the increased uptake of private insurance. Premium subsidies and the greater generosity of coverage make older individuals, in particular, prefer to sign up for private insurance rather than rely on Medicaid, even if they are eligible for the latter (see Pashchenko & Porapakkarm 2013, figure 6).<sup>21</sup>

One of the advantages of a structural, model-based approach is that it permits an explicit evaluation of the welfare consequences of the ACA reform as well as of alternative policy reforms. Furthermore, it permits a decomposition of the welfare consequences into the separate provisions of the ACA, in order to determine which parts of the reform had the most beneficial impact. **Table 2** shows, separately for individuals with low education (high school dropouts) and high education, the welfare gains from the ACA reform and its components, measured in terms of consumption-equivalent variation. The key insights from the table are as follows:

<sup>20</sup>This partial crowding-out of private insurance by the expansion of Medicaid has been documented empirically for earlier Medicaid expansions by Cutler & Gruber (1996).

<sup>21</sup>The magnitude of this finding is likely sensitive to the precise calibration of the relative generosity  $\gamma(me)$  of Medicaid versus private insurance  $[\gamma(pr)]$ .

1. The overall welfare impact of the ACA reform is significantly positive at 0.64% of permanent consumption.
2. Increased redistribution, and the introduction of private insurance premium subsidies specifically, is primarily responsible for these gains, and they accrue mainly to household types with lower incomes and/or higher health risks (low education in the case of Pashchenko & Porapakkarm 2013).
3. Premium pooling and penalties for nonparticipation alone are, if anything, welfare reducing.

This last finding stems from the fact that, at least in the context of the model, the penalties are not large enough to avoid a complete unraveling of the private health insurance market due to an adverse selection spiral.<sup>22</sup>

What is especially noteworthy about the results is the key role of the expansion of subsidies for the reduction in the number of uninsured as well as the welfare gain from the reform. Even after the Medicaid expansion, many low- to medium-income individuals do not qualify for it, and if they are not offered ESHI, the health insurance premium in the private market is too high for them to purchase insurance. In the model, subsidies solve this affordability problem<sup>23</sup> for many households, and because these subsidies are financed by higher progressive taxes, this part of the ACA reform provides welcome social insurance. Note that even high types might benefit from this part of the policy reform because the loss from redistribution away from their type is more than offset by the better insurance against within type idiosyncratic income and health risk, as well as the fact that ESHI premiums fall for this group due to an improved health composition of the pool. As **Table 2** shows, even though the welfare gains from the redistributive components of the ACA are concentrated among the low type, even high type individuals, on average, benefit from the enhanced social insurance provided by the subsidization of private insurance for those just too income rich to fall under the Medicaid threshold.

### 3.7.2. The Affordable Care Act in a model with endogenous evolution of the health distribution.

The preceding section discusses simulations of the ACA in a model with health expenditure risk in which medical spending and the evolution of health are exogenous. A recent literature at the intersection of quantitative macroeconomics, empirical microeconomics, and health economics has sought to integrate models of endogenous health spending and dynamic health accumulation, in the spirit of Grossman (1972), into the class of life-cycle models with idiosyncratic income risk discussed in the preceding section. Papers that model health expenditures and/or the evolution of health over the life cycle endogenously include those by Halliday et al. (2019), Fonseca et al. (2021), and Khwaja & White (2021). Papers by Hugonnier et al. (2013) and Yogo (2016) focus on asset pricing in such models.

Within this literature, a few recent papers have used this model structure to simulate the consequences of stylized versions of the ACA. Those by Jung & Tran (2016) and Khwaja & White (2021) model precisely the same components of the ACA reform as Pashchenko & Porapakkarm (2013), but do so in a model with endogenous health spending. As discussed in Section 3.6.3, these model elements introduce a moral hazard problem that might be exacerbated by the expansion

<sup>22</sup>Three-times-larger penalties are sufficient to stop the spiral and make the reform roughly welfare neutral.

<sup>23</sup>Ferreira & Gomes (2017) ask by how much the price of health goods ( $p$  in this model) has to fall to achieve the same welfare gains as the ACA reform, both in a model and for an ACA reform similar to the one discussed thus far, and find a high number of approximately 5.21%. They conclude that empirically plausible cost-cutting measures alone provide no good alternative to the ACA. Colla & Skinner (2020) review the empirical literature on the actual cost savings induced by the ACA.

**Table 3** Pre- and post-ACA steady states: model with endogenous medical spending and health<sup>a</sup>

Variable	Pre-ACA	Post-ACA
GDP (% change)	NA	-1.23
Hours worked (% change)	NA	-2.46
Medical goods $m$ (% change)	NA	1.87
Insured by ESHI (%)	61.0	62.9
Individually insured (%)	6.4	22.3
Publicly insured (%)	9.8	14.4
Uninsured (%)	22.8	0.4
Welfare (CEV; %)	NA	-1.7

<sup>a</sup>Based on Jung & Tran (2016, table 4).

Abbreviations: ACA, Affordable Care Act; CEV, consumption-equivalent variation; ESHI, employer-sponsored health insurance; NA, not applicable.

of health insurance. The analysis by Jung & Tran (2016), whose main results are summarized in **Table 3**, focuses exactly on this question.

The top panel of the table shows the long-run steady-state allocational consequences of the reform. In order to finance the ACA, and specifically the Medicaid expansion as well as the premium subsidies, income taxes have to rise; Jung & Tran (2016) show that a labor income tax increase of 1.2% on earners above \$200,000 is sufficient. That, plus the disincentive effect from the Medicaid expansion, lowers labor supply in the long run; the decline in uninsured health risk reduces the need for precautionary saving and thus the capital stock in the long run. Therefore, output falls. At the same time, the economy as a whole consumes more medical goods, a manifestation of the moral hazard problem exacerbated by more individuals being covered by health insurance (and thus paying less than 100% of the cost of their medical care). This last effect is by construction absent in models with exogenous health expenditures.

The bottom panel of the table indicates that the ACA reform is successful in expanding health care coverage, in that in the long run essentially everybody is insured. As in the preceding section, both the Medicaid expansion and the increased share of individuals purchasing individual health insurance are responsible, with the latter being more dominant.<sup>24</sup>

The last row of **Table 3** displays perhaps the biggest difference between the evaluation of the ACA in the preceding section and the evaluation in this section. Now the welfare consequences of the entire reform (community rating, penalties, subsidies, and Medicaid expansion) are substantially negative rather than positive, as in **Table 2**. The reasons for this difference are twofold and serve to make general points that extend beyond the comparison of the two specific papers (Pashchenko & Porapakarm 2013, Jung & Tran 2016). First, when medical expenditures are endogenously chosen by individuals, the potential ex post moral hazard problem leading to higher health expenditures and higher taxes to finance the Medicaid expansion and private premium subsidies can lead to adverse welfare consequences of the ACA reform, as emphasized by Jung & Tran (2016). Second, whereas Jung & Tran (2016) focus on steady-state welfare, Pashchenko & Porapakarm (2013) consider the welfare consequences of individuals living through the transition toward the new steady state. For a reform that leads to a reduction of capital and output

<sup>24</sup>The main disagreement between Jung & Tran (2016) and Pashchenko & Porapakarm (2013) is whether the penalties or the subsidies are mostly responsible for the increase in the insured rate and how large effective penalties have to be (see also Khwaja & White 2021).

along the transition (as does the ACA in both papers), the long-run welfare consequences tend to be more adverse than those in the short run. Thus, accounting for transitional dynamics and distinguishing between the short- and long-run consequences of the ACA reform are important, as is the choice of the weights on current versus future generations in the social welfare function.

**3.7.3. Interaction of the Affordable Care Act with labor income insurance policies.** Thus far, we have treated the initial type distribution  $\Psi(s)$  in young age as exogenously given; recall that  $s$  in part captures the initial health constitution of an individual that also determines the distribution of health shocks in the second period. Both labor productivity when young  $z^y(s)$  and the health insurance premium on private health insurance markets  $\phi(s; pr)$  depend on this health state  $s$  and on the ACA-enforced community rating mandating  $\phi(s; pr) = \phi(pr)$ , which rules out the dependence of health insurance premiums on preexisting health conditions as captured by  $s$ . For any social welfare function, like the one outlined in Equation 3, that values social insurance against being born as an unfavorable type, such community ratings provide exactly this social insurance. By the same token, health-related policies in the labor market<sup>25</sup> that enforce the compression of wages  $z^y(s)$  and earnings across health types compress the distribution of lifetime utilities  $V(s)$ . If labor supply in the first period is exogenous (i.e., under Assumption 2, which we maintain for the sake of exposition), it would in fact be optimal to socially insure income fully.<sup>26</sup>

However, assume now that initial (health) type  $s$  is partially endogenous. Suppose that individuals can exert health effort  $e$  (e.g., exercising, adhering to a healthy diet, refraining from smoking or drinking) at a utility cost  $v(e)$  that affects their (and thus the population's) distribution over health status  $\Psi(s; e)$ . In addition to the community rating mandate of the ACA, the government contemplates social insurance in the labor market by providing wage insurance indexed by a parameter  $\tau$  such that wages (and thus labor earnings) are given by a weighted average of individual and average productivity  $\bar{z}^y$ :

$$z^y(s; \tau) = (1 - \tau)z^y(s) + \tau\bar{z}^y. \quad 30.$$

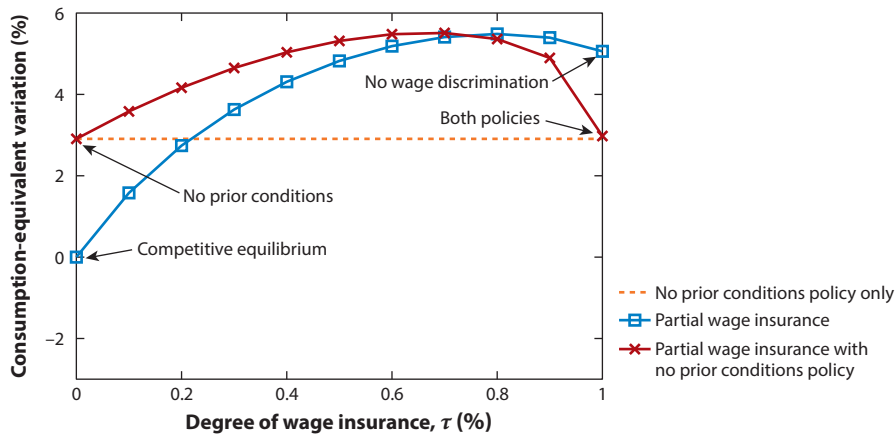
Absent effort choice, that is, for a constant health type distribution  $\Psi(s)$ , it is optimal to provide full social insurance, both in the labor market and in the health insurance market. If health effort is endogenous, though, such full insurance insulates individuals from all economic consequences (through lower wages and/or higher health insurance premiums) of unhealthy behavior, leading to a worse population health distribution, potentially lower output, and higher health insurance costs.<sup>27</sup> Furthermore, if future health depends on current health status, as in Equation 7, then perhaps most of the costs of the introduction of increased social insurance through the ACA (or other policies) materializes only far into the future. Finally, as Cole et al. (2019) argue, health care reform and labor market policies now interact and need to be studied jointly.<sup>28</sup> In the context of this simple model [which Cole et al. (2019) expand to a quantitative life-cycle model estimated on income and health data from the Panel Study on Income Dynamics and MEPS], the policy

<sup>25</sup>Examples include the 1990 Americans with Disabilities Act (ADA) and its 2008 amendment act, the ADAAA. Li (2015) also studies the ACA and disability insurance jointly.

<sup>26</sup>A recent literature studies the interaction among health, health insurance, and income inequality, as well as the desirability of progressive taxation in this context (e.g., Tsujiyama 2013, Prados 2018, Chen et al. 2020, Jung & Tran 2020).

<sup>27</sup>Although no health insurance can entirely insure against the adverse effects of unhealthy behavior (e.g., obesity, diabetes, alcohol, cardiovascular disease) because quality of life is inevitably adversely affected by such negative health outcomes, the financial impacts of these negative health outcomes are nonetheless significantly reduced by full insurance.

<sup>28</sup>Nakajima & Tuzeman (2017) also analyze the interaction between the ACA policy reform in the health insurance markets and labor market reforms, but model both worker and firm heterogeneity explicitly.



**Figure 2**

Welfare effects of varying wage insurance. The point labeled “Competitive equilibrium” represents the allocation without policy and serves as a benchmark for comparison. The point labeled “No prior conditions” has community rating but no wage insurance, the point labeled “No wage discrimination” represents a full wage insurance policy, and the point labeled “Both policies” signifies the presence of community rating and full wage insurance. Figure adapted with permission from Cole et al. (2019, figure 14).

design problem amounts to choosing whether to implement the community legislation (community rating) of the ACA<sup>29</sup> and the optimal extent of wage compression.

**Figure 2** depicts the welfare results. The  $x$  axis measures the degree of policy-induced wage insurance (as measured by  $\tau$ ), and the  $y$  axis represents the welfare consequences of a specific policy reform, measured as consumption-equivalent variation, relative to the unregulated equilibrium in which both health insurance premiums and wages are competitively determined and fully depend on the health-relevant state  $s$ . Initially, increasing wage insurance  $\tau$  is beneficial. However, beyond a certain point ( $\tau > 70\text{--}80\%$ , depending on the presence of community rating, named “no prior conditions” in Cole et al. 2019), further wage compression is detrimental, precisely because the reduction in incentives to lead a healthier life and associated negative dynamic effects on the population health distribution outweigh the short-run insurance effects. The figure also shows the policy interaction: Optimal labor income insurance is smaller when health insurance premium risk is insured through the ACA.

The analysis shown in **Figure 2** reinforces two points we have made repeatedly in this section: (a) The short-run effects of a policy reform, with the distribution in individual health and economic characteristics held constant, can differ vastly from its long-run consequences, and (b) providing additional social insurance can be less favorable in models where health expenditures, health efforts, and thus the population health distribution are endogenous. Finally, this analysis suggests that health insurance market reforms such as the ACA interact strongly with labor market policies. To make this last point more fully, we need an explicit model of the labor market with endogenously determined ESHI. This class of models, to which we now turn, also allows us to study a hitherto ignored aspect of the ACA, the employer mandate.

#### 4. FRICTIONAL LABOR MARKET MODELS

The ACA is mainly a reform of the US health insurance system. However, as we argue in the introduction, given that most working-age Americans receive health insurance coverage from their

<sup>29</sup>Cole et al. (2019) assume mandatory participation or subsidies/penalties such that everyone participates.

employers, the ACA can also be construed as a large-scale labor market reform. In this section, we first summarize the nexus of the labor market and insurance market in the USA, then describe the frameworks that have been proposed to study, both empirically and theoretically, the equilibrium effects of the ACA on the labor market.

#### 4.1. Nexus Between Labor and Health Insurance Markets

The USA is unique among industrialized nations in that it lacks a national health insurance system and most of the working-age population obtain health insurance coverage through ESHI. More than 60% of the nonelderly population received their health insurance sponsored by their employers, and approximately 10% of workers' total compensation was in the form of ESHI premiums (Kaiser Family Found. & Health Res. Educ. Trust 2009).<sup>30</sup> Also, there have been many well-documented connections among firm size, wages, health insurance offerings, and worker turnover. For example, it is well known that firms that do not offer health insurance are more likely to be small firms, to offer low wages, and to experience higher rate of worker turnover. In the 1997 Robert Wood Johnson Foundation Employer Health Insurance Survey, Aizawa & Fang (2020) find that the average size was approximately 8.8 for employers that did not offer health insurance, in contrast to an average size of 33.9 for employers that did. The average annual wage was \$20,560 (in 1996 constant US dollars) for workers at firms that did not offer health insurance, in contrast to an average wage of \$29,077 at firms that did. Moreover, the annual separation rate of workers at firms that did not offer health insurance was 17.3% versus 15.8% at firms that did. Moreover, workers in firms that offer health insurance are more likely to self-report better health than those in firms that do not offer health insurance.

The US insurance system that ties health insurance to employment may lead to inefficiency in multiple dimensions. First, it may lead to workers making socially inefficient mobility decisions, which are often referred to as job lock or job push effects. Madrian (1994) and Gruber & Madrian (1994) provide reduced-form evidence for job locks induced by the ESHI, and Dey & Flinn (2005) quantify job locks and job pushes through the lens of an estimated equilibrium model of the labor market in which firms and workers bargain over both wages and health insurance offerings (for a survey of the large reduced-form literature on the interactions among health, health insurance, and the labor market, see Currie & Madrian 1999). Second, it can result in dynamic inefficiency in terms of health investment over one's life cycle. Fang & Gavazza (2011) argue that health is a form of general human capital and provide evidence that labor turnover and labor market frictions prevent an employer–employee pair from capturing the full surplus from investment in an employee's health, generating underinvestment in health during working years and increasing medical expenditures during retirement.

#### 4.2. Labor Market Models with Health and Health Insurance

In this section, we describe the ingredients of equilibrium labor market models that have been proposed in the literature (e.g., Aizawa 2019, Fang & Shephard 2019, Aizawa & Fang 2020). The model features individuals (or households) and firms, where individuals (or households) experience health shocks, value health, have risk-averse preferences (and thus value health insurance), and supply labor; and the firms decide wage and health insurance offerings to compete for workers. The workers and firms interact through a frictional labor market. Risk-neutral employers recognize that risk-averse workers value health insurance and also that health insurance may improve

<sup>30</sup>Among those with private coverage, approximately 95% obtained employment-related health insurance (Selden & Gray 2006).



workers' health, in turn making workers more productive. For both of these reasons, employers may choose to offer health insurance as an instrument to attract new workers and/or to retain existing workers from being poached. Firms that offer health insurance may be self-insured, or they can join a risk pool (e.g., small group insurance market).

**4.2.1. Individuals or households.** To integrate health insurance into an equilibrium model, individuals must value health insurance. The literature has adopted two main approaches to introduce health insurance in labor market models.

The first and more reduced-form approach is to think of health insurance as a form of amenity valued by workers. This approach is taken by Hwang et al. (1998) and Dey & Flinn (2005, 2008). For example, Dey & Flinn (2005) assume that workers' instantaneous (indirect) utility function is given by

$$u_{\xi}(w, d) = w + \xi d, \tag{31}$$

where  $\xi$  is the worker's exogenous value of having health insurance and  $d \in \{0, 1\}$  is an indicator for whether the worker has health insurance. In the population, the amenity value  $\xi$  can be heterogeneous and drawn from some distribution, say,  $H(\cdot)$  with nonnegative support. Note that this formulation maintains individuals' risk neutrality. This approach is simple but has several limitations. First, it does not link the value of the health insurance to health expenditure.<sup>31</sup> Second, it does not allow health insurance to affect the evolution of health, though Dey & Flinn (2005) do allow health insurance to be a productive factor in the sense that it reduces the rate of separations into unemployment.

Another approach, taken by Aizawa (2019), Fang & Shephard (2019), and Aizawa & Fang (2020), derives workers' valuation for health insurance by explicitly assuming risk-averse utility functions and modeling the health expenditure risks. Specifically, individuals are assumed to have a utility function  $u_{\chi}(c)$ , where  $\chi$  denotes individuals' observable characteristics and the function  $u_{\chi}(\cdot)$  is often assumed to be of constant absolute risk aversion (CARA):

$$u_{\chi}(c) = -\frac{\exp(-\gamma_{\chi}c)}{\gamma_{\chi}}, \tag{32}$$

where  $\gamma_{\chi} > 0$  is the absolute risk aversion parameter for demographic type  $\chi$ . Alternatively, it may take a constant relative risk aversion (CRRA) form:

$$u_{\chi}(c) = \frac{c^{1-\gamma_{\chi}} - 1}{1 - \gamma_{\chi}}, \tag{33}$$

where  $\gamma_{\chi} > 0$  is the relative risk aversion parameter for demographic type  $\chi$ .

It is useful to describe the trade-offs in the choice of the CARA or CRRA utility function. Because the CRRA utility function does not allow for negative consumption, if one were to adopt a CRRA utility function, then it is essential to impose a positive consumption floor (presumably coming from an unmodeled social safety net). If one were to adopt the CARA utility function, then such a restriction would not be necessary, though empirically it may still be useful to impose a consumption floor or to assume a finite support for the medical expenditure distribution so as to bound the value of the insurance.

In this formulation, individuals value health insurance partly because it helps them reduce the consumption risk resulting from health expenditure shocks. Specifically, individuals experience random health expenditure shocks, denoted by  $\tilde{m}_{\chi b}^x$ , whose distribution depends on their

<sup>31</sup>Note that in this formulation the value of health insurance can be made to depend on the workers' health by making  $\xi$  health dependent.

demographic type  $\chi$ ; their health status  $b \in \mathcal{H} \equiv \{H, U\}$ , where  $H$  denotes healthy and  $U$  denotes unhealthy; and their health insurance status  $x \in \{0, 1\}$ . Motivated by well-known empirical regularities, the literature typically models the health expenditure process as follows. With some positive probability  $p_{\chi,b}^x$ , an individual's health expenditure will be zero; with the complementary probability  $1 - p_{\chi,b}^x$ , the medical expenditure is represented by a random variable with positive support, denoted by  $m|(\chi, b, x)$ . Note that an individual's health insurance status is allowed to affect the medical expenditure distributions to capture a possible moral hazard effect in health care.

The discussion above is for individuals. In the USA, spousal health insurance benefits are heavily used by married couples. In both the Survey of Income Program Participation (SIPP) and MEPS data, if both spouses are employed and offered health insurance by their employers,  $\sim 55\%$  of spouses choose to obtain insurance from one of the employers, and only  $\sim 23\%$  choose to obtain insurance from their own employers separately. Furthermore, if only one spouse is employed and offered ESHI, more than 90% of the insured couples obtain health insurance offered by the employer of the employed spouse. There is no law in the USA that would require firms to provide health insurance coverage to spouses of employees, either before or after the ACA. Of course, firms were incentivized to bundle employee insurance with spousal coverage for many reasons. First, the tax exemption of ESHI includes the premium payment for spousal coverage. Second, the dysfunctional individual private health insurance market before the ACA made the spousal coverage provided by employers particularly valuable. By establishing a community-rated health insurance exchange with tax subsidies, the ACA provides a more affordable option for health insurance for spouses outside of the ESHI. This may significantly change firms' incentives to offer spousal coverage under the ACA. To study these issues more formally, however, one would have to specify a household labor supply model, where couples make their labor supply decisions jointly. In household search models, it is common to assume that couples have instantaneous utility functions that depend on equalized joint consumption; that is, the spouses pool their incomes in the household consumption. For example, Fang & Shephard (2019) assume that the couple's utility from consumption is given by absolute risk aversion (CARA) preferences:

$$U_{\chi}(c) = -\exp(-\psi(\chi) \cdot c), \quad 34.$$

where  $\psi(\chi) > 0$  is the coefficient of absolute risk aversion and  $c$  is household consumption.

**4.2.2. Firms.** Firms hire workers to produce. They rely on wages and amenities, including tax-exempted offerings of ESHI, to attract and/or retain workers. In the USA, most of the large firms form health insurance risk pools of their own employees and sign only "administrative services only" contracts with an insurer to administer the health insurance claims and access the insurers' provider networks. Small firms, however, may join the small business risk pools of a large insurance company.

The fact that the USA has an employment-based health insurance system is not based on any grand design. Rather, it is a historical accident resulting from the labor shortage during World War II. In 1942, the USA faced a severe labor shortage, as many eligible workers were in military service. President Franklin D. Roosevelt signed Executive Order 9250, which established the Office of Economic Stabilization, froze wages, and prevented businesses from raising wages to attract workers. Offering health insurance benefits became the tool for firms to compete for workers, a practice that became institutionalized in 1943 when the War Labor Board ruled that contributions to insurance and pension funds did not count as wages and the Internal Revenue Service (IRS) decided that ESHI premiums should be exempt from taxation.

Firms offer health insurance to their workers because it is a tax-subsidized tool to attract and retain workers. Also, the workers' improved health as a result of having access to health insurance means that workers are more productive, say, as a result of taking fewer sick days.

To capture these mechanisms, one requires a model where firm size (i.e., the number of employees of different health status that a firm has in the steady state) is affected by its compensation packages. Aizawa & Fang (2020) propose an extension of Burdett & Mortensen's (1998) classic paper to incorporate health insurance and health into a frictional labor market model with on-the-job searches. More specifically, consider a firm with productivity  $p$ . A worker with health status  $b$  working for the firm can produce  $d_b \cdot p$  units of output, with  $d_H = 1$  and  $d_U = d \in (0, 1)$ , where  $d \in (0, 1)$  captures the workers' productivity loss from being unhealthy.

A firm's compensation package is denoted by  $(w, I)$ , where  $w$  is the wage and  $I \in \{0, 1\}$  is an indicator for whether the firm offers ESHI. Let us denote the steady-state level of workers with health status  $b \in \{H, U\}$  and with demographic characteristic  $\chi$  for a firm that offers package  $(w, I)$  as  $n_b(w, I; \chi)$ . Then the firm's steady-state profit flow is given by

$$\sum_{b \in \{H, U\}} \sum_{\chi} (d_b p - (1 + \tau_p)w - I \cdot m_{\chi b}^1) n_b(w, I; \chi) - C \cdot I, \quad 35.$$

where  $m_{\chi b}^1 \equiv E[\tilde{m}_{\chi b}^1]$  is the expected medical expenditure for an insured worker with health  $b$  and demographic type  $\chi$ ,  $\tau_p \in [0, 1]$  is the payroll tax firms pay on workers' wages, and  $C$  is the fixed cost of providing ESHI and is drawn from, say, a type I extreme value distribution.

In the population, firms' productivity  $p$  is drawn from a distribution  $\Gamma$ . A firm with productivity  $p$  will choose  $(w, I)$  to maximize its steady-state profit flow (Equation 35).

**4.2.3. Labor market.** As is clear from firms' steady-state profit function (Equation 35), firms' optimal choices of the compensation packages  $(w, I)$  very much depend on how the firms' worker size and composition, namely  $n_b(w, I; \chi)$  and  $b \in \{H, U\}$ , depend on  $(w, I)$ . Of course,  $n_b(w, I; \chi)$  is determined by the workers' optimal search decisions and the steady-state labor market conditions. The labor market models in the literature that endogenizes the firm sizes are quite limited; the model by Burdett & Mortensen (1998) is one of the exceptions.<sup>32</sup> Burdett & Mortensen (1998) provide an equilibrium explanation for how ex ante identical workers may receive different wages (i.e., a model of equilibrium wage dispersion) in a frictional labor market in which employed workers also engage in on-the-job search. In the equilibrium, equally productive firms are indifferent between posting wages in support of the equilibrium wage distribution. A higher wage means that the firm makes less profit from each worker, but it is exactly compensated for by the larger firm size in equilibrium; a firm posting a higher wage will have a larger size in equilibrium because it attracts more workers via job-to-job transitions (due to on-the-job search) and loses fewer workers from moving to higher-paying firms. An additional desirable implication of the Burdett & Mortensen (1998) model is that it explains the positive correlation between firm size and wage, a well-known empirical pattern of the labor market that we describe in Section 4.1. Extensions of the Burdett & Mortensen (1998) model to incorporate the heterogeneity of firm productivity first appear in papers by Bontemps et al. (1999, 2000).<sup>33</sup>

Aizawa & Fang (2020) extend the Burdett & Mortensen (1998) model in many dimensions to make it suitable to study the equilibrium of the labor market integrated with health and health

<sup>32</sup>Some papers in the literature model the labor market friction using the random matching framework of Mortensen & Pissarides (1994) (e.g., See 2019). In the Mortensen & Pissarides (1994) model, a firm is synonymous with a worker–vacancy match; as such, a firm always has a single worker. Thus, these papers do not endogenize firm sizes. See (2019) investigates the macroeconomic and welfare consequences of Medicare-for-all reform in an incomplete asset market model where workers make their labor market and health insurance decisions jointly, and he focuses on the reform's labor market effects.

<sup>33</sup>Moscarini & Postel-Vinay (2013) further extend these models to allow for aggregate uncertainty to study interesting and empirically relevant properties about firm size and wage adjustment over the business cycles.

insurance.<sup>34</sup> First, to appropriately quantify the willingness to pay for health insurance, which is important to evaluate the welfare consequences of the ACA reform, workers' (or households') preferences must exhibit risk aversion instead of risk neutrality (as assumed in Burdett & Mortensen 1998 and subsequent literature). Second, workers' health and its evolution, as well as the random health expenditures, must also be explicitly modeled. In particular, the health evolution process must be endogenous to the individual choices, in one way or another. Aizawa & Fang (2020) allow health transitions to depend on health insurance status, which is an endogenous choice. Cole et al. (2019) instead endogenize health investment decisions. These elements are necessary in order to evaluate the impact of the ACA on health expenditures, health insurance premiums, and government budgets. Third, to the extent that the US health insurance market is a mixture of both private health insurance (including ESHI, either from one's own employer or from one's spouse's, and individual private health insurance) and public health insurance options such as Medicaid (**Figure 1**), one would like to include these options in the model for the workers, together with other safety net protections afforded to Americans. Fourth, health is important not only for workers (because healthier individuals are less likely to incur health shocks, and even if health shocks do occur, they are likely less expensive) but also for firms (because healthy workers are more productive, in that they take less sick leave, for example). Fifth, there are many regulatory features of the US labor market and health insurance market that one would like to incorporate, such as ADA and ERISA (Employee Retirement Income Security Act) laws that prevent employers from offering health insurance options that are dependent on workers' disability status and wage levels. At the same time, however, the compensation contracts are still sufficiently incomplete to leave open the possibility of adverse selection.

Relative to the competitive labor market models described in Section 3, this class of frictional labor market models can be more readily integrated to study endogenous firm responses and are particularly well suited to study some of the important ACA provisions such as the size-dependent employer mandate. This class of models also provides a convenient vehicle to study the impact of the ACA on labor market dynamics, including job-to-job transitions, unemployment, firm size distribution, and the aggregate productivity effects of the ACA.

**4.2.4. Government.** The government played an important role in the labor and health insurance market even before the implementation of the ACA. In the labor market, first and foremost, government taxes individuals and firms via personal and corporate income taxes, respectively, but at the same time it exempts the ESHI premium from personal income taxation. Indeed, the exemption of ESHI premiums is the largest tax expenditure in the US tax code, in an amount estimated to be more than \$200 billion in fiscal year 2021 (Tax Policy Cent. 2021).

Government also plays an important role in the health insurance and health care market. As shown in **Figure 1**, ~34% of the US population is insured under Medicaid and Medicare. Fully modeling Medicaid and Medicare in equilibrium search models is difficult, however. Medicaid eligibility often includes both income and assets, and modeling Medicaid asset eligibility would require the modeling of savings decisions, which is challenging both because of the computational complexity and because the typical labor market data sets do not have detailed asset information. The challenge of modeling Medicare arises from its age-dependent nature. Medicare is available for those older than 65, so accurately modeling Medicare would require a finite horizon model,

<sup>34</sup>Dizioli & Pinheiro (2016) also extend the model to incorporate health insurance as a productivity factor, showing that firms that offer health insurance are larger and pay higher wages in equilibrium. But in their basic model, workers are risk neutral and their demand for health insurance is due to the difference in utility cost parameters between when one is sick with health insurance versus without health insurance.

which would complicate the computation of the labor market steady state in search models. As a compromise, Aizawa & Fang (2020) model Medicaid availability as a probability function of income and justify it with the low asset levels in their study population of males with a high school education (or less).

**4.2.5. Equilibrium.** The equilibrium of the model consists of (a) workers' labor market decisions regarding whether to accept offers they receive, both when they are unemployed and when they are employed, and whether they will purchase private health insurance if their jobs do not offer ESHI, and (b) firms' decisions regarding which compensation package, including wages and health insurance menus, to offer to their workers, such that the workers' decisions are optimal given the distribution of compensation packages offered by the firm and the firms' decisions are optimal given the steady-state labor market worker distributions implied by the workers' job market decisions. Note that when individuals are married (as in Fang & Shephard 2019), the couples' labor market decisions are dependent on each other.

**4.2.6. Model estimation.** The model sketched above is typically estimated using the method of simulated moments, with data moments obtained from a variety of data sets. The often-used worker-level data include MEPS (see <https://www.meps.ahrq.gov/mepsweb/>), SIPP (see <https://www.census.gov/programs-surveys/sipp/tech-documentation/questionnaires.html>), Current Population Survey, and American Community Survey data, whereas firm-side data are typically from the Kaiser Family Employer Health Insurance Benefit Survey (see <https://www.kff.org/health-costs/report/employer-health-benefits-annual-survey-archives/>).

**4.2.7. Mechanisms.** It is useful to explain the mechanisms of how the Burdett & Mortensen (1998)–style equilibrium search model of the labor market can explain the well-documented facts described in Section 4.1. Consider two sets of firms with low and high productivities in the productivity distribution (for an illustration of this discussion, see Aizawa & Fang 2020, table 15). First, when these two sets of firms offer health insurance, both will be subject to adverse selection in terms of the fraction of unhealthy workers among the new hires, but the adverse selection problem is less severe for high-productivity firms than for low-productivity firms. The reason is that the high-productivity firms offering health insurance can at the same time offer higher wages; in contrast, low-productivity firms can offer only low wages if they were to offer health insurance. As a result, high-productivity firms can poach a larger fraction of healthy workers from a much wider range of firms than the low-productivity firms. We refer to this as the adverse selection effect among new hires.

Second, the adverse selection effect that a firm offering health insurance suffers in terms of the unobserved health component of their new hires can be mitigated by the positive effect of health insurance on the improvement of health. We refer to this as the health improvement effect of health insurance.

Third, the positive effect of health insurance on health, which leads to increased worker productivity, is better captured by high-productivity firms. The reason is that the job-to-job transition rate for workers in high-productivity firms, regardless of their health status, is significantly lower than that in low-productivity firms. After all, workers in a more productive firm have a lower chance of receiving an offer from an even more productive firm than do workers in a less productive firm. Thus, high-productivity firms are more likely to retain their workers as the workers' health is improved by insurance, allowing these firms to capture both the increased productivity and the reduction in the expected health care cost resulting from the health improvement effect of health insurance. We refer to this as the retention effect (see also Fang & Gavazza 2011). These

three effects can also explain why, in the steady state, firms that offer health insurance may have healthier workers than those that do not offer it, despite the adverse selection among new hires.

**4.2.8. Counterfactual policy simulations.** The structural modeling approach described so far in this section has several key advantages (for a related discussion, see Todd & Wolpin 2010). First, once the baseline model is estimated, simulations can be used to evaluate the long-run equilibrium causal impacts of the ACA. It is often difficult to interpret the reduced-form pre- and post-ACA comparisons for policy impact evaluation as the causal and long-run equilibrium policy impact for several reasons. Second, as described in Section 2, the ACA has been implemented in phases, not wholesale. For example, it took several years for the full individual mandate penalty as stipulated in the ACA, \$695 or 2% of one's taxable income, to be enforced by the IRS, and it was voided by the 2017 Trump tax cut; and the employer mandate penalty was not fully implemented in the first 2 years of the ACA. Third, many features of the ACA, including the employer mandate, the individual mandate, and the premium subsidy, have all been challenged in court. Thus, reduced-form policy evaluations are likely to capture short-term policy impacts, at best. Moreover, to the extent that the ACA is a federal law, the credibility of the reduced-form policy evaluation as causal impact depends crucially on the credibility of the parallel trend assumption between the control and treatment groups.

As illustrated above, the structural approach can also shed light on the mechanisms of the overall policy effects and allows one to consider not only the impact of the policy on individual or firm behavior but also the welfare impact of the reform on individuals and firms. Even for individual or firm outcomes, the structural approach allows us to simulate a variety of other outcomes of interest that are difficult to measure directly in the data. For example, one may be interested in knowing the fraction of individuals who would have been offered ESHI if not for the ACA, which would capture the substitution effect of the ACA on ESHI; such an outcome would be difficult to measure directly in the data but easy to simulate using the structural model.

Finally, and probably most importantly, the structural approach allows us to simulate the impact of variations of the ACA, to the extent that the ACA may be subject to future reforms. For example, we can simulate the impact of the ACA without the individual mandate, the ACA without the employer mandate, or the ACA without the tax exemption of the ESHI premiums.

Specifically, Aizawa & Fang (2020) consider a stylized version of the ACA that incorporates all the main components, except for the young adult dependent coverage extension, as described in Section 2. First, all individuals are required to have health insurance or else pay a penalty. Second, all firms with more than 50 workers are required to offer health insurance or else pay a penalty. Third, the pre-ACA health-rated private individual health insurance market is replaced by a health insurance exchange where individuals can purchase health insurance at community rated premium. Fourth, the participants in the health insurance exchange can obtain income-based subsidies. Fifth, individuals whose income is below 138% of the FPL are eligible for Medicaid regardless of their demographic status. In particular, the introduction of the health insurance exchange represents a substantial departure from the baseline model sketched above because the premium in the health insurance exchange needs to be endogenously determined in equilibrium. The other three components of the ACA are, to a large extent, modifications to the individual's (or household's) budget constraints or the firm's profit flows.

Aizawa & Fang (2020) evaluate the long-run equilibrium impact of the ACA, as well as the contributions of the various components of the ACA; they also evaluate a number of interesting modifications. Noting that the employer mandate requires that firms offer ESHI to their workers but not that they offer ESHI to the workers' spouses, Fang & Shephard (2019) simulate the impact of another provision of the ACA regarding premium subsidy—specifically, one's eligibility

**Table 4 Counterfactual policy experiments: key statistics under the benchmark model, the ACA, and other health care reform proposals<sup>a</sup>**

	Benchmark	ACA	ACA without IM	ACA without EM	ACA without PS
	1	2	3	4	5
<b>Labor market statistics</b>					
Fraction of firms offering ESHI	0.525	0.459	0.419	0.438	0.564
...if firm size is at least 50	0.935	0.989	0.965	0.918	0.998
...if firm size is less than 50	0.480	0.400	0.357	0.383	0.515
Unemployment rate	0.079	0.079	0.079	0.079	0.078
Average wages of the employed	0.989	0.992	0.997	0.995	0.969
...among firms offering ESHI	1.070	1.110	1.126	1.109	1.045
...among firms not offering ESHI	0.798	0.766	0.798	0.797	0.701
<b>Distribution of health insurance status</b>					
Uninsured	0.213	0.066	0.114	0.075	0.157
ESHI	0.595	0.580	0.536	0.555	0.681
Individual insurance	0.034	0.112	0.098	0.121	0.000
Medicaid	0.050	0.099	0.102	0.101	0.037
Spousal insurance	0.108	0.143	0.150	0.147	0.125
Premium in EX (\$10,000)	N/A	0.150	0.175	0.151	0.419

<sup>a</sup>Wages and premiums are for 4 months. Data are from Aizawa & Fang (2020, table 16).

Abbreviations: ACA, Affordable Care Act; EM, employer mandate; ESHI, employer-sponsored health insurance; EX, health insurance exchange; IM, individual mandate; PS, premium subsidy.

to receive federal premium subsidy depends on whether one is offered the option to join ESHI, including that from the spouse's employer—on firms' decision to offer spousal benefits.

### 4.3. Summary of Key Results

We now summarize the key results from the counterfactual simulations.

**4.3.1. Benchmark versus the full Affordable Care Act.** Table 4 presents the results from the simulations under various policy environments. Column 1 shows that the steady state of the estimated benchmark (pre-ACA) economy exhibits the patterns we discuss in the introduction. It also shows that 93.5% of the firms with more than 50 workers offer ESHI to their workers, in contrast to 48.0% of the firms with fewer than 50 workers. Overall, 52.5% of the firms offer ESHI to their workers. The average 4-month wage of the workers employed at firms offering ESHI is approximately \$10,700, while that for workers employed at firms not offering ESHI is \$7,980. The steady-state unemployment rate is 7.9%. Finally, column 1 shows that the uninsured rate among the population studied is ~21.3% overall; the fractions of individuals who have their own ESHI, private individual insurance, Medicaid, and spousal coverage are, respectively, 59.5%, 3.4%, 5.0%, and 10.8%. These patterns match those in the data.

Column 2 reports the counterfactual results from the full implementation of the ACA. It shows that, overall, the fraction of firms offering ESHI declines from 52.5% under the benchmark to ~45.9% under the ACA. Of course, because of the employer mandate for firms with 50 or more workers, the ESHI offering rates for these large firms increase from 93.5% in the benchmark to over 98.9% under the ACA. However, the ESHI offering rate for firms with fewer than 50 workers decreases significantly from 48.0% under the benchmark to 40.0% under the ACA. The

steady-state unemployment rate stays approximately the same under the ACA as that under the benchmark. The average 4-month wage of the workers in firms offering ESHI increases slightly from \$10,700 to \$11,100, while that for workers in firms not offering ESHI decreases slightly from \$7,980 to \$7,660. Overall, the average wage of the employed worker slightly increases from \$9,890 to \$9,920.

The uninsured rate under the full implementation of the ACA is predicted to be 6.6%, significantly lower than the benchmark of 21.3%. Notably, the fraction of the population with individual insurance increased from 3.4% in the pre-ACA benchmark to 11.2% under the ACA.<sup>35</sup> This represents the biggest source of the drop in the uninsured rate under the ACA. The second important source for the reduction in the uninsured rate is Medicaid, as the fraction of the population covered by Medicaid increases from 5.0% in the benchmark to 9.9% under the ACA. Notably, the fraction of individuals covered by their own ESHI slightly dropped from 59.5% in the benchmark to 58.5% under the ACA. The sizable decrease in the ESHI offer rate among small firms shifts the insurance status of married employees from their own ESHI coverage toward spousal coverage, contributing to an increase in overall spousal coverage from 10.8% in the benchmark to 14.3% under the ACA. Thus, the overall impact on the ESHI coverage is very small: It is 72.4% under the ACA, while it is 70.3% in the benchmark.

Our results also indicate that the full implementation of the ACA has almost no effect on the unemployment rate. This finding is consistent with existing empirical evidence. For example, Kaestner et al. (2017) found that the Medicaid expansions had little effect on work effort despite the substantial changes in health insurance coverage; if anything, the evidence is that the expansions increased work effort, although not significantly. Kucko et al. (2017) also found that there is no evidence that wage and salary workers adjust their labor supply in response to an increased availability of directly purchased health insurance.

The more interesting findings are from simulation of the modifications to the ACA. We summarize some of these results below.

**4.3.2. The Affordable Care Act without the individual mandate.** The ACA without the individual mandate essentially corresponds to the actual case after the Tax Cuts and Jobs Act of 2017, which repeals the individual mandate penalty but keeps the other components of the ACA intact. Column 3 of **Table 4** shows that, surprisingly, the ACA without the individual mandate would still significantly reduce the uninsured rate to ~11.4%, which is ~4.8 percentage points higher than under the ACA yet still represents a 9.9-percentage-point reduction from the 21.3% uninsured rate predicted in the benchmark.

This result is consistent with the findings of Lurie et al. (2021), who estimate the effect of the ACA's individual mandate on insurance coverage using regression discontinuity and regression kink designs with tax return data. Even though they find statistically significant responses to both extensive margin exposure to the mandate and marginal increases in the mandate penalty, their estimates imply fairly small quantitative responses to the individual mandate, especially in the health insurance exchanges.<sup>36</sup> However, the reduced-form estimates tend to estimate the marginal treatment effects of the group impacted by the discontinuity or kinks (as in Lurie et al. 2021) or the

<sup>35</sup>To reconcile these statistics with those reported in **Figure 1**, it is useful to note that the study population of Aizawa & Fang (2020) has a high school education (or less) and ranges from 26 to 46 years old.

<sup>36</sup>Using 2012–2015 American Community Survey data and a triple-difference estimation strategy that exploits variation by income, geography, and time, Frean et al. (2017) also found that the individual mandate's exemptions and penalties had little impact on coverage rates.



average treatment effect of the population (as in Frean et al. 2017); moreover, it does not account for the equilibrium effects of the individual mandate. Thus, the finding from the counterfactual simulation that, even after accounting for equilibrium effects, the ACA without the individual mandate can still achieve a significant reduction in the uninsured rate is an important addition to the existing reduced-form literature and is consistent with the observed performance of the ACA after 2018, when the 2017 Tax Cuts and Jobs Act effectively eliminated the individual mandate penalty.

The reason there is still a sizable reduction in the uninsured rate in the absence of individual mandate is related to the generous premium subsidies stipulated under the ACA. Because individuals are risk averse, they would like to purchase insurance if the premium they need to pay out of pocket is sufficiently small; the individual mandate penalty in the ACA acts as the stick and the premium subsidy as the carrot to further incentivize individuals to buy insurance. As we show in Section 4.3.4, below, the carrot is much more powerful than the stick. However, the equilibrium effects of the repeal of individual mandate can be ascertained in the simulations as well. Workers who decide to forgo health insurance when the individual mandate is repealed tend to be those who work at firms with medium wages and are healthy. These account for the 1.4-percentage-point decline in the individual insurance coverage under the ACA without the individual mandate (column 3 of **Table 4**) relative to the full ACA. Because those who decide to remain uninsured when there is no individual mandate are precisely those who are healthy, their absence from the exchange exacerbates the adverse selection problem, leading to a substantial increase in the premium in the exchange (from \$1,500 under the ACA to \$1,750 in the ACA without the individual mandate).

**4.3.3. The Affordable Care Act without the employer mandate.** What would happen to the ACA without the employer mandate? Column 4 of **Table 4** reports the results from this counterfactual experiment. It shows that, surprisingly, the employer mandate is not essential for the ACA at all, and the uninsured rate increases only slightly relative to the full version of the ACA: The uninsured rate under this system would be  $\sim 7.5\%$ , only 0.9 percentage points higher than the 6.6% uninsured rate predicted under the full ACA. The incentive of large firms to offer health insurance is mostly related to the fact that health insurance is a more economical way to compete for and/or retain workers than wages, because it allows the firms to exploit the risk premiums that the risk-averse workers are willing to pay for health insurance. Thus, the set of firms whose health insurance offering decisions are affected by whether or not there is an employer mandate is relatively small. In addition, the reduction in the fraction of individuals who obtain insurance from ESHI is mostly compensated for by the increase in individual insurance via the exchange (with premium subsidy), Medicaid, and spousal insurance. This finding is consistent with reduced-form evidence reported by Lyons (2017), who employed a triple-difference identification strategy and a synthetic control group approach to analyze the impact of the employer mandate in the Massachusetts Health Care and Insurance Reform Law of 2006 on insurance coverage. Lyons (2017) find that roughly half of workers newly taking up ESHI in large firms subject to the mandate would have enrolled in subsidized coverage had their employers been exempted or subjected to a more lenient employer mandate, while almost all of the workers obtaining ESHI from medium-sized firms because of the levied mandate would have obtained subsidized coverage.

Bruegemann & Manovskii (2010) also develop a search-and-matching model to study firms' health insurance coverage decision, showing that the insurance market for small firms suffers from an adverse selection problem because those firms try to purchase health insurance when most of their employees are unhealthy. Nakajima & Tuzeman (2017) study the impact of the ACA on a firm's demand for part-time versus full-time workers in response to the employer mandate and workers' willingness to work part time in response to the weakening of the link between full-time

employment and health insurance. They predict that approximately 2.1 million more part-time jobs are created under the ACA at the expense of 1.6 million full-time jobs.<sup>37</sup>

**4.3.4. The Affordable Care Act without premium subsidy.** Both the Medicaid expansion and premium subsidies in the ACA were challenged in court. Column 5 of **Table 4** reports the counterfactual simulation results when we remove both premium subsidies in the exchange and the Medicaid expansion. Relative to the full ACA results reported in Column 2, the uninsured rate is much higher, at 15.7%. Importantly, essentially no one participates in the health insurance exchange without premium subsidies due to the adverse selection “death spiral.”<sup>38</sup> These results demonstrate that premium subsidies are the key to solving the adverse selection problem in the insurance exchange and that they contribute importantly to the substantial reduction of the uninsured rate achieved under the full ACA. Moreover, we find that employers respond to the nonfunctioning health insurance exchange by offering ESHI at a much higher rate, for both large and small firms.

Note that the ACA premium subsidy an individual is eligible to receive is currently based on her income and the second-lowest Silver Plan premium in the marketplace. To the extent that an individual’s price elasticity of demand for health insurance may be heterogeneous, the optimal premium subsidy should be contingent on such heterogeneity. Indeed, there is a small but growing IO literature that studies the optimal design of premium subsidies in the health insurance exchange. For example, Tebaldi (2017) found that in the California ACA marketplace, younger households are significantly more price sensitive and cheaper to cover than older households. He argues that the optimal subsidy should be dependent on age, the subsidy for the young households should be higher, and, moreover, higher participation of the young in the exchange can drive down the equilibrium premium for older participants. This in turn lowers the premium subsidy for the old, and the savings from that reduction can be used to pay for the higher subsidy for the young. In fact, Tebaldi (2017) shows that such a premium subsidy policy in favor of the young can raise enough revenues to reduce the overall cost of the program. Aizawa (2019) studies the optimal joint design of major policies in the ACA and the implications of targeting these policies to certain individuals. He also finds that, compared with the health insurance system under the ACA, the optimal structure lowers the tax benefit of ESHI and makes individual insurance more attractive to younger workers. Under the optimal tax and subsidy policies, firms will change their insurance provisions endogenously, and a greater number of younger workers will sort into individual markets, helping to improve the risk pool in individual insurance and lowering the uninsured risk. As in the Aizawa & Fang (2020) paper, a key feature of Aizawa’s (2019) paper is that the risk pool of the individuals in the health insurance exchange is endogenous to the labor market decisions by firms and workers.

**4.3.5. Role of the tax exemption of the employer-sponsored health insurance premium.**

The US tax code exempts ESHI premiums from personal income taxation. Many researchers attribute the fact that most firms offer ESHI to their workers to this exemption. Aizawa & Fang (2020) also simulate the counterfactual equilibrium outcomes when the ESHI tax exemption is

<sup>37</sup>Mulligan (2018) shows that both the income-based premium subsidy and the employer mandate act as taxes on full-time employment and predicts that the ACA will lead to a 3.0% reduction in total hours worked, though the effects are heterogeneous across groups (see also Mulligan 2013, 2015 and Gallen & Mulligan 2018, which extensively investigate the various labor market impacts of the ACA via its effect on marginal tax rates. These papers do not explicitly model the worker and firm behavior or health evolution and medical expenditures).

<sup>38</sup>This is consistent with the widely reported statistic that, between 2017 and 2020, 84% to 87% of those who purchased insurance from the health insurance exchange received a premium subsidy (Kaiser Family Found. 2020).

eliminated both under the benchmark and under the ACA. They find that the elimination of the tax exemption for ESHI premium would reduce, but not eliminate, the incentives of firms, especially the larger ones, to offer health insurance to their workers. They also find that the uninsured rate would increase from 21.3% to 31.8% when the ESHI tax exemption is removed in the benchmark economy and that it will increase from 6.6% to 12.4% under the ACA. Interestingly, they also experiment with the effect of prohibiting firms from offering ESHI in the post-ACA environment, finding that it would lead to a large increase in the uninsured rate. In fact, they find that prohibiting firms from offering ESHI would also decrease total welfare and increase overall government expenditure. Thus, these findings suggest that ESHI may complement, rather than hinder, the smooth operation of the health insurance exchange.

**4.3.6. Spousal insurance.** Spousal health insurance benefits were not and still are not required by any existing law. Nonetheless, prior to the ACA, almost all firms that offered employee health insurance also offered spousal benefits. How would the ACA affect firms' decision to offer spousal benefits to their employees? Interestingly, according to a survey conducted by Towers Watson and the National Business Group on Health, 12% of the respondent firms have already or are planning to exclude spouses from enrolling in their health plan when similar coverage is available through their own employer, and 5% are planning to completely eliminate spousal coverage (Towers Watson & Natl. Bus. Group 2013, p. 19).

Fang & Shephard (2019) integrate a multiperson household search model (e.g., Dey & Flinn 2008, Guler et al. 2012), similar to the model outlined above, into such an equilibrium framework. Their simulation implies that, while the provisions in ACA successfully reduce the uninsured rate and improved health outcomes, there are significant changes in firms' insurance offering decisions. First, the overall health insurance offering rate of firms declines. Second, an employee-only health insurance contract, which was almost completely absent in the pre-ACA equilibrium, emerges among low-productivity firms. Interestingly, these equilibrium responses are closely related to the availability of a non-employer-sponsored purchase option from the health insurance exchange as well as the specific eligibility rules of the associated premium subsidies. Indeed, if individuals' access to health insurance through their spouses' employers does not render households categorically ineligible for the premium subsidies, then the incidence of employee-only insurance is considerably muted. Fang & Shephard (2019) extend their model to examine how the ACA affects job mobility, showing that it reduces the extent to which job transition events depend on the insurance coverage status of individuals and their spouses. They also use the model to calculate households' valuation of spousal health insurance both before and after the ACA reform, showing that the ACA considerably reduces this value.

**4.3.7. Effects of young adult dependent coverage extension.** The equilibrium models discussed above do not incorporate the extension of the young adult dependent coverage, which was the first major provision of the ACA to be implemented (see Section 2); instead, a reduced-form literature evaluates the effects of this provision. Heim et al. (2014, 2018) study the impact of the ACA's young adult dependent coverage provision on youth labor market-related outcomes, including measures of employment status, job characteristics, and postsecondary education, using a data set of US tax records spanning 2008–2013. Using a difference-in-difference strategy wherein persons aged 27–29 act as the control group and those aged 24–25 act as the treatment group, Heim et al. find that the ACA provision did not result in substantial changes in labor market outcomes.<sup>39</sup> In particular, they show that employment and self-employment were not statistically

<sup>39</sup>The authors exclude 26-year-olds because such individuals could be in the treatment group (under 26) in some months of the year and in the control group (26 and over) in the other months.

significantly affected, though there is some evidence of an extremely small increase in the likelihood of young adults earning lower wages, not receiving fringe benefits, enrolling as full-time or graduate students, and being self-employed.

## 5. CONCLUSION AND OUTLOOK

The ACA was signed into law a decade ago. In this article, we have reviewed the structural-quantitative literature studying its short-run and potential long-run effects on the labor market and the macro economy. We conclude with a brief discussion about what we see as fruitful avenues for future research on the less immediate and less direct impacts of the ACA on the labor market and the macro economy.

### 5.1. The Affordable Care Act and Other Insurance Programs

The ACA has expanded Medicaid and dramatically extended access to affordable, community-rated, and premium-subsidized private health insurance to close to 20 million Americans. While some papers reviewed in Sections 3 and 4 address the impact of the ACA on public finance,<sup>40</sup> more research needs to be done to investigate the interactions between the ACA and other social insurance programs, such as Social Security, Medicare, and disability insurance, as well as other insurance products, such as long-term care insurance (see Ameriks et al. 2020 for a quantitative analysis of long-term care insurance). The expansion of health insurance access has positive consequences for the health of the working-age population, which in turn affects life expectancy and health upon retirement.<sup>41</sup> Better population health can also affect the timing of retirement. Thus, even though the ACA expanded access to health insurance mostly for the working-age population, it is bound to have important implications for old-age social insurance programs such as Social Security and Medicare. The interactions between the labor and health insurance market, and the interactions among different segments of the health insurance market, are the focus of Aizawa & Fu (2020), who develop and estimate an equilibrium model of competitive labor and health insurance markets but with rich heterogeneity across local markets, households, and firms. They use their estimated model to quantify the welfare loss from the segregation of risk pools across ESHI, the individual health insurance exchange, and Medicaid.

### 5.2. The Affordable Care Act, Economic Recessions, and Health Crises

In this review we have focused on idiosyncratic income and health shocks. However, it is during adverse aggregate shocks—both regular business cycles and economic depressions, especially when induced by health crises such as the Spanish flu of 1918–1919 or the COVID-19 pandemic—that access to health insurance is particularly valuable. Furthermore, in a system where most individuals gain access to health insurance through employment, the elevated incidence of unemployment in economic downturns might have profound consequences for the demand for medical treatment, the population health distribution and household consumption, and finances in the short and long run. Integrating analyses of the ACA with quantitative business-cycle studies therefore seems promising.

<sup>40</sup>For a comprehensive study of the long-run fiscal consequences of entitlement programs, and Medicare and Medicaid specifically, see Gokhale & Smetters (2006).

<sup>41</sup>French et al. (2017) use a dynamic discrete choice model of consumption/savings and labor supply to assess the impact of the Medicaid and private nongroup insurance provisions of the ACA on the labor supply and savings of older Americans.

### 5.3. The Affordable Care Act, Technological Innovation, and Economic Growth

An important open area for research is the interaction between the ACA and the adoption of new technology (such as robots and automation) and technological innovation. As discussed above, even though the ACA is a reform of the health insurance sector, it is nonetheless a reform of the labor market as well, because of the strong nexus between the health and labor markets in the USA. To the extent that the reform may, on the margin at least, increase the cost of hiring workers (as a result of, say, the employer mandate), firms may be more incentivized to adopt robots or other automation technology to replace workers (for an attempt to model and quantify the impact of the ACA on firms' technological choices, see Fang et al. 2021).

Improvements in health, driven by innovations in medical procedures, drugs, biologics, devices, and the services associated with delivering health care, have been a major source of the overall gain in economic welfare. Medical innovations in the USA are funded mostly by for-profit private companies, and their incentives to invest in research and development are sensitive to both the expected size of the market (Finkelstein 2007) and the government intervention risks in the health care sector (Kouijien et al. 2016). By significantly expanding access to health insurance, especially for the nonelderly population, the ACA may change firms' incentives to invest in new drugs, devices, and other innovations to treat ailments more prevalent among the population whose ability to pay for care is most improved by the ACA. These innovations, in turn, might spur economic growth and endogenously direct it toward the medical sector (Chandra & Skinner 2012, Ehrlich & Yin 2013, Frankovic & Kuhn 2019, and Frankovic et al. 2020 link health spending and technological progress).

### 5.4. The Affordable Care Act and Other Behavioral Margins

The young adult dependent coverage extension in the ACA may potentially affect individuals' incentive to attend college and borrow student loans, which in turn may affect the occupation and self-employment decisions of young adults. Two papers by Heim et al. (2014, 2018) focus on the labor supply of young adults, but the young adult dependent extension of the ACA might reduce the incentive to be a full-time student among those aged 19–23, as those individuals can now stay on their parents' plans even if they are not enrolled as full-time students [Jung & Shrestha (2018) show empirically, using SIPP data, that this effect on full-time college enrollment is likely sizable]. In contrast, it is also possible that the ACA allows students to more freely pursue majors and careers of their choice with less concern about health insurance coverage.

ESHI from a spouse's employer is an important source of the health insurance for married couples in the USA. Indeed, prior to the ACA, one of the most important indirect benefits of marriage was the ability to obtain insurance offered by the spouse's employer. This linkage has been weakened by the ACA, as the health insurance exchange provides a place to purchase affordable community-rated insurance, with a premium subsidy for low-income individuals. Fang & Shephard (2019) have demonstrated this dilution of the value of ESHI spousal benefits. It is then natural to examine how the ACA differentially affects the marriage and divorce decisions of individuals with different socioeconomic statuses.

### 5.5. The Affordable Care Act and Political Economy

The ACA was passed along partisan lines in both the House of Representatives and the Senate. Postenactment public opinion remains sharply divided (e.g., Pacheco et al. 2020). Numerous court challenges and Republican attempts to repeal and replace the ACA have so far failed. It is important to examine the political-economic implications of the ACA through its direct effects on political elections and its indirect consequences via changes in inequality and preferences for redistribution.

The ACA represents a large expansion of the social insurance programs in the USA, particularly the Medicaid expansion and the premium subsidy for people who buy health insurance from the exchange. To the extent that one of the most important roles of unions is to negotiate nonwage benefits on behalf of their members (Freeman & Medoff 1984), the ACA might contribute to a further decline in unions (the fraction of workers belonging to a union was approximately 20% in 1980; it is now below 10%). An interesting area of study is how the interaction of the ACA with other social insurance programs impacts the unionization rate, as well as on the overall welfare impacts of unions (see Aizawa et al. 2021 for a model of the welfare effect of unions in the presence of social insurance programs).

## DISCLOSURE STATEMENT

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