ANNALS OF ECONOMICS AND FINANCE **14-1**, 1–19 (2013)

What Does the Corporate Income Tax Tax? A Simple Model Without Capital

Laurence J. Kotlikoff

Department of Economics, Boston University, 270 Bay State Road
Boston MA 02215, USA
E-mail: kotlikoff@gmail.com

and

Jianjun Miao

Department of Economics, Boston University, 270 Bay State Road
Boston MA 02215. USA
CEMA, Central University of Finance and Economics, Beijing, China
AFR, Zhejiang University, China
E-mail: miaoj@bu.edu

This paper challenges the traditional view of the corporate tax as taxing corporate capital rather than the act of incorporating. Our model has no capital. Entrepreneurs pay to go public to diversify their risk. In discouraging incorporation, the tax keeps more entrepreneurs private and exposed to more risk. The tax falls primarily on high-skilled entrepreneurs and to a lesser extent on labor, who experience less demand for their services. The wage reduction also induces marginal entrepreneurs to set up shop and experience more risk. Hence, the answer to the title's question is that the corporate tax taxes risk-sharing.

Key Words: Corporate tax; Risk taking; Tax incidence; Entrepreneurship.
JEL Classification Numbers: H22, H31, H32.

1. INTRODUCTION

According to Harberger (1962), the corporate income tax raises the cost of using capital to produce corporate goods and has incidence and efficiency effects that depend on differences in corporate and non-corporate

1529-7373/2013

goods' production technologies.[1] Harberger's formulation has dominated corporate-tax analysis for a half century notwithstanding its disconnect with three key facts.[2] First, virtually all goods are produced by both corporate and non-corporate firms using the same product-specific methods. Second, the choice of organizational form has long been a business decision, not a technological imperative. And third, sectors, such as agriculture, which Harberger identified as "non-corporate" based on output shares, have become substantially more "corporate" over time, while a few "sectors," including transportation, which Harberger classified as "corporate," have become somewhat less "corporate."[3]

These observations led Gravelle and Kotlikoff (1989) to endogenize the choice of organizational form. Gravelle and Kotlikoff assume that entrepreneurs aren't able to fully exercise their talents if they are forced to reach joint decisions with other managers who have potentially different objectives.[4] Hence, being an entrepreneur limits one's ability to expand management and, thus, operations. Consequently, only the more able entrepreneurs, who supply plenty of managerial talent on their own, will choose to operate by themselves. The alternative to running your own show in your own shop is working less productively in unison with other managers, but being able to scale up operations by hiring more managers as well as other productive factors. But doing so comes at a price; it means becoming large and, thereby, becoming identified by the government as a "corporation," which must pay taxes on the use of capital.[5]

Gordon and Mackie-Mason (1994, 1997) also let firms decide whether to incorporate, but the motivation is solely tax minimization. In their framework, each firm makes the decision based on its own tax situation, with the progressivity of individual as well as corporate tax schedules ensuring that different firms will make different choices.

A shortcoming of these approaches to endogenizing incorporation is the linkage of corporate taxation to capital utilization rather than to the act, per se, of incorporating. Also none of these articles focuses on the main event triggering corporate tax exposure, namely selling certified ownership

[1]See Kotlikoff and Summers (1987) for a simplified presentation of the Harberger Model.

[2]See Auerbach's (2006) review of the corporate tax theory.

[3]See Gravelle and Kotlikoff (1989).

[4]All firms producing a given good do so with the same production function. But the effective managerial input supply of agents is impaired if one needs to coordinate decisions with other managers.

[5]In Gravelle and Kotlikoff (1989) the number of managers also reference the number of owners, and the IRS references large numbers of shareholders as one of the corporate characteristics that trigger application of corporate taxation. See Gravelle and Kotlikoff for a discussion of the IRS's rather circular definition of what constitutes a corporation for purposes of corporate tax liability.

claims to the general public.[6] To rectify these shortcomings, we present a very simple model of corporate income taxation that omits capital entirely. Our model also connects going corporate with one decision — going public.[7] Doing so permits risk averse entrepreneurs to certify their firms' technologies and sell their uncertain outputs to the market at a sure price; i.e., going public lets entrepreneurs fully diversify their idiosyncratic production risk. But this decision comes, in our model, at a fixed cost. This cost proxies for the expenses incurred in providing audited statements and annual reports, complying with other public disclosure requirements, and demonstrating to investors that the firm's technology, captured here by the entrepreneur's otherwise unobservable ability, is as advertised.

The fixed cost of going public limits the size of the incorporated sector; only the more able entrepreneurs (agents with very high levels of entrepreneurial talent) can cover this cost and, thereby, secure their livelihoods. Agents with low entrepreneurial skill can also avoid business risk; they simply can work for private or public firms and earn the going wage. Thus the size of the fixed cost of going public and the level of the prevailing wage determine which agents become entrepreneurs and which entrepreneurs go public.

As we show, the corporate income tax induces excessive risk exposure. It leads some higher ability entrepreneurs, who would otherwise have gone public, to stay private and, thereby, bear their idiosyncratic risk. The increased risk facing these firms leads them to demand less labor, thereby reducing the equilibrium wage. This reduction in the wage, in turn, induces some lower ability entrepreneurs to switch from working to establishing private companies. Hence, the corporate tax leads to too much risk taking not only by relatively high-skilled agents, but also by relatively low-skilled agents.

Incidence, in our model, is measured in terms of the tax's impact on the well being of agents with differing levels of entrepreneurial talent. The lowest ability agents continue working after the tax, but at a lower wage, and are definitely worse off. Agents who switch from working to going private experience offsetting welfare effects — namely more risk exposure, but greater net business income because of lower labor costs. In contrast, all initial private entrepreneurs are better off because their labor costs fall. Public entrepreneurs who choose to unincorporate when the tax is imposed also end up facing more business risk. But their welfare loss is mitigated

[6]The Internal Revenue Service's definition of a corporation is a business entity that has corporate characteristics. These are limited liability of its owners, the issuance of shares of easily transferable stock, and existence as a going concern.

[7]Chen, Miao and Wang (2010) provide a related dynamic model of a firm's life-cycle. They study the question of how nondiversifable risk affects entreprenerial investment and financing decisions.

by not having to pay the fixed cost of going pubic and by being able to hire labor at a lower wage. Finally, public entrepreneurs who remain public are forced to pay taxes on their business income (the return to their abilities), but the pre-tax level of this income rises thanks to the reduction in labor costs.

Thus, the only group that suffers a welfare loss with no offsetting gain is low-ability workers. These workers can, it would seem, bear a significant share of the corporate tax burden — a tax that our model's government nominally levies on the business incomes of society's most able entrepreneurs. This theoretical presumption is confirmed by our numerical examples, which show workers bearing roughly 16 percent of the burden of the corporate income tax, while corporate entrepreneurs (agents with skills high enough to take their companies public absent the tax) bear almost all of the rest of the burden of the tax. But the main incidence punchline of our model is that the corporate income tax falls on very highly skilled entrepreneurs, who end up bearing the bulk of the corporate income tax. Yes, the wages they end up paying their workers decline, but not by enough to make up for the tax payments due on their company's profits.

The notion that the corporate tax falls partially on labor may sound familiar. Bradford (1978) and Harberger (1995) argue that countries, which raise their corporate tax, will induce capital to flow abroad, making labor in the capital-exporting country relatively abundant and reducing the equilibrium pre-tax wage. But the framework they use to reach this conclusion remains Harberger's (1962) with two modifications. First, the non-corporate sector is vanquished; all goods are produced solely by corporations, leaving entrepreneurs with no choice over organizational form. Second, Harberger's closed economy is broken into two or more regions (countries), each with its own tax on the use of capital. Because capital is in fixed global supply, it will generally bear the full burden of the average corporate income tax levied across the country (world). Workers in relatively high-tax regions (countries) will also be hurt, while those in low-tax regions (countries) will be helped. But workers, in general, will be insulated from the tax. This conclusion — that workers, on the whole, aren't harmed by imposing corporate taxes at the same rate in all regions (countries) — does not hold in our model. In our framework, the tax on corporate income taxes business risk sharing. Entrepreneurs respond by hiring less labor because hiring labor is risky. It entails taking on a fixed obligation that you need to pay no matter how well your firm performs. Stated differently, there are no explicit or implicit wage contracts making wage payments contingent on the firm's end-of-period idiosyncratic productivity draw.

In addition to its general implication that workers as a whole will share a non-trivial share of the burden of the corporate tax, our model also differs from the previous literature in suggesting that it is not capital, per se, that is likely to bear the brunt of this tax, but rather highly skilled entrepreneurs. From the perspective of an open economy, this difference between incidence predictions can be substantial. Take the U.S., which is a highly open economy. The existing literature would suggest that the corporate income tax is borne to a very large extent by U.S. workers, insofar as the reduction in their pre-tax earnings is likely to be close to the size of the tax revenues collected. This is not the end of the traditional story with respect to incidence, since, again, workers in countries to which previous U.S-domiciled capital moves end up with largely offsetting gains in their pre-tax earnings and worldwide capital owners bear the brunt of the tax. But it is the end of the story in terms of the tax's impact on U.S. workers. In our model, we find workers, particularly low skilled one, being made somewhat worse off, but those who really pay, in terms of lost income, from the corporate tax, are not low-skilled workers, but very high-skilled entrepreneurs.

Our model builds on Kihlstrom and Laffont (1979), who study the decision to become an entrepreneur given the uncertain return to that enterprise as well as the general equilibrium that ensures. They assume that agents differ in their degree of risk aversion. More risk averse agents become workers and less risk averse agents become entrepreneurs. In contrast, we assume that agents differ in abilities. Low-ability agents become workers. High-ability agents become entrepreneurs. In addition, unlike Kihlstrom and Laffont (1979), we let entrepreneurs take their firms public at the cost of documenting their productive capacities and being labeled a "corporation" whose income is subject to taxation.

Our model also bears close connection to Chamley's (1983) classic study of entrepreneurship. In his model, entrepreneur skill types cannot be observed, even at a cost. High ability entrepreneurs signal their type by borrowing with unlimited liability, whereas low ability entrepreneurs borrow with limited liability. Thus, in Chamley's model, as in Gravelle and Kotlikoff (1989), higher ability entrepreneurs choose non-corporate form, whereas lower ability entrepreneurs organize themselves as corporations. Here, we find the opposite. Higher ability entrepreneurs go public because they can afford the fixed costs of doing so and because doing so allows them to reduce their business-risk exposure.

2. MODELING THE TAXATION OF BUSINESS RISK SHARING

Consider a static economy populated by a continuum of agents with unit mass. The agents have an identical expected utility function given by

$$E\left[u\left(c\right)-\eta v\left(l\right)\right],\ \eta>0,$$

where c and l represent consumption and labor, respectively. Assume that $u' > 0$, $u'' < 0$, $v' > 0$, $v'' > 0$, and $v(0) = 0$. Agents differ in their skills, with each agent's skill level s drawn from a distribution $G(s)$ over $[0, s_{\max}]$, with density $g(s)$.

Each agent can choose to be a) an entrepreneur who establishes a private firm, b) an entrepreneur who takes her firm public (incorporates), or c) a worker. If the agent establishes a private firm, she combines her skill and the labor she hires to produce output according to the production function: $F(z, s, l) = zs^{1-\alpha}l^{\alpha}$, where $\alpha \in (0, 1)$, and z is a positive random variable with distribution H. We assume that each entrepreneur's draw of z is idiosyncratic. Since private firms have no means of insuring against low realizations of z, their owners face undiversified business risk.

Entrepreneurs can hire workers at a competitive wage w. As in Kihlstrom and Laffont (1979), we assume that the demands of entrepreneurship preclude additional work by agents who choose to operate a firm. Thus, if an agent chooses to be an entrepreneur, she receives uncertain business income $F(z, s, l) - wl$. Each agent is endowed with A units of income and limits her wage bill to $wl \leq A$. This assumption ensures that workers get paid even if the entrepreneur experiences a very bad shock z.[8]

Consumption of an entrepreneur with skill level s is given by

$$c^e = F(z, s, l) - wl + A.$$

Her labor demand, $l_d^e(s, w)$, satisfies

$$V^e(s, w) = \max_l E\left[u\left(F(z, s, l) - wl + A\right)\right], \tag{1}$$

subject to $0 \leq l \leq A/w$. Here $V^e(s, w)$ denotes the indirect utility function of the entrepreneur with skill level s. Given our assumed preferences and technology, $l_d^e(s, w)$ is single valued.

By going public, entrepreneurs fully diversify their idiosyncratic business risk, producing $F(\bar{z}, s, l)$, where $\overline{z}$ is the mean of z. But going public is costly for two reasons. First, it requires paying a fixed cost $K < A$. These costs cover monitoring costs, fees paid to investment banks and lawyers, etc. Second, public firms must pay corporate income taxes at an effective rate τ. To focus on the effect of corporate taxation, we ignore other taxes such as personal income taxation. Corporate income-tax revenues are used to finance exogenous government spending.

[8]Permitting entrepreneurs to default on their wage payments would introduce risk sharing between firms and workers, which we preclude for the following reason. Such risk-sharing arrangements would require entrepreneurs to verify their ability levels at the cost K assumed below; i.e., it would require their going public.

The labor demand, $l_d^p(s,w)$, of an agent with skill s who takes her firm public satisfies

$$\pi(s,w) = \max_l F(\bar{z}, s, l) - wl,$$

where $\pi(s,w)$ denotes pre-tax profits. The public entrepreneur's consumption is given by

$$c^p = (1-\tau)\,\pi(s,w) - K + A,$$

and the public entrepreneur's indirect utility is given by:

$$V^p(s,w) = u\left((1-\tau)\,\pi(s,w) - K + A\right).$$

Since our model has no third-party investors, entrepreneurs who go public sell their firms into the market and buy claims on firms from the market from other entrepreneurs who go public. An easy way to picture the market is to assume that each entrepreneur with a given skill level, say, s^*, pools her profit together with the profit of all other entrepreneurs with the same skill. This ensures that each receives $\pi(s^*,w)(1-\tau)$ to spend on consumption in addition to A; stated differently, a public firm whose owner has skill level s^* can sell her firm, as an ongoing enterprise that benefits from her entrepreneurial skill/leadership/direction, for $\pi(s^*,w)(1-\tau)$.

Agents choosing to become workers receive the safe wage w. We assume all workers receive the same wage in the competitive market, independent of their skills. Their consumption is

$$c^w = wl + A,$$

and their optimal labor supply, $l_s(w)$, satisfies

$$V^w(w) = \max_l u(wl + A) - \eta v(l),$$

where $V^w(w)$ is an agent's indirect utility from working.

Consider next an agent's occupation choice. An agent with skill level s chooses to become an entrepreneur if and only if

$$V^e(s,w) \geq V^w(w).$$

Agents choosing to become entrepreneurs go public if and only if

$$V^p(s,w) \geq V^e(s,w).$$

In the next section, we derive conditions supporting two cutoff values, $s_1(w)$ and $s_2(w)$, such that an agent with skill level s becomes a worker if

$s \in [0, s_1(w)]$, becomes a private entrepreneur if $s \in [s_1(w), s_2(w)]$, and goes public if $s \in [s_2(w), s_{\max}]$.

In equilibrium, the sum of the labor demands of private and public firms equals the total labor supply of agents choosing to work; i.e.,

$$\int_{s_1(w)}^{s_2(w)} l_d^e(s,w)\, g(s)\, ds + \int_{s_2(w)}^{s_{\max}} l_d^p(s,w)\, g(s)\, ds = G(s_1(w))\, l_s(w). \quad (2)$$

3. EXISTENCE AND PROPERTIES OF EQUILIBRIUM

To show the existence of an equilibrium, we first establish the existence of the cutoff values $s_1(w)$ and $s_2(w)$ for a given w.

LEMMA 1. *If $\eta > 0$ is sufficiently large and if K and τ are sufficiently small, there exist unique cutoff values $s_1(w)$ and $s_2(w)$ such that $s_1(w) < s_2(w)$ and*

$$V^e(s_1(w), w) = V^w(w), \quad (3)$$

$$V^e(s_2(w), w) = V^p(s_2(w), w). \quad (4)$$

Proof. By the envelope theorem, we can show that $V^e(s,w)$ and $V^p(s,w)$ are strictly increasing in s. In addition, they are continuous functions of s given our assumptions on preferences and technology. When s approaches zero, $V^e(s,w)$ and $V^p(s,w)$ approach $u(A)$ and $u(A-K)$, respectively. So $V^e(0,w) > V^p(0,w)$. Note that $V^w(w)$ decreases with η. When η is sufficiently large, workers choose not to work and $V^w(w)$ approaches $u(A)$. Thus, by the intermediate value theorem, there is a unique value $s_1(w) \in [0, s_{\max}]$ such that (3) holds. When $s > 0$,

$$V^e(s,w) = E\left[u\left(F(z,s,l_d^e) - wl_d^e + A\right)\right] < u\left(F(\bar{z},s,l_d^e) - wl_d^e + A\right) < u(\pi(s,w) + A),$$

where l_d^e denotes the optimal labor demand of the private entrepreneur. The inequality follows from the concavity of u and the second inequality follows from the definition of $\pi(s,w)$. It follows that

$$V^e(s,w) < u((1-\tau)\pi(s,w) - K + A) = V^p(s,w),$$

for sufficiently small K and τ. Thus, by the intermediate value theorem, there exists a unique cutoff value $s_2(w) \in (0, s_{\max}]$ such that equation (4) holds. When η is sufficiently large, $s_1(w)$ approaches zero. Thus, we can make $s_1(w) < s_2(w)$. ▮

Figure 1 illustrates Lemma 1. Given Lemma 1 and its proof, an agent with skill level s works if $s \in [0, s_1(w)]$, becomes a private entrepreneur if $s \in [s_1(w), s_2(w)]$, and goes public if $s \in [s_2(w), s_{\max}]$.

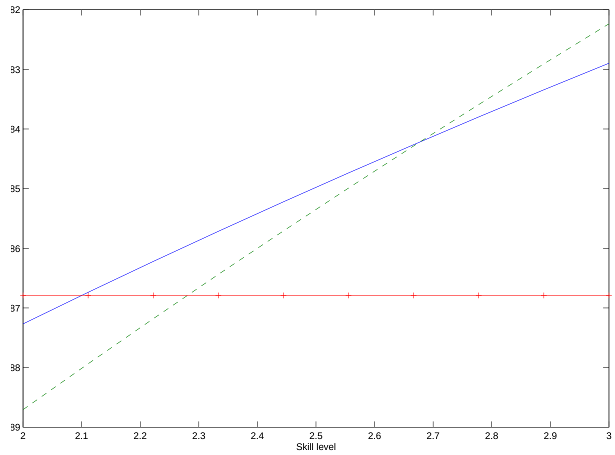

FIG. 1. Determination of the cutoff values. This figure plots indirect utility as functions of the skill level s for a given wage w. The horizontal line represents a worker's indirect utility function $V^w(w)$. The solid curve represents a private entrepreneur's indirect utility $V^e(s, w)$. The dashed curve represents a public entrepreneur's indirect utility $V^p(s, w)$.

Proposition 1. *Let the assumptions in Lemma 1 hold. Then there exists an equilibrium.*

Proof. Given our assumed preferences and technology, total labor demand and total labor supply are continuous functions of wage w. In addition, when w is sufficiently large, all agents choose to be workers and total labor supply exceeds total labor demand. When w approaches zero, all agents choose to be entrepreneurs. Thus, total labor demand exceeds total labor supply. By the intermediate value theorem, there is a wage rate such that the labor market clears. ▮

Clearly, if the total labor demand curve is downward sloping and the total labor supply curve is upward sloping, the equilibrium is unique. However, given our assumption on preferences, the total labor supply curve may not slope upward because of competing income and substitution effects. Moreover, it is not trivial to show that the total labor demand curve is downward sloping; when the wage rate, w, changes, a firm's cutoff values as well as its labor demand change. It is straightforward to show that $l_d^p(s,w)$ and $s_1(w)$ decrease with w. It is not hard to show $l_d^e(s,w)$ decreases with w given certain conditions identified by Kihlstrom and Laffont (1979). The difficulty comes in ensuring monotonicity of $s_2(w)$.

Lemma 2. *Let the assumptions in Lemma 1 hold. Then (i)* $\partial s_1(w)/\partial w > 0$. *(ii) Suppose*

$$u'(c^p)\, l_d^p > E[u'(c^e)]\, l_d^e, \tag{5}$$

then $\partial s_2(w)/\partial w > 0$.

Proof. (i) Differentiating equation (3) yields the desired result.
(ii) Differentiating equation (4) yields:

$$\frac{\partial s_2}{\partial w} = \frac{u'(c^p)\, l_d^p - E[u'(c^e)]\, l_d^e}{u'(c^p)(1-\tau) F_2(\bar{z}, s_2, l_d^p) - E[u'(c^e) F_2(z, s_2, l_d^e)]}. \tag{6}$$

As Figure 1 illustrates, the $V^p(s,w)$ curve has a larger slope than the $V^e(s,w)$ curve at the cutoff value $s_2(w)$. This implies that the denominator in equation (6) is positive. Given (5), we obtain $\partial s_2(w)/\partial w > 0$. ∎

The expressions $u'(c^p)\, l_d^p$ and $E[u'(c^e)]\, l_d^e$ represent the decrease in the $V^p(s,w)$ and $V^e(s,w)$ curves, respectively, following a decrease in w. If the decrease in $V^p(s,w)$ is larger than the decrease in $V^e(s,w)$ in that condition (5) holds, then an increase in w raises $s_2(w)$. Intuitively, an entrepreneur has less incentives to make his firm public following an increase in the wage, when this wage increase hurts entrepreneurs in the public firms more than entrepreneurs in the private firms.

Lemma 3. *For* $s > 0$, *we have*

$$l_d^e(s,w) < l_d^p(s,w),$$

i.e., private entrepreneurs demand less labor at a given skill level than do public entrepreneurs.

Proof. The labor demand $l_d^e(s,w)$ satisfies the following first-order condition:

$$E\left[u'\left(zs^{1-\alpha}l^{\alpha} - wl + A\right)\left(\alpha z s^{1-\alpha} l^{\alpha-1} - w\right)\right] \geq 0,$$

where the equality holds when $l_d^e(s,w)$ is an interior solution. It follows that

$$\begin{aligned} w &\leq \frac{E\left[u'\left(zs^{1-\alpha}l^{\alpha}-wl+A\right)\alpha zs^{1-\alpha}l^{\alpha-1}\right]}{E\left[u'\left(zs^{1-\alpha}l^{\alpha}-wl+A\right)\right]} \\ &= \alpha\bar{z}s^{1-\alpha}l^{\alpha-1}+\frac{Cov\left(u'\left(zs^{1-\alpha}l^{\alpha}-wl+A\right),\alpha zs^{1-\alpha}l^{\alpha-1}\right)}{E\left[u'\left(zs^{1-\alpha}l^{\alpha}-wl+A\right)\right]} \\ &< \alpha\bar{z}s^{1-\alpha}l^{\alpha-1}, \end{aligned}$$

where the last inequality follows from $u''<0$. Because $l_d^p(s,w)$ satisfies the first-order condition:

$$\alpha\bar{z}s^{1-\alpha}l^{\alpha-1}=w,$$

we can deduce that $l_d^e(s,w)<l_d^p(s,w)$. ▮

The following lemma establishes the monotonicity of total labor demand.

LEMMA 4. *Let the conditions in Lemma 1 and (5) hold. Suppose $l_d^e(s,w)$ decreases with w. Then the total labor demand decreases with the wage rate w.*

Proof. Differentiating the total labor demand function with respect to w yields:

$$\begin{aligned} &\int_{s_1(w)}^{s_2(w)}\frac{\partial l_d^e(s,w)}{\partial w}g(s)\,ds-l_d^e(s,w)\,g(s_1)\frac{\partial s_1}{\partial w} \\ &+\int_{s_2(w)}^{s_{\max}}\frac{\partial l_d^p(s,w)}{\partial w}g(s)\,ds-\left[l_d^p(s_2,w)-l_d^e(s_2,w)\right]g(s_2)\frac{\partial s_2}{\partial w}. \end{aligned}$$

Given Lemmas 1-3 and assumptions, the preceding expression is negative. ▮

We are now ready to show that the equilibrium is locally unique.

PROPOSITION 2. *Let the conditions in Lemma 4 hold. Suppose equilibrium occurs in the upward sloping part of the $l_s(w)$ curve. Then the equilibrium is unique.*

Proof. Proposition 1 gives the existence. For uniqueness, Lemma 4 shows that total labor demand decreases with w. Lemma 2(i) shows that

$s_1(w)$ increases with w. It follows from the assumption that total labor supply $G(s_1(w))\,l_s(w)$ increases with w. Hence, the equilibrium is locally unique. ∎

We turn next to comparative statics beginning with the following proposition, which is key to understanding the tax's incidence.

PROPOSITION 3. *Suppose the conditions in Proposition 2 hold. Then an increase in the corporate tax rate τ reduces the equilibrium wage w; i.e., $\partial w/\partial \tau < 0$.*

Proof. Differentiating equation (2) with respect to τ yields

$$\begin{aligned}
&\frac{dw}{d\tau}\Big[\int_{s_1(w)}^{s_2(w)} \frac{\partial l_d^e(s,w)}{\partial w} g(s)\,ds + l_d^e(s_2,w)\,g(s_2)\,\frac{\partial s_2}{\partial w} - l_d^e(s,w)\,g(s_1)\,\frac{\partial s_1}{\partial w} \\
&+ \int_{s_2(w)}^{s_{\max}} \frac{\partial l_d^p(s,w)}{\partial w} g(s)\,ds - l_d^p(s_2,w)\,g(s_2)\,\frac{\partial s_2}{\partial w} \\
&- l_s(w)\,g(s_1)\,\frac{\partial s_1}{\partial w} - G(s_1(w))\,\frac{\partial l_s(w)}{\partial w}\Big] \\
=\; & \left[l_d^p(s_2,w) - l_d^p(s_2,w)\right] g(s_2)\,\frac{\partial s_2}{\partial \tau}. \qquad (7)
\end{aligned}$$

Differentiating equation (4) yields

$$\frac{\partial s_2}{\partial \tau} = \frac{\pi(s_2,w)\,u'(c^p)}{u'(c^p)(1-\tau)\,F_2(\bar{z},s_2,l_d^p) - E\left[u'(c^e)\,F_2(z,s_2,l_d^e)\right]}.$$

From the proof of Lemma 2, we know that the denominator is positive. Thus, $\partial s_2/\partial \tau > 0$. Using this fact and Lemma 3, we know that the expression on the right-hand side of equation (7) is positive. Using Lemmas 1-4, we deduce that the expression in the bracket on the left-hand side of equation (7) is negative. Thus, $\partial w/\partial \tau < 0$. ∎

Figure 1 provides the intuition behind Proposition 3. An increase in the corporate tax rate τ reduces corporate profits, and hence the utility of the owner of the corporate firm. That is, the $V^p(s,w)$ curve shifts down. As a result, entrepreneurs have less incentives to go public so that s_2 goes up. This means there are fewer corporations in the economy. Hence, aggregate labor demand falls because public firms hire more labor than private firms. The decline in labor demand leads the equilibrium wage to fall, enabling high ability agents to shift some of the tax burden onto the least able members of society — workers. Note that since there is no capital in the model, the corporate tax is equivalent to a pure profits tax, albeit with one important exception. In taxing business risk sharing, it reduces the incentive to go public and, thereby, reduces the total demand for labor.

What is the effect of the corporate tax rate τ on the cutoff values s_1 and s_2? By Proposition 3, an increase in τ reduces wage w, and the decrease in w reduces s_1 by Lemma 2(i). The reason is that lower skilled agents who were close to the margin in deciding to start their own firms rather than play it safe and work for others, now see private entrepreneurship as more attractive thanks to the lower wages they'll need to pay their workers.

The effect of τ on s_2 is ambiguous. By (4), s_2 depends on both w and τ; the lower wage that must be paid to labor raises the profits of all entrepreneurs and makes clearing the fixed cost of going public less of a hurdle, but having to pay the corporate income tax has the opposite effect. Formally,

$$\frac{ds_2}{d\tau} = \frac{\partial s_2}{\partial w}\frac{\partial w}{\partial \tau} + \frac{\partial s_2}{\partial \tau} \tag{8}$$

An increase in τ has a positive direct effect, $\partial s_2/\partial \tau > 0$ as shown in the proof of Proposition 3. It also has an indirect effect through the general equilibrium wage change, represented by the first term on the right-hand side of (8). This effect is negative by Proposition 3 and Lemma 2(ii). We are unable to show analytically which effect dominates. In our numerical examples the positive direct effect typically dominates the negative indirect effect; so an increase in the corporate tax rate raises s_2, thereby discouraging incorporation (going public).

4. ILLUSTRATING THE EFFECTS OF CORPORATE TAXATION

Our examples assume the following form for utility:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma},\ v(l) = \frac{l^{1+\phi}}{1+\phi},$$

where $\gamma > 0$ is the coefficient of constant relative risk aversion and $1/\phi > 0$ is the Frisch elasticity of labor supply. We assume that s is drawn from a Pareto distribution with density $\xi s^{-\xi-1}$on $[1, \infty)$ and that z is drawn from a lognormal distribution with mean zero and variance σ^2.[9] Our baseline

[9]The Pareto distribution does not satisfy our distributional assumption because its lower support is not zero. However, our numerical results are consistent with our theoretical predictions presented in Section 3.

parameter values are: $\gamma = 2$, $\phi = 1$, $\eta = 9$, $\alpha = 0.6$, $\xi = 1.1$, $\sigma = 0.5$, $K = 0.05$, and $A = 1$. We compute and compare pre-tax ($\tau = 0$) and post-tax ($\tau = 0.15$) equilibria. At these equilibria, labor supply is upward slopping.[10] In addition, all conditions specified in Proposition 3 are satisfied.

4.1. Pre- and Post-Tax Equilibria

Table 1 presents results for our baseline assumptions and two alternatives.

TABLE 1.

The Impact of Corporate Taxation.

	Pre-Tax Equilibrium			Post-Tax Equilibrium		
	s_1	s_2	w	s_1	s_2	w
Baseline	2.52	2.92	2.14	2.38	4.76	2.10
$\gamma = 2.5$	2.61	2.74	2.18	2.46	4.25	2.14
$\sigma = 0.52$	2.56	2.77	2.15	2.41	4.44	2.11

Note: The baseline parameter values are given by $\gamma = 2$, $\phi = 1$, $\eta = 9$, $\alpha = 0.6$, $\xi = 1.1$, $\sigma = 0.5$, $K = 0.05$, and $A = 1$.

As advertised, corporate taxation reduces the cutoff value s_1, raises the cutoff value s_2, and lowers the wage, w. Consequently, the number of private entrepreneurs expands at both ends of the skill distribution, with marginal workers encouraged by the lower cost of labor to start their own businesses and marginal public entrepreneurs driven by the tax to operate privately. In the pre-tax baseline equilibrium, 63.8 percent of agents are workers, 5.4 percent are private entrepreneurs, and 30.8 percent are public entrepreneurs. The tax reduces the share of workers to 61.5 percent, raises the share of private entrepreneurs to 20.5 percent, and reduces the share of public entrepreneurs to 18.0 percent. Thus, the share of all entrepreneurs (private plus public) who go public is highly sensitive to the corporate tax rate; it falls from 85.1 percent to 46.7 percent. The share of total employment by public firms falls by less, however — from 91.9 percent to 70.8 percent. This reflects the fact that the entrepreneurs remaining public have the most skill and, therefore, the highest demand for labor. The wage in the baseline case falls by 1.9 percent across the equilibria.

The results for the other parameter values show similar sensitivity of the cutoff values and private-public split of entrepreneurs to the tax. And their differences with the baseline results are intuitive. A higher degree of risk aversion (larger value of γ) or a higher degree of risk (a larger value of

[10]Given our utility function, labor supply curve can bend backward. When $A > wl(\gamma - 1)$ labor supply slopes upward.

σ), makes agents less willing to take risk. Consequently, more low-skilled agents opt to be workers (s_1 is higher) and a higher share of entrepreneurs take their firms public (s_2 is lower and closer to s_1). Interestingly, the equilibrium wage is higher when γ or σ are larger; the higher demand for labor from the public firms outweighs the higher supply.

4.2. Incidence

We turn next to the incidence of the corporate tax. We categorize agents into five groups according to their skill levels. Agents in group 1 have the lowest skill levels and are workers in both the pre- and post-tax equilibria. Group 2 agents work in the pre-tax equilibrium, but become entrepreneurs in the post-tax equilibrium. Agents in group 3 are entrepreneurs in both equilibria. Agents in group 4 are entrepreneurs who go public in the pre-tax equilibrium, but stay private in the post-tax equilibrium. Agents in group 5 have the highest skill levels and go public in both equilibria.

Consider, first, marginal incidence, i.e., the incidence from imposing an infinitesimal tax starting at the pre-tax (zero-tax) equilibrium. In this case, the measures of agents in groups 2 and 4 converge to zero. The absolute incidence on those in group 1 (workers) with skill level $s \acute{\in} [0, s_1]$ is, from Roy's identity,

$$-l_s\left(w\right)\frac{dw}{d\tau},$$

where $l_s\left(w\right)$ is worker's pre-tax labor supply. This expression is positive because $dw/d\tau < 0$. Group 1's incidence share is given by

$$-\frac{G\left(s_1\right)l_s\left(w\right)}{\int_{s_2}^{s_{\max}}\pi\left(s,w\right)dG\left(s\right)}\frac{dw}{d\tau}, \tag{9}$$

where the denominator equals marginal corporate tax revenues. For those at the other end of the skill distribution — the public entrepreneurs in group 5, absolute incidence is $\pi\left(s,w\right)+l_d^p\left(s,w\right)\frac{dw}{d\tau}$ (the derivative of profits evaluated at $\tau = 0$), and the incidence share is

$$1+\frac{\int_{s_2}^{s_{\max}}l_d^p\left(s,w\right)dG\left(s\right)}{\int_{s_2}^{s_{\max}}\pi\left(s,w\right)dG\left(s\right)}\frac{dw}{d\tau}. \tag{10}$$

This expression shows that corporations bear less than 100 percent of the the tax burden with the degree of tax shifting depending on the extent to which the wage falls.

To compute the incidence on those in group 3 (private entrepreneurs), consider the certainty-equivalent compensating differential, $x(\tau)$, which satisfies

$$Eu\left(c^e\left(\tau\right)+x\left(\tau\right)\right)=Eu\left(c^e\left(0\right)\right),$$

where $c^e(0)$ and $c^e(\tau)$ denote the entrepreneur's consumption in the pre- and post-tax equilibria, respectively. Note that we have assumed that entrepreneurs do not supply labor and thus do not derive disutility from work. The derivative with respect to τ is

$$E\left[u'\left(c^e(\tau)+x(\tau)\right)\left(\frac{dc^e(\tau)}{d\tau}+\frac{dx(\tau)}{d\tau}\right)\right]=0.$$

Evaluating at $\tau=0$,

$$E\left[u'\left(c^e(0)\right)\right]\frac{dx(\tau)}{d\tau}=-E\left[u'\left(c^e(0)\right)\frac{dc^e(\tau)}{d\tau}\right]=E\left[u'\left(c^e(0)\right)\frac{l_e^d(s,w)\,dw}{d\tau}\right],$$

where we use the envelope theorem to derive the second equality. Thus,

$$\frac{dx(\tau)}{d\tau}=\frac{l_d^e(s,w)\,dw}{d\tau}.$$

As proved above, $dw/d\tau<0$; hence, group 3 benefits from the corporate tax. This group's incidence share is

$$\frac{\int_{s_1}^{s_2} l_d^e(s,w)\,dG(s)}{\int_{s_2}^{s_{\max}} \pi(s,w)\,dG(s)}\frac{dw}{d\tau}. \tag{11}$$

The labor market-clearing condition and equations (9)-(11) indicate that the marginal incidence shares sum to 1. Table 2 shows these shares for the baseline and other parameterizations. Its headline finding is that workers bear a significant fraction — roughly 16 percent of the tax burden. For the baseline parameter values, workers bear 16.8 percent of tax burden, while corporations bear 84.2 percent. Private entrepreneurs benefits from corporate taxation and these benefits account for 1.0 percent of tax revenues.

When agents are more risk averse or when there is more risk in running private businesses, more entrepreneurs go public and are more reluctant to become private in response to the tax. Hence, there is a smaller decline in the demand for labor and less downward pressure on the wage. This leaves private and public entrepreneurs bearing a somewhat larger share of the tax burden.

As table 3 makes clear, marginal incidence analysis provides only a rough guide to the actual incidence of a fully implemented corporate tax. The table shows the incidence shares with our fifteen percent tax fully turned on, with incidence for each group calculated as the additional income needed in the post-tax equilibrium to restore pre-tax levels of utility. Measuring incidence based on equivalent variation generates similar results.

TABLE 2.

Marginal Tax Incidence Measured as a Percentage of Tax Revenues.

	Workers	Private Entrepreneurs	Public Entrepreneurs
Baseline	16.8	−1.0	84.2
$\gamma = 2.5$	16.5	−0.3	83.8
$\sigma = 0.52$	15.5	−0.5	85.0

Note: The baseline parameter values are given by $\gamma = 2$, $\phi = 1$, $\eta = 9$, $\alpha = 0.6$, $\xi = 1.1$, $\sigma = 0.5$, $K = 0.05$, and $A = 1$.

TABLE 3.

Incidence of a 15 Percent Corporate Income Tax Measured as a Percentage of Tax Revenues

	Group 1	Group 2	Group 3	Group 4	Group 5	Total Incidence
Baseline	26.2	0.06	−1.7	16.0	81.8	122.4
$\gamma = 2.5$	24.2	0.04	−0.5	13.2	81.4	118.3
$\sigma = 0.52$	24.7	0.05	−0.8	14.7	81.8	120.4

Note: The baseline parameter values are given by $\gamma = 2$, $\phi = 1$, $\eta = 9$, $\alpha = 0.6$, $\xi = 1.1$, $\sigma = 0.5$, $K = 0.05$, and $A = 1$.

According to Table 3, agents in group 5 (high skilled agents who remain public) bear burdens that collectively total about four fifths of tax revenues. Agents in group 4 (entrepreneurs who would otherwise go public and are of zero measure in table 2) also bear a significant burden of the tax, about 16 percent in the baseline case. Workers in group 1 are also worse off. Their baseline tax burden is 26.2 percent of tax revenues thanks to the decline in their wage rate. Agents in group 2 (also of zero measure in table 2) are also worse off. They have the choice of remaining as workers, but earning a lower wage or becoming private entrepreneurs and earning more profits, on average, because labor has become cheaper, but becoming exposed to personal business risk. These agents opt for taking on the business risk, but, on balance, they are worse off. Agents in group 3, who are private entrepreneurs both before and after tax, are better off because they now pay their workers lower wages after tax while experiencing no greater risk. Their benefits are about 1.7 percent of tax revenues given baseline parameters.

As is readily seen, the incidence results are robust to different levels of risk aversion and entrepreneurial risk. Another immediate point is that the sum of the incidence shares exceeds 100 percent as we'd expect. The difference — roughly 20 percent of tax revenues — reflects the excess burden from the corporate income tax.[11] The distortions relected here arise solely

[11] Proper measurement of excess burden requires compensating for tax-induced income effects, which we defer for future research.

from inducing private agents to take on excessive exposure to risk. Again, the tax leads higher skilled agents, who would otherwise go public and play it safe, to stay private and gamble that their businesses will be profitable. And it induces a set of lower skilled agents, who would otherwise work for others, to gamble on their own businesses because their former jobs are no longer paying as well as they did.

5. CONCLUSION

Almost six decades since the Harberger Model appeared in print, economists are still wrestling with the economic impact of this levy. Harberger's view of the tax as penalizing the use of capital by corporate firms retains currency, notwithstanding the difficult of squaring the model's assumptions with the facts. Neither outputs nor inputs, or, for that matter, technologies are "corporate." A given good can be produced by noncorporate as well as by corporate firms. And net business income does not exclusively reflect a return to capital. It also includes a return to entrepreneurship and entrepreneurial skills.

The real margin of choice affected by the corporate tax is, in the first analysis, not how much capital is hired, but whether entrepreneurs will continue to incorporate as a mean of limiting their exposure to their businesses' risk. In our simple model, which features no capital, raising the corporate tax keeps a subset of entrepreneurs from going public. They respond to their greater business risk exposure by hiring fewer workers, which means a lower wage and makes workers bear a share of the corporate tax burden. Most of the tax's burden, however, falls on entrepreneurs who are sufficiently high skilled to continue to be able to afford going public.

The reduction in labor costs makes middle-skilled entrepreneurs (those who stay private even absent a tax) better off. It also induces some low-skilled entrepreneurs to switch from working for others to setting up their own risky ventures.

The fact that moderately high-skilled entrepreneurs are dissuaded from going public and that moderately low-skilled entrepreneurs are induced to go private provides the answer to the title's question — What Does the Corporate Tax Tax? The answer is that it taxes business risk-sharing and redistributes from the most and least skilled members of society to those whose skills lie in between.

REFERENCES

Auerbach, Alan J., 2006. Who Bears the Corporate Income Tax? James Poterba ed. *Tax Policy and the Economy* **20**, 1-40.

Bradford, David F., 1978. Factor Prices May Be Constant, But Factor Returns Are Not. *Economic Letters.*

Christophe Chamley, 1983. Entrepreneurial Abilities and Liabilities in a Model of Self-Selection. *The Bell Journal of Economics* **Vol. 14, no 1** (Spring, 1983), pp. 70-80.

Chen, Hui, Jianjun Miao, and Neng Wang, 2010. Entrepreneurial Finance and Non-Diversifiable Risk. *Review of Financial Studies* **23**, 4348-4388.

Gordon, Roger H. and Jeffrey K. Mackie-Mason, 1994. Tax Distortions to the Choice of Organizational Form. *Journal of Public Economics* **55**, 279-306.

Gordon, Roger H. and Jeffrey K. Mackie-Mason, 1997. How Much Do Taxes Discourage Incorporation? *Journal of Finance* **52**, 477-505.

Gravelle, Jane G., and Laurence J. Kotlikoff, 1989. The Incidence and Efficiency Costs of Corporate Taxation When Corporate and Non-Corporate Firms Produce the Same Good. *Journal of Political Economy* **97**, 749-780.

Harberger, Arnold C., 1962. The incidence of the Corporation Income Tax. *Journal of Political Economy* **70**, 215-240.

Harberger, Arnold C., 1995. The ABCs of Corporation Income Taxation, in American Council for Capital Formation, *Tax Policy and Economic Growth*, Washington, D.C., pp. 51-73.

Kihlstrom, Richard E. and Jean-Jacques Laffont, 1979. A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion. *Journal of Political Economy* **87**, 719-748.

Kotlikoff, Laurence J. and Lawrence H. Summers, 1987. Tax Incidence. *Handbook of Public Economics* **Vol. 2**, Alan J. Auerbach and Martin Feldstein ed., North-Holland Publishing Companying.