Employer Mandates and Firm Dynamics

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Abstract
I examine the consequences of health insurance mandates on firm size distributions by developing a conceptual framework adapted from the model presented in Melitz (2003). Within the framework of my model, I arrive at three main results. First, I find that imposing an employer mandate on firms encourages entry for smaller, less productive firms that would not be affected by the mandate. My second finding is that revenues gained through fines imposed by the mandate can be used to lower corporate taxes without creating a budget deficit. Finally, I find that imposing an employer mandate increases aggregate price levels, which harms consumer welfare. I estimate that one would need to increase consumption by 6.8 percent to fully compensate a consumer for welfare losses brought about by these higher aggregate price levels. While my model is used to examine the Employer Mandate, it can be adapted to examine a large class of size-specific policies.
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1 Introduction

In the event of policy changes that affect marginal costs of production, firms must adjust their behavior in a multitude of dimensions. One such recent policy reform that has been the subject of an ongoing debate is the Employer Mandate embedded within the Affordable Care Act, which requires firms with 50 or more employees to offer health insurance plans to at least 95% of their full-time employees, with non-abiding firms facing financial penalties. This policy is just one example of a large class of size-specific policies that have impacts on firm behavior. In this paper, I present a conceptual framework with heterogeneous firms adapted from the model presented in Melitz (2003). While the conceptual framework developed in this paper is used to develop a trade model that predicts firm entry into export markets, it incorporates firms that vary by productivity and size, making it relevant for analyzing the impact of size-specific policies like the Employer Mandate. In this model, when no policies are imposed, firms have the choice of whether to offer health insurance. In the event that they do not, their decision process is exactly as outlined in Melitz (2003). In the event that they do, their production decision is slightly different – while offering health insurance requires firms to pay an additional fixed cost, they receive a positive scaling to their productivity level. This scaling is necessary for the choice of insurance-provision to be nontrivial and, as I shall argue, justified by findings in the empirical literature.

Unlike numerous studies that examine the effects of mandates in partial equilibrium, my model’s general equilibrium environment makes it possible to analyze aggregate welfare implications of policies like the Employer Mandate. In my analysis of the model I develop, I find that imposing an Employer Mandate increases the mass of producing firms by decreasing barriers for lower-productivity firms to enter the market, and that the Employer Mandate increases the share of firms offering insurance. Further, I find that governments would be able to lower taxes and still fully fund a fixed budget by implementing an Employer Mandate. As a consequence of the policy, however, aggregate price levels rise, implying negative effects for consumer welfare. In my main model calibration, I calculate that aggregate consumption
would need to be increased by 6.86 percent in order to fully compensate a consumer for these welfare losses.

The Employer Mandate is the largest federal policy pertaining to employer provided health insurance (EPHI) in modern U.S. history. Given the large degree of public debate regarding the efficacy of this policy,\(^1\) it is essential to develop a stronger understanding of both the effects that the Employer Mandate has on steady-state welfare, as well as the heterogeneous impacts it imposes upon firms with varying levels of productivity. While I restrict the analysis of my model to examining the numerous implications of the Employer Mandate, it could be easily adapted to analyze the impact of other size-specific firm policies.

The remainder of this paper is organized as follows: sections 2, 3 and 4 examine the motivating background and previous literature surrounding policies related to the Employer Mandate. Sections 5 and 6 present my conceptual framework, while sections 7 and 8 analyze the equilibria of economies with and without an Employer Mandate imposed, respectively. Section 9 concludes.

## 2 The Employer Mandate

As discussed, the Employer Mandate is a policy (effective as of January 1, 2016) embedded within the Affordable Care Act (ACA) which requires firms with 50 or more employees to offer health insurance to at least 95\% of their full-time\(^2\) employees, or else face substantial financial penalties. This policy was created with the intention of encouraging employers to continue offering insurance, as state-specific standards of minimal levels of care rose with the implementation of the ACA. Firms above the size threshold are fined a fixed amount per employee if they do not offer insurance, and at least one employee receives a federal subsidy for insurance coverage.

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\(^1\)The debate regarding the Employer Mandate is highly partisan. Numerous GOP officials have expressed the concern that the policy will ultimately lead to heightened levels of unemployment, while many Democratic Party members have argued that the policy will help to ensure the coverage of thousands of U.S. citizens.

\(^2\)Full-time is specified to be a minimum of 30 hours per week.
While the intent of the Employer Mandate is to improve the quality of benefits enjoyed by American workers, unintended consequences may arise. It is possible that, in response to an employer mandate, firms could lower wages in a manner proportional to the value workers place upon health insurance. Further, it is possible that firms near the cutoff of 50 employees could consider either downsizing, reducing hours of employees to a below full-time status, or outsourcing the work of particular tasks to other firms (Dillender et al., 2016). Thus, the effects of the Employer Mandate could be the opposite of the policy’s intention – firms could respond in a manner that reduces the welfare of their employees.

For proponents of stricter, state-level mandates in the past, the Employer Mandate is regarded as a triumph for workers. Requiring minimum levels of coverage can prevent contract negotiations between firms and employees where there exists imperfect information regarding relevant illnesses. As described in Rothschild and Stiglitz (1978), such imperfect information can generate substantial negative externalities for prospective employees. It is also possible that individuals who are able to access low-cost medical procedures through EPHI may be able to avoid higher cost procedures in the future (McGuire and Montgomery, 1982). Even under the assumption that firms shift all of the burden of mandates to workers, there is evidence that such mandates can result in potential Pareto improvements, as per capita costs rise only slightly and welfare for lower-income individuals increases significantly (Holahan et al., 1994). Finally, there is evidence that large-scale mandates can work to reduce job-lock in the labor market, particularly by generating increased mobility in younger workers (Akosa Antwi et al., 2013).

With significant arguments on both sides of the debate, there is no clear consensus regarding whether mandates – in particular the Employer Mandate – reduce or increase welfare. A stronger understanding of the behavior of firms in response to policies like the Employer Mandate could better inform the ongoing debate on EPHI, as well as provide researchers with tools to assess whether the Mandate is a desirable policy. Further, a framework providing insight into the long-run impact of this policy could aid policymakers in
anticipating subsequent shifts in the economy.

3 Literature Review

There is a growing literature on the welfare implications of the Employer Mandate, as well as a well-established literature surrounding health reform in Massachusetts, which implemented similar policies around 2006. Kolstad and Kowalski (2016) find that in the aftermath of Massachusetts health reform, firms providing EPHI paid slightly lower wages than non-EPHI firms. Focusing on the more recent Affordable Care Act, Dillender et al. (2016) provide evidence that firms reduced hours for many of their employees in response to the Employer Mandate, resulting in a significant rise in involuntary underemployment. Corroborating this finding, Even and Macpherson (2018) find that industries more likely to be affected by the ACA employer mandate exhibited higher rates of involuntary underemployment. Examining the effect of less restrictive employee mandate policies from 2004-2006, Van der Goes et al. (2011) produce small, negative estimates of the effect of increased state-level mandates on the probability of an individual having EPHI. In contrast, Gruber (1994) finds no evidence that state-level firm mandates have significant effects on insurance coverage, arguing this is likely the case due to the non-binding nature of less-restrictive mandates.

While the evidence on supply-side responses to mandate policies is mixed, there have been multiple studies that have considered employee responses to employer mandate policies. These studies arrive to a similar consensus: worker mobility is reduced by EPHI, especially for non-married individuals that cannot benefit from a spouse’s plan. Gilleskie and Lutz (1999) find that unmarried men exhibit significantly higher rates of job-lock relative to married men who are more likely to obtain health insurance through a spouse. Examining the interaction between health shocks and EPHI and their effects on labor supply, Bradley et al. (2013) find that, conditional on a new breast cancer diagnosis, women who depend on their own job for health insurance tend to reduce labor hours less than their counterparts who obtain health
insurance through a spouse. Buchmueller and Valletta (1996) find evidence that, all else equal, job-lock rates are higher for individuals more likely to use health care services, while Madrian (1994) finds that voluntary job turnover rates are significantly lower for individuals with EPHI than those without it.

Along with the numerous papers examining the job-lock phenomenon associated with EPHI, studies have examined adjustments and other economic behaviors from both firms and individuals. One of the most significant subjects within this section of the literature is the adjustment of wages in response to rises in insurance premiums. While popular theory predicts that insurance-providing firms will shift the burden of rising insurance premiums to their employees by lowering wages, it is difficult to determine whether this occurs in practice. Sommers (2005) finds evidence that in the short run, firms bear some burden of rising premiums in the event of sticky nominal wages, and that firms will reduce employment in response.

While there are numerous papers examining the implications of insurance mandates on labor mobility, wages and employment, there is a lack of research regarding the distributional consequences of mandates on firms – the introduction of mandate policies can spur market exit, delay market entry, and adjust firms’ hiring and firing strategies. As these responses vary by firm, distributional characteristics like size (in employment) are altered by the onset of additional mandates. Further, given the empirical framework utilized in the majority of papers that examine the effects of EPHI and mandates, it is difficult to make statements about net welfare in response to mandates, as these papers can only analyze the impact of such policies in partial equilibrium. My paper provides a conceptual framework that is able to examine the effects on distributional characteristics of firms, as well as examine the implications of healthcare mandates on net societal welfare. And, given its size-cutoff requirement, my framework is especially well-suited for analyzing the effects of the recent ACA Employer Mandate.

Currently, to the best of my knowledge, there is no work in the literature that attempts to
model heterogeneous firm responses to healthcare policies in a general equilibrium framework. Despite this, there are multiple papers focused on firm dynamics and international trade that provide a strong baseline from which to build such a model. Using the principle of firms differing in productivity levels developed in Hopenhayn (1992), Melitz (2003) adapted the model developed in Krugman (1980) in order to better capture firm selection into export markets. What makes the modeling framework presented in Melitz (2003) desirable for the purposes of this paper is that it considers a closed-economy and open-economy case, which can be adapted to compare economies in which there is either no EPHI, the choice to provide EPHI, or an employer mandate in place. Further, in Melitz’s model, all firms produce unique varieties of a product consumed by “love of variety” consumers, effectively giving each firm a degree of market power. This, along with heterogeneity in productivity levels, allows for us to abstract from the concept of a representative firm with no market power, to the more realistic concept of many nonidentical firms with some degree of market power. Given the empirical observation that EPHI status of firms is not perfectly correlated with size, this framework serves as a more effective way to capture firm responses to mandate policies.

4 Variability in Insurance Coverage

One of the main advantages of the conceptual framework I present in this paper is its ability to address variation in the shares of firms offering health insurance over different size classes. While larger firms are more likely to offer health insurance to their employees, there is still notable variability in the offerage status by firm size – there are a considerable number of large firms that do not offer health insurance, accompanied by a significant number of smaller firms that do offer health insurance.

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3Throughout this paper I define firm size to be the number of workers employed at a firm.
This variation in offer status is illustrated in figure 1, which displays the share of the employees offered health insurance by their firm, separated by various firm size bins.\footnote{Data comes from the IPUMS-CPS database.} The finding that larger firms are more likely, but not guaranteed, to offer health insurance when a smaller firm does not motivates the structure of my model so that it can capture this empirical fact. The features that allow for this observation to be captured are developed in the following sections.

5 Setup of the Model

Assuming no government policies are in place, a firm will solve two optimization problems when determining whether to offer health insurance – one where it does offer insurance, and one where it does not. From there, it will backwards induct to determine which strategy to employ. As described earlier, firms that offer health insurance pay higher fixed costs of production, but enjoy lower marginal costs relative to when they do not offer insurance. It is the tradeoff between these two factors that ultimately decides whether a firm will offer insurance. In the following subsections, I outline the consumer demand function and consider
the firm’s solution to each optimization problem.

5.1 Demand

Suppose that the economy is comprised of a mass of workers, denoted by \( L \), and a continuum of goods \( \Omega \). Each worker has identical “love of variety” preferences given by:

\[
U = \left( \int_{\omega \in \Omega} c_{\omega}^\rho \right)^{1/\rho}
\]

where \( c_{\omega} \) denotes the amount of consumption on variety \( \omega \), and \( \rho \in (0, 1) \) is a measure of a consumer’s elasticity of substitution. As \( \rho \to 1 \), preferences approach perfect substitutes, and as \( \rho \to 0 \), preferences approach perfect complements. Assume that the set of varieties consumed is an aggregate good \( C \) so that \( C \equiv U \). Define the associated aggregate price by

\[
P = \left( \int_{\omega \in \Omega} p_{\omega}^{1-\sigma} \right)^{1/\sigma} \tag{1}
\]

where \( \frac{\sigma}{\sigma-1} = \frac{1}{\rho} \). Assume these goods are substitutes, i.e. \( \rho \in (0, 1) \). Then, the consumer’s optimal quantity of consumption of variety \( \omega \) is given by

\[
c_{\omega} = \left( \frac{p_{\omega}}{P} \right)^{-\sigma} C \tag{2}
\]

Given equation 2, we can derive the following expression for a consumer’s expenditure on good \( \omega \), denoted by \( x_{\omega} \)

\[
x_{\omega} = \left( \frac{p_{\omega}}{P} \right)^{1-\sigma} X \tag{3}
\]

Here, \( X = PC \) denotes aggregate expenditures.
5.2 The Firm’s Problem When not Offering Insurance

The firm’s problem in the case where they do not offer health insurance is exactly that of Melitz (2003) in the closed economy case. I make some notational changes and thus present the framework for the no-insurance case below.

As in Melitz, assume that there is a continuum of firms that produce unique varieties. The only difference between each firm is their productivity, \( \varphi \), which is drawn from a probability distribution \( g(\varphi) \) before entering the market. Assume that production requires just one input, labor, supplied inelastically at the level \( L \), a measure of exogenous labor force size. Allow the price of labor, \( w \) to be the numeraire. Firms face a constant marginal cost of production and a fixed overhead cost. Assume that each firm needs \( \frac{L}{\varphi} \) units of labor to produce each additional quality of its variety, and that each firm incurs a fixed cost of production \( f \). Then, the labor required for a firm to produce \( q_\omega \) units of good \( \omega \) is given by:

\[
l_\omega = f + \frac{q_\omega}{\varphi_\omega}
\]  

(4)

Note that marginal cost is only dependent on productivity \( \varphi \). Thus, we express optimal price as a function of \( \varphi \), and substitute this into the firm’s profit function:

\[
\pi_\omega(\varphi) = p_\omega(\varphi)q_\omega - l_\omega(\varphi)
\]

\[
= p_\omega(\varphi)q_\omega - \left( f + \frac{q_\omega}{\varphi_\omega} \right)
\]

One can impose the firm’s first-order condition to derive firm’s the optimal pricing rule:

\[
p_\omega(\varphi) = \left( \frac{\sigma}{\sigma - 1} \right) \frac{1}{\varphi}
\]

(5)

Note that equation 5 simply expresses that each firm’s optimal price is a constant markup over its marginal cost, where their markup is dependent on the representative consumer’s
substitution preferences. The more willing a consumer is to substitute between goods (higher values of $\sigma$), the smaller degree of market power each firm has, subsequently diminishing their markups. We can substitute this optimal pricing rule into equation 3 to obtain an expression for optimal revenue:

$$r_\omega(\varphi) = \left(\frac{1}{P \rho \varphi}\right)^{1-\sigma} R$$

$$r_\omega(\varphi) = (P \rho \varphi)^{\sigma-1} R$$

(6)

where we see that revenues are increasing in productivity. Note that, conditional on having the same productivity level, any two firms will behave identically. Thus, we will henceforth drop the subscripts when denoting optimal prices, revenues, and profits:

$$p_\omega(\varphi) = p(\varphi) \Rightarrow r_\omega(\varphi) = r(\varphi) \Rightarrow \pi_\omega(\varphi) = \pi(\varphi)$$

Using the optimal pricing rule we can derive the following expression for profits:

$$\pi_N(\varphi) = \frac{r_N(\varphi)}{\sigma} - f$$

(7)

where the $N$ subscript is used to identify profits and revenues if a firm were to not offer insurance. Intuitively, as $\sigma$ increases and firms are forced to lower price markups, profits decrease as well.

For any firm, notice that size (in labor hired) is increasing in $\varphi$:

$$l_N(\varphi) = r_N(\varphi) - \pi_N(\varphi)$$

$$= r_N(\varphi) - \frac{r_N(\varphi)}{\sigma} + f$$

$$= \left(1 - \frac{1}{\sigma}\right) r_N(\varphi) + f$$

As $\frac{\partial r_N}{\partial \varphi} > 0$, this implies that $\frac{\partial l_N}{\partial \varphi} > 0$. Intuitively, as firms become more productive, the marginal product of labor of each additional worker increases so that ceteris paribus, it is
profitable to hire more workers.

5.3 Firm’s Problem when Offering Insurance

We now consider the firm’s optimization problem when choosing to offer health insurance. In order to keep the model tractable, some simplifying assumptions are in order.

1. Firms that choose to offer health insurance must provide \( \tau \) units of health insurance for every unit of labor used. Here, \( \tau = (w + h) \), where \( w \) is the wage rate and \( h \) is the additional, health related expenses paid by each firm for each unit of labor.\(^5\) While a more realistic assumption would be that firms provide insurance to family members of their employees, this further complicates the firm’s problem and we thus abstract from such a requirement.

2. Firms must pay an additional fixed cost \( f_H \) of implementing health coverage. This fixed cost reflects the time and effort that the firm must spend adjusting to supplying health care – this time may be spent developing insurance contracts, identifying appropriate plans to implement, and informing current and prospective employees of the feature. This is time that could otherwise be spent producing and earning revenue, and is thus costly to the firm.

3. Firms providing healthcare obtain a scaling \( \alpha > \tau > 1 \) to their drawn productivity level.\(^6\) This markup reflects the externality benefits of a healthier labor force, and is backed up by the empirical finding that employees of firms that provide health insurance are less likely to miss time from work, which forces the firm to adjust and reallocate the tasks of its employees. There is also evidence that individuals with health insurance exhibit less stress than individuals without health insurance (Haushofer et al., 2017), which is associated with higher levels of productivity (Sobocki et al., 2006), and

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\(^5\)As \( w \) is the numéraire, in this scenario \( \tau = (1 + h) \).

\(^6\)Note that we assume \( \alpha > \tau \), for otherwise, trivially, firms would never choose to supply healthcare if given the choice, as it would increase their (constant) marginal cost of production.
recent evidence implies that firms offering insurance may be more profitable per worker
(Yamada et al., 2016). From an alternative point of view, firms offering health insurance
may attract more productive workers that value this benefit.

Let \( \pi_H \) and \( l_H \) denote profits and labor costs under a health insurance system, respectively. Also, let a firm’s productivity under a health insurance system be given by \( \varphi_H \equiv \alpha \varphi \). Then, profits are given by

\[
\pi_H(\varphi) = p_H(\varphi)q_H(\varphi) - l_H(\varphi)
\]

where we have that

\[
l_H(\varphi) = (f + f_H) + \frac{\tau q}{\alpha \varphi}
\]

Thus, profits can also be written as

\[
\pi_H(\varphi) = p_H(\varphi)q - (f + f_H) - \frac{\tau q}{\alpha \varphi}
\]

(8)

We can solve for the optimal price to maximize (8):

\[
p_H(\varphi) = \left( \frac{\sigma}{\sigma - 1} \right) \frac{\tau}{\alpha \varphi}
\]

(9)

As before, firms charge a constant markup over their marginal cost of production. Note that as \( \sigma \to \infty \) preferences approach perfect substitutes, and the firm’s price markup converges to 1 as they lose market power. Given the optimal pricing rule, firm revenues are given by

\[
r_H(\varphi) = \left( \frac{P \rho \alpha \varphi}{\tau} \right)^{\sigma - 1} R
\]

As \( \tau \) increases, we see that firms earn lower revenues (despite charging higher prices) as a result of lower production. Conversely, as the scaling a firm receives to its productivity increases, so do its revenues and profits.
Finally, we can derive a similar expression for profits to the case of no EPHI:

$$\pi_H(\varphi) = \frac{r_H(\varphi)}{\sigma} - (f + f_H)$$ \hspace{1cm} (10)

So long as $\alpha > \tau$, it is clear that for any firm $r_H > r_n$ – it is the additional fixed cost that prevents some firms from offering insurance. Note that with this framework in place, many of the properties of the original Melitz model hold:

1. **Conditional on offering health insurance, more productive firms produce more.**
   
   Let $\varphi_A > \varphi_B$. Then, we have that
   
   $$\frac{q_H(\varphi_A)}{q_H(\varphi_B)} = \frac{r_H(\varphi_A)/p_H(\varphi_A)}{r_H(\varphi_B)/p_H(\varphi_B)}$$
   
   $$= \left(\frac{\varphi_A}{\varphi_B}\right)^\sigma > 1$$

2. **Under the healthcare framework, higher productivity firms earn higher revenues.**
   
   Again, assume that $\varphi_A > \varphi_B$. Then, notice
   
   $$\frac{r_H(\varphi_A)}{r_H(\varphi_B)} = \frac{(P\tau^{-1}\rho\varphi_A\alpha)^{\sigma-1} R}{(P\tau^{-1}\rho\varphi_B\alpha)^{\sigma-1} R}$$
   
   $$= \left(\frac{\varphi_A}{\varphi_B}\right)^{\sigma-1} > 1$$

3. **Under the assumption that $f_H$ and $\alpha$ are fixed, more productive firms earn more profits when all firms offer health insurance.**
   
   Continuing to assume $\varphi_A > \varphi_B$, we have
   
   $$\pi_H(\varphi_A) - \pi_H(\varphi_B) = \frac{1}{\sigma} (r_H(\varphi_A) - r_H(\varphi_B)) > 0,$$

   as $r_H(\varphi_A) > r_H(\varphi_B)$. 
Note that result 3 does not necessarily hold if $f_H$ and $\alpha$ vary by firm (see Appendix).

6 Timeline and the Decision to Offer Health Insurance

In this section, I provide a timeline that describes a firm’s decision process in whether or not to enter the market and, ultimately, whether to offer health insurance. A diagram of this process is displayed in figure 2. Each firm’s decision process abides by the following sequence:

1. Each prospective firm decides whether or not to draw a productivity $\varphi$ from a distribution $g(\varphi)$. Prospective firms choosing to draw a productivity incur a fixed cost $f_e$ so that firms will only enter if the expected value of the draw exceeds the fixed cost.

2. Firms that draw a productivity $\varphi_0$ then choose whether to enter the market. This will occur if either $\pi_H(\varphi_0) \geq 0$ or $\pi_N(\varphi_0) \geq 0$. In an economy where there is a partitioning of firms by offer status, it assumed that firms enter if $\pi_N(\varphi_0) \geq 0$.

3. Conditional on entering the market, firms that enter the market will offer health insurance only if $\pi_H(\varphi_0) > \pi_N(\varphi_0)$

4. Each period, every firm faces an exogenous probability $\delta$ of incurring a shock that knocks them out of the market. By assumption, each period, the mass of firms exiting the market due to bad shocks is exactly replaced by a mass of new, entering firms.

The ultimate focus of this project is to consider how decisions to offer/not offer insurance can change with size cutoff policies. As in Hopenhayn (1992), $\varphi$ can be used as a measure of size, which we have shown is positively related to $\varphi$. In the case where a policy binds such that all firms above a certain threshold $\varphi^*$ must provide health insurance, the decision is trivial for all firms with $\varphi > \varphi^*$. Firms with $\varphi < \varphi^*$ will solve the same two optimization problems, and chose whichever scheme provides the higher profits.
Enter the market

\[ \pi_N(\varphi) \geq 0 \]

\[ \pi_N(\varphi) < 0 \]

Offer insurance

\[ \pi_H(\varphi) \geq \pi_N(\varphi) \]

Do not offer

\[ \pi_H(\varphi) < \pi_N(\varphi) \]

FIGURE 2: Diagram of firm’s decision of whether to purchase insurance.

7 Analysis of Economy with No Mandate Imposed

In this section, I analyze the equilibrium of an economy where all firms have the choice of offering or not offering insurance, with no firms facing penalties for their decisions.

7.1 Aggregation

An equilibrium in an economy with heterogeneous firms choosing to offer insurance will be characterized by a mass \( M = M_N + M_H \) firms, where \( M_N \) and \( M_H \) denote the masses of firms offering and not offering insurance, respectively. Using the same definition of average productivity used in Melitz, average productivity \( \tilde{\varphi} \) of producing firms is be given by

\[
\tilde{\varphi} = \left[ \frac{1}{M} \left( M_N \tilde{\varphi}_N^{\sigma-1} + M_H \left( \frac{\alpha}{\tau} \tilde{\varphi}_H \right)^{\sigma-1} \right) \right]^{\frac{1}{\sigma-1}} \tag{11}
\]

where \( \tilde{\varphi}_N \) and \( \tilde{\varphi}_H \) denote average levels of productivity for non-offering and offering firms, respectively. Letting \( \tilde{r}_N \equiv r_N(\tilde{\varphi}_N) \) denote average revenues amongst non-offering firms, and
defining $\tilde{r}_H$ similarly, we have that average revenues $\tilde{r}$ are given by

$$\tilde{r} = \frac{1}{M} (M_N \tilde{r}_N + M_H \tilde{r}_H)$$

Using similar definitions, average profits $\tilde{\pi}$ are given by

$$\tilde{\pi} = \frac{1}{M} (M_N \tilde{\pi}_N + M_H \tilde{\pi}_H)$$

We define aggregate welfare $W$ to be the inverse of the aggregate price level:

$$W \equiv \frac{1}{\bar{P}}$$

Intuitively, higher aggregate price levels imply that consumption becomes more expensive for workers, harming their welfare. Note that the level of health coverage in the economy does not influence aggregate welfare in this model, as it is assumed that workers do not gain utility from health or from holding health insurance. The implications of this assumption are discussed in a later section.

### 7.2 Firm Entry and Exit

As in Melitz, there is an unbounded pool of prospective firms looking to enter the economy. Firms looking to enter the market must first pay an initial fixed cost $f_e$ to sample a productivity parameter from a density $g(\varphi)$ with an associated cumulative distribution $G(\varphi)$. Assume $g$ is continuous with a positive support over $(0, \infty)$. Firms drawing a sufficiently high $\varphi$ will enter the market and choose to either offer or not offer health insurance. Each time period, producing firms face an exogenous probability $\delta$ of exiting the market. Assume no time discounting exists.
FIGURE 3: Example off a cutoff productivity, where all firms with $\varphi < \varphi^*$ do not enter the market.

Note that each firm’s value function for drawing productivity $\varphi$ is given by

$$V(\varphi) = \max \left\{ 0, \sum_{t=0}^{\infty} (1 - \delta)^t \pi(\varphi) \right\} = \max \left\{ 0, \frac{\pi(\varphi)}{\delta} \right\}$$

As $\pi$ is continuous and increasing in $\varphi$, there is some $\varphi^*$ such that

$$\varphi^* = \inf \{ \varphi \in (0, \infty) \mid \pi(\varphi) > 0 \}$$

where the inf operator obtains the infimum of the set. Assuming $\varphi^* > 0$, then there will be a mass of firms with $\varphi < \varphi^*$ who choose to not enter the market. Figure 3 displays this graphically – all firms with $\varphi^*$ (the shaded region) choose not to enter the market, while all other firms enter the market.

As profits pare increasing in $\varphi$, then if $\alpha > \tau$ there will be some level of productivity $\varphi_H$. 

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such that \( \pi_H(\varphi) > \pi_N(\varphi) \) for all \( \varphi \geq \varphi^*_H \). If \( \varphi^*_H > \varphi^* \), then there will be a partitioning of firms such that all firms with \( \varphi \in (\varphi^*, \varphi^*_H) \) will not offer insurance, while firms with \( \varphi \geq \varphi^*_H \) will offer insurance. If \( \varphi^*_H < \varphi^* \), then all producing firms will offer health insurance. As seen in section 4, in the U.S. economy there is variability in the share of firms that offer insurance – a large share employees do not receive insurance from their employers. This is far from the extreme case of all producing firms offering insurance. Thus, to obtain a partitioning of firms we assume that \( \alpha, \tau, \) and \( f_H \) are such that we always have \( \varphi^* < \varphi^*_H \).

Since firms either offer or do not offer health insurance, we have that profits \( \pi(\varphi) \) for a firm with productivity \( \varphi \) are given by

\[
\pi(\varphi) = \begin{cases} 
0, & \varphi < \varphi^* \\
\pi_N(\varphi), & \varphi^* \leq \varphi \leq \varphi^*_H \\
\pi_H(\varphi), & \varphi > \varphi^*_H 
\end{cases}
\]

Revenues and prices are defined similarly.

Note that firms will only pay the fixed cost \( f_e \) if the expected value of drawing \( \varphi \) from \( g(\varphi) \) exceeds \( f_e \). From this, we are able to derive a relationship between average profits and the fixed cost of entry:

\[
\tilde{\pi} = \frac{\delta f_e}{1 - G(\varphi^*)} \quad (15)
\]

where \( G(\varphi^*) = \int_0^{\varphi^*} g(\varphi) d\varphi \) is the probability of a draw sufficiently low that a firm will choose to not enter the market. Intuitively, if the depreciation rate \( \delta \) or the fixed cost of drawing a productivity \( f_e \) increase, firms will require a higher level of expected profits to enter the market as a means to counteract the rising costs of entering.

### 7.3 Zero-Cutoff Profits

As average productivity levels \( \varphi_N \) and \( \varphi_H \) are tied to their respective cutoff productivities, average profits and revenues for each type of firm are also tied to their respective cutoff
productivity levels. Consider producing firms that are not offering insurance. For such firms, it must be the case that

\[ \pi_N(\varphi^*) = 0 \iff r_N(\varphi^*) = \sigma f \]

With this condition, we have that

\[ \pi_N(\tilde{\varphi}_N) = f \left[ \left( \frac{\tilde{\varphi}_N}{\varphi^*} \right)^{\sigma^{-1}} - 1 \right] \] (16)

where the dependence of \( \tilde{\varphi}_N \) on \( \varphi^* \) is understood. Following the same procedure, we have that

\[ \pi_H(\tilde{\varphi}_H) = (f + f_H) \left[ \left( \frac{\tilde{\varphi}_H}{\varphi^*_H} \right)^{\sigma^{-1}} - 1 \right] \] (17)

As earlier, this implies that

\[ \tilde{\pi} = \frac{1}{M} (M_N \tilde{\pi}_N + M_H \tilde{\pi}_H) \]

\[ = \frac{1}{M} [M_N f k_N(\varphi^*) + M_H (f + f_H) k_H(\varphi^*_H)] \]

where \( k_N(\varphi^*) = \left[ \left( \frac{\tilde{\varphi}_N}{\varphi^*} \right)^{\sigma^{-1}} - 1 \right] \) and \( k_H(\varphi^*_H) = \left[ \left( \frac{\tilde{\varphi}_H}{\varphi^*_H} \right)^{\sigma^{-1}} - 1 \right] \). This verifies that, as in Melitz, the zero profit condition implies a relationship between the cutoff level of productivity \( \varphi^* \) and average profits. As will be shown in the following section, \( \varphi^*_H \) can be expressed as a function of \( \varphi^* \) so that the zero-cutoff profit condition is entirely determined by \( \varphi^* \).

### 7.4 Equilibrium Conditions

As in Melitz, the free-entry and zero-cutoff profit equations provide two mappings between \( \tilde{\pi} \) and \( \varphi^* \). As a result, the equilibrium \((\varphi^*, \tilde{\pi})\) pair is determined by the intersection of these two expressions. Given the equilibrium level \( \varphi^* \), one can find an expression for \( \varphi^*_H \) by using the zero-cutoff profit condition (see Appendix for derivation):

\[ \varphi^*_H = \varphi^* \left( \frac{f_H}{f} \right)^{\frac{1}{\sigma-1}} \left[ \left( \frac{\alpha}{\tau} \right)^{\sigma-1} - 1 \right]^{\frac{1}{\sigma}} \] (18)
FIGURE 4: General equilibrium profits as a function of \( \varphi \), using a Pareto density function with shape parameter 6.5 and lower bound 1.

Note that this expression implies a necessary condition that \( \frac{\alpha}{\tau} \) is sufficiently small, so that \( \varphi^*_H \geq \varphi^* \). Without such a condition, all producing firms would choose to offer health insurance, which would not adequately capture current industry behavior. Figure 4 displays equilibrium profit functions for offering and non-offering firms as functions of productivity, with \( \varphi^*_H \) corresponding with the intersection of these two curves.

Provided that \( \frac{\alpha}{\tau} \) is sufficiently small, notice that \( \frac{\partial \varphi^*_H}{\partial \alpha} < 0 \), implying that the cutoff productivity for offering health insurance decreases as the productivity scaling increases – this is intuitive, as a larger scaling of productivity implies that there are greater returns to offering insurance. Thus, the corresponding threshold productivity at which it becomes more profitable for a firm to offer insurance decreases.

Similarly \( \frac{\partial \varphi^*_H}{\partial f_H} > 0 \) and \( \frac{\partial \varphi^*_H}{\partial \tau} > 0 \). This implies that if the fixed cost of offering insurance increases, or the additional cost per unit of insured labor increases, then it will take a higher level of productivity to induce firms to offer insurance.
In equilibrium, we must have that aggregate revenue $R$ is equal to aggregate expenditures from offering firms ($L_H$) and non-offering firms ($L_N$):

$$R = L = L_N + L_H$$

As total labor is supplied inelastically, we have that $L_N = p_N L$ and $L_H = p_H L$, where $p_N$ and $p_H$ denote the ex-ante probabilities of not offering insurance and offering insurance, respectively. Noting that $\bar{r} = p_N \bar{r}_N + p_H \bar{r}_H$, we can determine the mass of producing firms by noting

$$M = \frac{R}{\bar{r}} = \frac{L}{p_N \bar{r}_N + p_H \bar{r}_H} \quad (19)$$

### 8 Policy Intervention: Employer Mandate

To this point, we have only considered an economy where firms are freely able to choose whether to offer health insurance, with no possibility of penalty for not offering. Suppose that the government imposes a policy that requires producing firms with $\varphi > \varphi_m$ (where $\varphi_m > \varphi^*$) to offer insurance to their employees, or else pay some fixed fine $\tau_m < \tau$. This is in line with the penalties imposed by the Employer Mandate, which requires violating firms to pay a fixed fine per employee that is less than the typical cost of an insurance premium. Affected firms must decide whether it is more profitable to offer insurance (and pay additional fixed costs but enjoy lower marginal costs of production), or to not offer insurance and incur higher marginal costs of production. Namely, affected firms compare $\pi_m(\varphi)$ to $\pi_H(\varphi)$. This new decision process is outlined in figure 5.\textsuperscript{7}

\textsuperscript{7}Note that this economy is entirely separate from the scenario outlined earlier. That is, this is not a scenario where firms make decisions with no mandate imposed, and then face a mandate after already entering the market. This model explores an economy where all prospective firms know a mandate exists before entering. As a result, we are unable to see the transition dynamics between the two equilibria.
FIGURE 5: Firm decision process when the mandate is imposed.
Under such a system, the labor required to produce \( q \) units of output is given by

\[
l_m(\varphi) = f + \frac{\tau_m q}{\varphi}
\]

Similar to before, firms maximize profits by setting a price that is a constant markup over their marginal cost:

\[
p_m(\varphi) = \left(\frac{\sigma}{\sigma - 1}\right) \frac{\tau_m}{\varphi}
\]

Similar expressions can be found for revenues and profits:

\[
r_m(\varphi) = \left(\frac{P \rho \varphi}{\tau_m}\right)^{\sigma - 1} R
\]

\[
\pi_m = \frac{r_m(\varphi)}{\sigma} - f
\]

Note that as a result of the higher labor costs, producing firms affected by the mandate must charge higher prices and subsequently earn lower revenues and profits in equilibrium. Interestingly, this implies that in equilibrium there can exist firms with moderate productivity values that essentially behave as though they are lower productivity firms. We explore the implications that this has for smaller firms in the coming sections.

### 8.1 Effect of the Mandate

Note that firms with \( \varphi < \varphi_m \) are not affected by the policy. Similarly, firms with \( \varphi > \varphi_H^* \) are not affected, as these firms choose to offer insurance willingly. Thus, the affected region of firms are those with \( \varphi \in [\varphi_m, \varphi_H^*] \). Suppose that \( \varphi_m \) is selected by policymakers so that \( \pi_m(\varphi_m) = 0 \). While an extreme assumption, this ensures that no firms are knocked out of the market upon the introduction of the policy. Manipulating the ZCP conditions for \( \pi_m \) and \( \pi \) yields the desired value for \( \varphi_m \):

\[
\varphi_m = \tau_m \varphi^*
\]
Let $\varphi^*_{HM} < \varphi^*_H$ denote the cutoff level of productivity such that firms with $\varphi \geq \varphi_m$ are willing to offer insurance. This implies that for any $\varphi \geq \varphi^*_{HM}$, we have that $\pi_H(\varphi) \geq \pi_m(\varphi)$. Again manipulating the ZCP condition, one can find that

$$
\varphi^*_{HM} = \varphi_m \cdot \tau_m \left[ \left( \frac{\alpha}{\tau} \right)^{\sigma-1} - \left( \frac{1}{\tau_m} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}}
$$

$$
= \varphi^* \cdot \tau_m^2 \left[ \left( \frac{\alpha}{\tau} \right)^{\sigma-1} - \left( \frac{1}{\tau_m} \right)^{\sigma-1} \right]^{\frac{1}{\sigma}}
$$

Since $\pi_m < \pi_N$ for any $\varphi$, it can never be the case that $\varphi^*_{HM} > \varphi^*_H$. Note that, provided $(\frac{\alpha}{\tau}) > 0$, we will have that $\varphi^*_{HM} > \varphi_m$. This implies that setting a mandate productivity cutoff that knocks no firms out of production will result in some firms choosing to pay the mandate fine rather than offer insurance. We will explore the implications of this in the following section.

Results: Equilibrium Effects from the Employer Mandate

For a given distribution function $G(\varphi)$ and values for the model’s exogenous parameters, one can compare equilibrium values of various variables between an economy with and without an employer mandate imposed. Following a common trend in the literature see (Helpman et al., 2004; Chaney, 2008; Melitz and Redding, 2014), I use a Pareto distribution\footnote{Axtell (2001) shows that Pareto density functions fit firm size distributions well. As an added virtue, Pareto distributions often allow for closed-form model solutions.} with lower bound $\varphi_{\text{min}}$ and shape parameter $\gamma$. This yields functional forms of

$$
G(\varphi) = 1 - \left( \frac{\varphi_{\text{min}}}{\varphi} \right)^\gamma, \quad \varphi > \varphi_{\text{min}}
$$

$$
g(\varphi) = \frac{\gamma}{\varphi^{\gamma+1}}, \quad \varphi > \varphi_{\text{min}}
$$

where $\varphi_{\text{min}} = 1$ and $\gamma = 5.0$. My choice of $\gamma = 5.0$ is motivated by estimates from Bernard et al. (2003), who estimate a value of $\gamma = 3.6$ for U.S. firms. As Del Gatto et al. (2006) argue that this finding may be slightly downward-biased, and as the productivity gains from
TABLE 1: Parameters with sources (when appropriate) disciplining their values.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>0.1313</td>
<td></td>
</tr>
<tr>
<td>$\tau$</td>
<td>0.1250</td>
<td>IPUMS CPS</td>
</tr>
<tr>
<td>$\tau_m$</td>
<td>0.0585</td>
<td>IPUMS CPS</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>4</td>
<td>Feenstra et al. (2012)</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>5.0</td>
<td>Bernard et al. (2003), Del Gatto et al. (2006)</td>
</tr>
<tr>
<td>$f_e$</td>
<td>1</td>
<td>BLS</td>
</tr>
<tr>
<td>$f$</td>
<td>0.1</td>
<td>BLS</td>
</tr>
<tr>
<td>$f_H$</td>
<td>0.05</td>
<td>BLS</td>
</tr>
</tbody>
</table>

offering health insurance become disproportionately larger with lower values of $\gamma$, I choose a value of $\gamma = 5$. While this is a slightly upward-biased estimate of the true shape parameter, it ensures a sufficient partitioning of firms by EPHI status in equilibrium.

In disciplining the model’s remaining parameters, I turn to empirical data. Using the Integrated Use Public Micro Series' Current Population Survey (IPUMS CPS) data for 2016, I find that among full-time workers receiving health insurance from their employers, the median employer contribution was roughly $5,000, while the median full time worker yearly wage was $40,000. Thus, I assign $\tau = 0.1250$ to reflect percent contribution of median wage.

Similarly, I find that the standard Employer Mandate fine is roughly 5.85 percent of median income, and I thus assign $\tau_m = 0.0585$. As $\alpha > \tau$ is necessary for a partitioning of firms to occur, I assign $\alpha = 1.05\tau$ – that is, I choose $\alpha$ to be 5 percent larger than $\tau$ as means to ensure that health insurance becomes relatively more attractive for more productive firms in the model. Recent work by Feenstra et al. (2012) suggests that for the representative consumer, an elasticity of substitution of 4 is appropriate.

I calibrate $f_e$, $f$ and $f_H$ so that my model captures the observation from the Bureau of Labor Statistics’ Business Employment Dynamics (BLS BED) data that roughly 80 percent of establishments survive their first year of operation, so that the probability of successful entry $1 - G(\varphi^*)$ is roughly 80 percent in equilibrium. To capture this trend, I assign $f_e = 1$, $f = 0.1$ and $f_H = 0.05$. Table 1 displays the selected values for parameters, and the sources motivating their selection when appropriate.
Upon specifying parameter values, one can calculate and compare equilibrium allocations between the mandate and no-mandate economies. The results of the effects of the mandate on the values of cutoff productivity levels and variable values are displayed in Table 2.

<table>
<thead>
<tr>
<th>Without Mandate</th>
<th>With Mandate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\varphi^*$</td>
<td>1.2002</td>
</tr>
<tr>
<td>$\varphi_m$</td>
<td>1.2490</td>
</tr>
<tr>
<td>$\varphi_{HM}$</td>
<td>1.5828</td>
</tr>
<tr>
<td>$\varphi^*_H$</td>
<td>2.3033</td>
</tr>
<tr>
<td>$\varphi^*_H$</td>
<td>2.2613</td>
</tr>
<tr>
<td>$M$</td>
<td>0.84106</td>
</tr>
<tr>
<td>$P$</td>
<td>0.97228</td>
</tr>
<tr>
<td>$W$</td>
<td>1.0285</td>
</tr>
<tr>
<td></td>
<td>0.96250</td>
</tr>
</tbody>
</table>

TABLE 2: Comparing steady-states of mandate and no-mandate economies.

Note that the equilibrium cutoff productivity $\varphi^*$ decreases relative to an economy with no mandate imposed.\(^9\) Under an economy with an employer mandate, firms that draw $\varphi \in (\varphi_m, \varphi_{HM}^*)$ are forced to charge higher prices than they would have in an economy with no mandate. In this model, imposing a mandate effectively forces intermediate-productivity firms to behave as though they are low-productivity firms – they must charge higher prices and earn lower profits than they would in an economy without an employer mandate. This in turn makes it easier for firms with drawn low values of $\varphi$ to compete with firms that draw higher values of $\varphi$. As a result of the equilibrium productivity cutoff $\varphi$ decreasing, the equilibrium mass of firms increases, reflecting the larger number of firms able to successfully enter the market.

Another result of interest is the number of firms offering health insurance. While in a non-mandate economy, all firms with $\varphi > \varphi_H^*$ offer health insurance, in a mandate economy firms with $\varphi > \varphi_{HM}^*$ offer health insurance. We see that $\varphi_{HM}^* < \varphi_H^*$, where $\varphi_H^*$ is the cutoff for the economy with no mandate imposed. Thus, implementing an employer mandate increases the ex-ante probability (and hence the overall mass) of firms offering insurance. Do

\(^9\)Note that $\varphi_H^*$ decreases as well. Mathematically, this is because $\varphi_{HM}^*$ is a function of exogenous parameters, which have not changed, and $\varphi^*$, which decreased. The economic intuition is that as a result of firms becoming less productive on average, the aggregate price level rises which increases the returns to heightened levels of productivity brought about by offering insurance.
FIGURE 6: Equilibrium profits under a mandate and non-mandate system.

Note, however, that \( \varphi^* \neq \varphi_m \). This simply implies that firms with \( \varphi > \varphi_m \) choose to offer insurance, as for some it is still more profitable to pay the penalty than to incur the additional fixed costs of production. Imposing a less strict mandate – one in which \( \pi_m(\varphi_m) > 0 \) – could produce a condition in which all firms with \( \varphi > \varphi_m \) choose to offer insurance.

Note that welfare per worker decreases under the mandate economy relative to the no-mandate economy. Although the increase in the measure of firms has positive effects for welfare, average weighted productivity falls with the mandate. This is driven by the fact that less-productive firms are able to enter the market, and the fact that medium-productivity firms incur additional marginal costs that make them behave as though they are lower productivity. As a result, the aggregate price level rises, which decreases aggregate welfare.

While my model provides insight into the effects of a large-scale employer mandate on market entry, note that it is limited by its inability to account for consumer health preferences. Given that my model predicts that the total share of employment receiving EPHI increases under an employer mandate economy, there is likely a welfare-increasing channel that I am unable to account for that would make the net effects on welfare ambiguous. Further, note that I am not observing the transition from an equilibrium with no mandate imposed to the equilibrium with a mandate, but rather comparing the equilibrium prices and allocations.
between two respective economies. That all firms in the mandate economy are aware of the
effects of the mandate before entry is different than the more likely scenario of numerous
firms already producing upon the introduction of a mandate.

**Effect of the mandate on labor shares**

An essential motive behind the enactment of the ACA’s Employer Mandate was to increase
the share of labor that is employed by firms offering health insurance. I examine how these
labor shares are affected by the Employer Mandate within my model. Figure 7 displays the
share of employment at each type of firm. We see that before the mandate, roughly half of
all labor is employed at firms offering insurance, as opposed to 85 percent in the economy
with the Employer Mandate, with roughly 10 percent of labor at firms that choose to pay
the fine rather than offer insurance.

Note that this response is likely too sensitive to accurately mirror the effect of the mandate.
Part of the reason for this is that in this model, firms do not have the ability to reduce
workers to part time status or downsize in order to avoid the policy – whether firms are
affected by the policy is entirely determined by their draw of $\varphi$.

**Quantifying Welfare Losses**

While we have discussed qualitative differences between levels of welfare in different
economies to this point, it is useful to assign a quantitative measure to this difference. One
such method is to measure compensating variation for consumption. Let $\lambda$ denote the factor
by which one would need to increase consumption of each good by in order for an individual
to be indifferent between living in an economy with no mandate and an economy with an
employer mandate. Then, this $\lambda$ satisfies

$$\left( \int_{\Omega_N} c_{w}^{\rho} d\omega \right)^{\frac{1}{\rho}} = \left( \int_{\Omega_M} [(1 + \lambda) c_{w}^{\rho} d\omega \right)^{\frac{1}{\rho}}$$
where $\Omega_N$ and $\Omega_M$ denote the set of varieties available in a no-mandate and mandate economy, respectively.\textsuperscript{10} Then,

$$\lambda = \left( \frac{\int_{\Omega_N} c_{\omega}^p d\omega}{\int_{\Omega_M} c_{\omega}^p d\omega} \right)^{\frac{1}{p}} - 1$$

denotes the compensating differential needed to make a consumer indifferent in living between the two economies. As we assume a representative consumer, and in equilibrium aggregate consumption must equal the aggregate quantity of goods produced, we have that

$$\lambda = \frac{Q_N}{Q_M} - 1$$

where $Q_M$ and $Q_N$ denote aggregate production quantity in an economy with and without an employer mandate, respectively. Due to productivity losses, and the subsequent rise of the aggregate price level brought about by the Employer Mandate, it is intuitive that for any scenario $Q_N > Q_M$ so that $\lambda > 0$, though it is useful to examine this magnitude. Using

\textsuperscript{10}The dependence of $c_{\omega}$ on the type of economy is taken as understood.
the same parameter values as earlier, I calculate a compensating variation of 6.86 percent, implying one would need to boost aggregate consumption by 6.86 percent for an individual to be indifferent between living in an economy with or without an Employer Mandate. Table 3 restates the results of Table 2, now including the compensating variation factor.

<table>
<thead>
<tr>
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</tr>
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<tbody>
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</tr>
<tr>
<td>$P$</td>
<td>0.97228</td>
</tr>
<tr>
<td>$W$</td>
<td>1.0285</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>0.0686</td>
</tr>
</tbody>
</table>

TABLE 3: Effect of the employer mandate for specified parameter values.

Note that $\lambda$ is calculated under the assumption that health preferences do not enter into a consumer’s utility function. It is likely that this is an upward biased estimate of what the corresponding variation would be if consumers did have health preferences, as their utility would be increasing in the number of firms offering insurance.

8.2 Effect of the Mandate with Preexisting Taxes

Suppose that yearly government spending, fixed at $g$, is financed by taxing the profits of producing firms at a rate $\tau_1$. In the event of a mandate being imposed, assume that all penalties (with price $\tau_m$) are paid to the government. In the event that government spending is fixed at $g$, this implies that for a fixed mandate penalty, there are two different tax rates needed to finance government spending, depending on whether a mandate is imposed. Specifically, if $\tau_1$ and $\phi_{HN}^*$ denote the tax rate and market-entering cutoff productivity corresponding to an economy with no mandate imposed, while $\tau_2$ and $\phi_{HM}^*$ denote the tax rate and production
cutoff productivity corresponding to an economy with a mandate imposed, then

\[ g = \tau_1 \int_{\varphi_{\text{N}}}^{\infty} \pi(\varphi) d\varphi = \tau_2 \int_{\varphi_{\text{M}}}^{\infty} \pi(\varphi) d\varphi + \tau_m \int_{\varphi_{\text{M}}}^{\varphi_{\text{HM}}} q(\varphi) d\varphi \]  \hspace{1cm} (21)

where the dependence of the other cutoffs on whether the mandate is imposed is understood. Substituting each integral for its aggregate symbol, we can write \( \tau_2 \) as a function of \( \tau_1 \):

\[ \tau_2 = \frac{\tau_1 \Pi|_{\text{N}} - \tau_m Q_m}{\Pi|_{\text{M}, \tau_2}} \]  \hspace{1cm} (22)

Note that \( \Pi|_{\text{M}, \tau_2} \) is influenced by the value of \( \tau_2 \), as the taxes that prospective firms face ex-ante will influence market entry. This is due because higher taxes on profits lower the lifetime stream of non-taxed profits that a firm will expect to earn when weighing whether to pay \( f_e \) to draw from \( g(\varphi) \). As a result, firms will require a higher threshold value of expected profits to enter the market, meaning the composition of firms that enter the market will be influenced by the value of the tax rate, with higher tax rates implying that entering firms will be more profitable on average. Thus, the value of \( \tau_2 \) cannot be calculated analytically, though it is relatively easy to calculate by using numerical software.

There is an intuitive appeal to the idea that we should always have \( \tau_2 < \tau_1 \), as the government has two sources of revenue under an economy with an employer mandate: taxes on profits and fines paid by firms with \( \varphi > \varphi_m \) that choose to not offer insurance. This does not incorporate the possibility that aggregate profits are sufficiently lower with a mandate imposed – this could be the case due to medium productivity firms effectively being forced to behave as though they are lower productivity firms. Thus, there are two conflicting effects: added revenue from mandate fines, but potentially lower profits to tax due to the mandate. The coming section examines the net effects of these two forces.
Results: Tax-Funded Government Spending

Using the same density function and parameter values as earlier, I calculate $\tau_2$ for numerous values of $\tau_1$. A plot of each $(\tau_1, \tau_2)$ mapping for various initial values of $\tau_1$ to $\tau_2$ is displayed in Figure 8.

From Figure 8, we see that for feasible profit-tax values, imposing a mandate implies that the government could set relatively lower values of profit taxes for all firms to fund their fixed budget, given that they are receiving additional revenue from firms that have $\varphi > \varphi_m$ but do not offer insurance. This implies that additional revenue from mandate fines dominates the lower level of aggregate profits resulting from the mandate. For proponents of lowering corporate taxes, the results of my model suggest that an Employer Mandate could provide a means by which to lower marginal taxes paid by firms while not contributing to a government deficit. Again, this exercise does not reflect the transition between two equilibria, but rather the comparison of two separate economies.

FIGURE 8: $\tau_2$ needed to generate the same amount of government revenue in a mandate economy as the revenue generated by $\tau_1$ in a non-mandate economy.
9 Conclusion

Policies that vary among firms along the dimension of size have important consequences not only for welfare, but for influencing the dynamics that encourage market entry and development of production methods. The conceptual framework I present in this paper is well-suited for examining the impact of size-specific policies like the Employer Mandate, and can be adjusted to examine the effects of other size-specific policies. In analyzing my main calibration, my model suggests that the Employer Mandate can lower barriers that discourage lower-productivity firms from entering the market, while also offering a manner by which the government could lower corporate taxes while not contributing to a higher deficit. On the other hand, my model suggests that higher aggregate price levels brought about by the Employer Mandate could harm consumer welfare – within my model one would need to raise aggregate consumption by 6.86 percent to fully compensate for welfare losses consumers face due to the Employer Mandate.

While my findings provide a degree of insight into how the Employer Mandate may ultimately affect steady state economic outcomes, their interpretations should not be extrapolated due to the numerous simplifying assumptions I make. The assumption that health preferences do not enter into a consumer’s utility function is necessary to maintain tractability, though this assumption likely biases the measurements of relative welfare. Further, firms likely vary among dimensions other than productivity that would result in less than perfect correlation between productivity and the likelihood of offering insurance. Nonetheless, my conceptual framework provides a benchmark means by which to analyze the effects of the Employer Mandate.

As the Employer Mandate was only recently implemented, current empirical data is unlikely to reflect the steady state that the U.S. is approaching in response to the policy. My analysis only compares steady states between two economies, rather than the transition dynamics that occur between these steady states. While the future availability of longer-run data on EPHI will provide opportunities for empirical assessments of my model, the exercise
of determining transition dynamics between steady states is especially relevant for measuring the efficacy of size-specific policies like the Employer Mandate. I plan to investigate this transition in future research.
Acknowledgements

The completion of this project would not have been possible without the time and generosity of numerous individuals. I am especially indebted to my thesis advisor Robert Lester. As both my teacher and mentor, I have learned more from Rob than I could ever give him credit for.

I am grateful to numerous members of the economics department for both their interest in my research and their willingness to provide insights. Without implication, I would like to thank Dan LaFave, Lindsey Novak, Tim Hubbard and Andreas Waldkirch for the impacts, both directly and indirectly, my interactions with them have had on this project.

Finally, I would like to thank Samara Gunter for her constant support, enthusiasm, and selflessness in coordinating the theses of each of the economics department’s 11 thesis students this year. Her guidance was essential in ensuring that I made consistent progress in this project, as well as enriching the overall experience of writing my thesis.
References


Appendix

Derivations

- Expression for consumer expenditure:

\[ \frac{p_\omega c_\omega}{x_\omega} = \left(\frac{p_\omega}{P}\right)^{-\sigma} C p_\omega \]

\[ x_\omega = \left(\frac{p_\omega}{P}\right)^{-\sigma} CP \]

\[ x_\omega = \left(\frac{p_\omega}{P}\right)^{-\sigma} X \]

- Equilibrium pricing rule with no healthcare.

The firm’s problem is to choose the price that maximizes profits. Thus, the firm’s first-order condition is given by

\[ \frac{\partial \pi_\omega}{\partial p_\omega(\varphi)} = 0 \iff (1 - \sigma)p_\omega(\varphi)^{-\sigma} Q P^\sigma + \sigma Q p_\omega(\varphi)^{-\sigma - 1} P^\sigma / \varphi = 0 \]

\[ \iff (\sigma - 1)p_\omega(\varphi)^{-\sigma} Q P^\sigma = \sigma p_\omega(\varphi)^{-\sigma - 1} P^\sigma / \varphi \]

\[ \iff (\sigma - 1) = \frac{\sigma}{\varphi} p_\omega(\varphi)^{-1} \]

\[ \iff p_\omega(\varphi) = \left(\frac{\sigma}{\sigma - 1}\right)^{1/\varphi} \]

Recall that \( \frac{\sigma}{\sigma - 1} = \frac{1}{\rho} \). Then, we can write equation 5 as

\[ p_\omega(\varphi) = \frac{1}{\rho \varphi} \]

- Firm profits expression – no healthcare.
We have that
\[
\pi(\varphi) = p(\varphi)q(\varphi) - l(\varphi)
\]
\[
= r(\varphi) - f - \frac{q(\varphi)}{\varphi}
\]
\[
= r(\varphi) - f - \frac{r(\varphi)}{p(\varphi)\varphi}
\]
\[
= r(\varphi) - f - r(\varphi)\rho
\]
\[
= (1 - \rho)r(\varphi) - f
\]

Now, using the fact that \(1 - \rho = \frac{1}{\sigma}\), we have that
\[
\pi(\varphi) = \frac{r(\varphi)}{\sigma} - f
\]

- **Optimal firm profits: EPHI case.**

Firm profits are given by
\[
\pi^H(\varphi) = p^H(\varphi)q^H(\varphi) - l^H(\varphi)
\]
\[
= r^H(\varphi) - (f + f^H) - \frac{\tau q^H(\varphi)}{\alpha \varphi}
\]
\[
= r^H(\varphi) - (f + f^H) - \frac{\tau r^H(\varphi)}{\alpha \varphi p^H(\varphi)}
\]
\[
= r^H(\varphi) - (f + f^H) - pr^H(\varphi)
\]
\[
\pi^H(\varphi) = r^H(\varphi)(1 - \rho) - (f + f^H)
\]
\[
\pi^H(\varphi) = \frac{r^H(\varphi)}{\sigma} - (f + f^H)
\]

- **More productive firms produce more.**
Let $\phi_A > \phi_B$. Then, we have that

$$\frac{q^H(\phi_A)}{q^H(\phi_B)} = \frac{r^H(\phi_A)/p^H(\phi_A)}{r^H(\phi_B)/p^H(\phi_B)}$$

$$= \frac{(P_{\tau \rho} \phi_A^H)^{\sigma - 1} \phi_A \rho}{(P_{\tau \rho} \phi_B^H)^{\sigma - 1} \phi_B \rho}$$

$$= \left( \frac{\phi_A^H}{\phi_B^H} \right)^{\sigma}$$

$$= \left( \frac{\alpha \phi_A}{\alpha \phi_B} \right)^{\sigma}$$

$$= \left( \frac{\phi_A}{\phi_B} \right)^{\sigma} > 1$$

- More productive firms are more likely to provide health insurance, even when $\alpha$ and $f^H$ are random.

Suppose $\phi_A > \phi_B$, and that $E[\alpha] = \mu_\alpha$, $E[f^H] = \mu_H$. All else equal, a firm with productivity $\phi_o$ will be more likely to provide health insurance as $E[\pi^H(\phi_o)]$ increases. Thus, in order to show that firm $A$ is more likely to offer insurance than firm $B$, it suffices to show that $E[\pi^H(\phi_A)] > E[\pi^H(\phi_B)]$.

Note that

$$E[\pi^H(\phi_A, \alpha_A, f_A^H)] - E[\pi^H(\phi_B, \alpha_B, f_B^H)] = E\left[ \frac{r^H(\phi_A, \alpha_A)}{\sigma} - (f + f_A^H) \right] - E\left[ \frac{r^H(\phi_B, \alpha_A)}{\sigma} - (f + f_B^H) \right]$$

$$= \frac{r^H(\phi_A, \mu_\alpha)}{\sigma} - (f + \mu_H) - \left( \frac{r^H(\phi_B, \mu_\alpha)}{\sigma} - (f + \mu_H) \right)$$

$$= \frac{1}{\sigma} \left[ r^H(\phi_A, \mu_\alpha) - r^H(\phi_B, \mu_\alpha) \right]$$

$$= \frac{1}{\sigma} \left[ (P_{\tau \rho} \mu_\alpha \phi_A)^{\sigma - 1} \phi_A^H - (P_{\tau \rho} \mu_\alpha \phi_B)^{\sigma - 1} \phi_B^H \right]$$

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\[ \frac{\left( P \tau \rho \mu_{\alpha} \right)^{\sigma-1} R}{\sigma} \begin{cases} \frac{\varphi_{A}^{\sigma-1} - \varphi_{B}^{\sigma-1}}{\varphi_{A}^{\sigma-1} - \varphi_{B}^{\sigma-1}} \\
>0 \text{ since } \varphi_{A} > \varphi_{B} \end{cases} \]

Hence, more productive firms earn higher health insurance system profits on average and are thus more likely to offer health insurance.

- **It is NOT necessarily the case that more productive firms earn more profits if each fixed cost of offering insurance is random.**

Suppose that \( \varphi_{A} > \varphi_{B} \), and that \( f_{A}^{H} > f_{B}^{H} \). Then, the sign of

\[
\pi^{H}(\varphi_{A}) - \pi^{H}(\varphi_{B}) = \frac{1}{\sigma} \left( r^{H}(\varphi_{A}) - r^{H}(\varphi_{B}) \right) + \left( f_{A}^{H} - f_{B}^{H} \right)
\]

is ambiguous, as we know that the first term is positive, but the second term is negative. Thus, varying fixed costs can distort relative profits.

- **Aggregate price level when all firms provide health insurance:**

\[
P = \left( \int_{0}^{\infty} p^{H}(\varphi)^{1-\sigma} M \mu(\varphi) d\varphi \right)^{\frac{1}{1-\sigma}}
\]

\[
= M^{\frac{1}{1-\sigma}} \left( \int_{0}^{\infty} p^{H}(\varphi)^{1-\sigma} \mu(\varphi) d\varphi \right)^{\frac{1}{1-\sigma}}
\]

\[
= M^{\frac{1}{1-\sigma}} \left( \int_{0}^{\infty} \left( \frac{\tau}{\alpha \rho \varphi} \right)^{1-\sigma} \mu(\varphi) d\varphi \right)^{\frac{1}{1-\sigma}}
\]

\[
= M^{\frac{1}{1-\sigma}} \frac{\tau}{\alpha \rho \bar{\varphi}} \left( \int_{0}^{\infty} \varphi^{\sigma-1} \mu(\varphi) d\varphi \right)^{\frac{1}{1-\sigma}}
\]

Here, let

\[ \bar{\varphi} \equiv \left( \int_{0}^{\infty} \varphi^{\sigma-1} \mu(\varphi) d\varphi \right)^{\frac{1}{\sigma-1}} \]

be the weighted average of firm productivity levels. Then, we have that

\[ P = M^{\frac{1}{1-\sigma}} \frac{\tau}{\alpha \rho \bar{\varphi}} \]
Noting that the second term is related to the optimal pricing rule, we have that

\[ P = M^{1-\sigma} p^H(\bar{\varphi}) \]

- **Aggregate consumption when all firms offer insurance:**

Recall that individual consumption is given by

\[ c(\bar{\varphi}) = C \left( \frac{p^H(\bar{\varphi})}{P} \right)^{-\sigma} \]

Substituting in for the aggregate price level yields:

\[ c(\bar{\varphi}) = C \left( \frac{p^H(\bar{\varphi})}{M^{1-\sigma} p^H(\bar{\varphi})} \right)^{-\sigma} \]

\[ \iff c(\bar{\varphi}) = CM^{1-\sigma} \]

\[ \iff C = c(\bar{\varphi}) M^{1-\sigma} \]

\[ \iff C = c(\bar{\varphi}) M^{\frac{1}{\rho}} \]

- **Optimal revenues when all firms provide health insurance:**

In equilibrium, aggregate consumption will equal the aggregate quantity of varieties so that \( R = PC \). Thus, we have that

\[ R = M^{1-\sigma} c(\bar{\varphi}) M^{1-\sigma} p(\bar{\varphi}) \]

\[ = Mr(\bar{\varphi}) \]

- **Free entry condition:**
A firm’s expected value of entry is given by:

\[
E[\text{enter}] = E\left[(0 \times G(\varphi^*)) + (1 - G(\varphi^*)\pi^H(\varphi) / \delta) - f_e\right]
\]

\[
= (1 - G(\varphi^*))E[\pi^H(\varphi)] / \delta - f_e
\]

\[
= (1 - G(\varphi^*))\tilde{\pi}^H / \delta - f_e
\]

Now, setting this expression to 0 allows us to find the free entry condition:

\[
\tilde{\pi}^H = \frac{\delta f_e}{1 - G(\varphi^*)}
\]

**Zero-cutoff profits condition.**

Imposing the cutoff productivity level implies that firms earn zero profit:

\[
\pi^H(\varphi^*) = \frac{r(\varphi^*)}{\sigma} - (f + f^H) = 0
\]

\[
\iff r^H(\varphi^*) = \sigma (f + f^H)
\]

Now, we have that average profits are given by

\[
\bar{\pi}^H(\bar{\varphi}) = \frac{r^H(\bar{\varphi})}{\sigma} - (f + f^H)
\]

\[
= (f + f^H) \left[ \frac{r^H(\bar{\varphi})}{\sigma (f + f^H)} - 1 \right]
\]

\[
= (f + f^H) \left[ \frac{\tilde{\pi}^H(\bar{\varphi})}{r^H(\varphi^*)} - 1 \right]
\]

\[
= (f + f^H) \left[ \left( \frac{\bar{\varphi}}{\varphi^*} \right)^{\sigma - 1} - 1 \right]
\]

**Deriving an expression for \( \varphi^*_H \):**
Note that
\[ \pi_H(\varphi_H^*) = 0 \iff r_H(\varphi_H^*) = (f + f_H)\sigma \]

Now, notice that
\[ (\pi_H - \pi)(\varphi_H^*) = 0 \iff (r_H - r)(\varphi_H^*) = 0 \]
\[ \iff \left( \frac{r_H(\varphi_H^*)}{\sigma} - (f + f_H) \right) - \left( \frac{r(\varphi_H^*)}{\sigma} - f \right) = 0 \]
\[ \iff \frac{1}{\sigma} (r_H(\varphi_H^*) - r(\varphi_H^*)) = f_H \]
\[ \iff (r_H - r)(\varphi_H^*) = \sigma f_H \]

Now, recalling that \( r(\varphi^*) = \sigma f \), we can write
\[
\frac{(r_H - r)(\varphi_H^*)}{r(\varphi^*)} = \frac{\sigma f_H}{\sigma f} = \frac{f_H}{f}
\]
\[
\frac{(P\rho \sigma \varphi_H^*)^{-1} R - (P\rho \varphi^*)^{-1} R}{(P\rho \varphi^*)^{-1} R} = \frac{f_H}{f}
\]
\[
\frac{(P\rho)^{\sigma^{-1}} R \varphi_H^* (-1)}{(P\rho \varphi^*)^{\sigma^{-1}} R} = \frac{f_H}{f}
\]
\[
\frac{((\varphi_H^*)^{-1} (-1))^{\sigma^{-1}}}{(\varphi^*)^{\sigma^{-1}}} = \frac{f_H}{f}
\]
\[
(r_H^*)^{-1} = \frac{f_H}{f} \varphi^* (-1) \left[ \frac{(\alpha)}{(\tau)}^{-1} \right]^{-1}
\]
\[ \varphi_H^* = \varphi^* \left( \frac{f_H}{f} \right)^{\frac{1}{\sigma^{-1}}} \left[ \frac{(\alpha)}{(\tau)}^{-1} \right]^{\frac{1}{\sigma^{-1}}}
\]

Notice that \( \frac{\partial \varphi_H^*}{\partial \sigma} < 0 \), implying that the cutoff productivity for offering health insurance decreases as the productivity boost increases – this is intuitive, as a higher boost to productivity implies that it should take a smaller value of threshold productivity to reach threshold profits under a health insurance system.
Similarly $\frac{\partial \phi^*_H}{\partial f_H} > 0$ and $\frac{\partial \phi^*_H}{\partial \tau} > 0$. This implies that if the fixed cost of offering insurance increases, or the additional cost per unit of insured labor increases, then it will take a higher level of productivity to select into the insurance system.