Public Choice (2016) 167:177–199
DOI 10.1007/s11127-016-0334-7

Taking versus taxing: an analysis of conscription in a private information economy

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Received: 26 May 2015 / Accepted: 11 May 2016 / Published online: 27 June 2016

Abstract Most countries currently man their militaries through conscription (i.e., a draft). Conventional wisdom suggests that, by lowering the budgetary cost of the military, a draft reduces distortionary taxation, especially when military needs are large. We find that this intuition is misguided. When income taxes are set optimally, voluntary enlistments lead to less distortionary taxation than a draft, because the tax base left behind by a volunteer army tends to be more productive than that after a draft. For reasonable parameter values, drafts are more distortionary (and less socially desirable) when military needs are large.

Keywords Conscription · Optimal taxation · Tax distortion

1 Introduction

Governments enjoy the right to seize private resources for public use. Takings of labor by conscripting it (i.e., a military draft) currently are used by the majority of countries to man their armies.[1] Governments may also raise armies by taxing civilians to finance market-

[1] The U.S. ended the draft in 1973, but conscription is a reality in the majority of countries; see, e.g., Adam (2011), Mulligan and Shleifer (2005), and Poutvaara and Wagener (2007a). A few countries have recently ended conscription, or put in place plans to end it and replace it with voluntary enlistments. Conscription has ended in France (in 2001), Lebanon (in 2007), Sweden (in 2010), Germany (in 2011); Taiwan is scheduled conscription to end by 2016. Recruitment policies are said to be in the agenda of many other countries, including Brazil, China, Egypt, Israel, Malaysia, Mexico, Russia, South Korea, Turkey, and the former Soviet republics; see, e.g., Galiani et al. (2011), Lokshin and Yemtsov (2008), Gilroy and Williams (2006), and Jehn and Selden (2002).

Electronic supplementary material The online version of this article (doi:10.1007/s11127-016-0334-7) contains supplementary material, which is available to authorized users.

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based voluntary armed forces. The natural and enduring question is: should governments favor the market mechanism? Friedman (1967, p. 202), who advocated a voluntary army, acknowledged that a volunteer army may require "very high pay in the armed forces and very high tax burdens on those who do not serve." As Mulligan and Shleifer (2005, p. 86) put it concisely, "the draft saves on the cash cost of the military that must be otherwise financed through distortionary taxes." By lowering the budgetary cost of the military, a draft may reduce the needs for distortionary taxation. Although other costs surely are involved, conventional wisdom states that a draft might be the least distortionary way to raise a large army.

We demonstrate that this intuition is misguided and provide a comprehensive treatment of the fiscal advantages and the social desirability of the market mechanism. In our model economies, taxes are optimally designed to be efficient and equitable. In all specifications, some with closed-form solutions and others characterized numerically for a wide array of plausible parameter values, we find that taxes under a voluntary system are less distortionary than under a compulsory draft especially when military requirements are large. The fundamental observation is that the tax based of a draft and a voluntary system are very different and that the voluntary system's tax base is more productive. When tax schedules are set to minimize distortions, the broader tax base allows the government to collect taxes at a lower excess burden.

Our intuition is borne out transparently in a simple model in which the government seeks to maximize revenue and redistributes income through a guaranteed minimum income and a linear tax. When taxes are linear, revenue is simply the product of the tax rate and the tax base. Moreover, under quasilinear utilities, the optimal linear tax needed to fund a voluntary system turns out to be the same as the tax rate needed to fund a drafted one. In this case, government revenues differ entirely because of differences in the tax base. Tax bases differ because volunteers generally have limited opportunities in the civilian labor market. Thus the tax base of a civilian sector that supports a volunteer army comprises a larger proportion of higher-earning individuals.[2] This more productive tax base raises revenue with fewer distortions than an equally sized, though possibly less expensive (in budget terms), drafted force. The key intuition is that voluntary selection is advantageous for raising revenue. A draft inducts high- as well as low-income earners. When high-earning individuals are drafted, the government loses revenue that must be obtained from those who remain in the civilian economy, producing efficiency losses that may exceed those of a voluntary system.

The main theme of the paper is developed in a Mirrleesian economy in which civilian and military abilities are *private information* and taxes are unrestricted, other than by informational constraints. Sorting individuals according to ability is not possible. Instead, individuals self-select into the military or the government conscript them randomly. In a voluntary army, the government offers a wage sufficiently high to fulfill the necessary manpower requirements. In a drafted army, the government may pay soldiers below-market compensation for their service. In either case, following Mirrlees (1971), to cover the budgetary costs of the military (whether drafted or not), the government relies on a

[2] This implication of the model is consistent with the importance of the business cycle on unemployment and regional variations in unemployment rates for enlistments into the U.S. forces; see Sandler and Hartley (1999, pp. 160–162). This implication is also consistent with the fact that when the military has greater presence in a local labor market, there is a reduced black-white income gap and a larger gender gap; see, e.g., Kriner and Shen (2010, pp. 60–61). Military pay is not the only determinant of enlistment and retention; see, e.g., Hosek et al. (2004). We will examine a variant of our model in which non-pecuniary incentives motivate enlistments in order to capture this aspect of reality.

distortionary nonlinear labor income tax imposed on the individuals who remain in the civilian sector. Using a calibrated version of the model, we find that marginal taxes are generally lower under a voluntary system than under a draft. This finding is robust to an array of plausible parameter values (i.e., changes to the ability distribution and changes in individual preferences). Particularly, a voluntary system is less distortionary than a draft when the elasticity of labor supply with respect to the marginal tax rate is at the upper end of existing estimates. With a more elastic labor supply and a modestly sized army, more agents prefer the draft than with a less elastic labor supply. This difference, however, diminishes as military size grows.

Our findings contradict the existence of a trade-off between the foregone earnings costs and the deadweight tax costs (excess burden) of conscription. Indeed, in contrast to Milton Friedman's claim, a draft is potentially more distortionary when military needs are large. Suppose the drafted military pays soldiers a low wage, relative to the wage paid in a volunteer army of the same size. As the size of the army increases two changes take place: more revenue is needed to pay for the additional drafted soldiers and fewer high-income earners remain in the civilian economy. In a volunteer economy, as the size of the army increases, more revenue also is needed, but the sources of revenue do not decline as much as under a draft. Deadweight losses for the economy are smaller with voluntary enlistments because the remaining civilians face lower marginal tax rates. Although our analytical results are limited, as they generally are in Mirrleesian economies, our findings suggest that as the size of the required military increases, the tax distortions increase faster under a draft than under a voluntary system.

This paper is related to research studying the dichotomy between takings and open market purchases. This question is essential for many regulatory concerns: jury duty (Martin 1972; Posner 1973), confiscation and eminent domain (Pecorino 2011; Shavell 2010), and industry nationalization (Gordon et al. 1999). In all these settings, the distortionary tax revenues needed for an open market purchase make takings more appealing than the market mechanism. Our contribution is to quantify this tension in the context of conscription.[3] The armed forces are a major employer and defense expenditures are a large government spending category (see, e.g., Warner and Asch 1995, Chap. 6).

This paper complements classical references such as Miller et al. (1968), Friedman (1967), Hansen and Weisbrod (1967), and Oi (1967). The traditional argument against the draft focuses on the foregone earnings of higher-earning individuals. These early papers did not examine the tax distortions or redistributive needs of alternative recruitment schemes. The importance of the social savings associated with lower tax burdens under a draft continues to be the focus of many papers, including Garfinkel (1990), Lee et al. (1992), Ross (1994), Warner and Asch (1996), Warner and Negrusa (2005), Siu (2008) and Konstantinidis (2011).[4] These frameworks typically rely on homogeneous agents and the

[3] Takings are quite common in practice, but they are almost completely neglected in the public finance literature. Mulligan (2008) is one of the few papers that study "in-kind" taxes, with a special focus on conscription. A point of contrast with Mulligan (2008) is that we examine a two-sector private-information economy and allow for nonlinear Mirrleesian taxation. We consider, for example, Mirrleesian taxation of service time in the military. Mulligan (2008), instead, focused on unidimensional sorting. When it considers the tax burden of funding either system (Cf. Sect. IV.C), it presumes that the marginal cost of raising revenue is the same for both recruitment scenarios. Our findings emphasize that they may be different, and that this difference is in favor of a voluntary system.

[4] Alternatively, Da Costa and Werning (2008) looks at inflation as an instrument to achieve efficiency in a monetary economy. Likewise, we consider a series of potential instruments used to collect the required resources.

government is assumed to use linear or lump-sum taxes. We consider settings with explicit distributional concerns so our taxes recognize an equity and efficiency trade-off. In our Mirrleesian framework, in particular, the only restrictions on the set of tax instruments available to the government are due to the presence of limited information. Finally, our framework uses two dimensions of ability. We are thus able to separately discuss civilian and military ability, social costs, and the distributive properties of voluntary enlistments and a draft.[5] Put simply, the literature postulates a trade-off between the reduced opportunity cost of voluntary enlistments and the public financing to entice voluntarism. We show that such a trade-off does not necessarily exist.

The paper unfolds as follows. The basic theory is outlined in Sect. 2. Section 3 discusses our main quantitative findings. Section 4 concludes. An Appendix not for publication contains several remarks and extensions of the basic framework.

2 Theory

We first state the general military manpower problem faced by the government under a voluntary system and a draft. We also present some insights based on selection principles and use a linear tax example to illustrate key differences in the tax base. Finally, we characterize the Mirrleesian taxes that support each recruitment mechanism.

2.1 Problem statement

There is a continuum of individuals of measure one. Each individual is endowed with a civilian and a military ability, θ and m, respectively. Abilities are distributed according to a well-behaved distribution function $\mathbb{F}(\theta, m)$,

$$\int_0^\infty \int_0^\infty \mathbb{F}(d\theta, dm) = 1. \tag{1}$$

A fraction $R \in (0, 1)$ of the population is needed for the military. We take R as given for several reasons. First, we are not interested in determining the optimal size of the military.[6] Second, in practice, the military typically establishes recruitment quotas rather than other possible targets. Finally, since ability is not observable, the fraction of individuals required for service, along with the distribution $\mathbb{F}(\theta, m)$ and the military production function, is a *sufficient statistic* to examine the effect of alternative recruitment policies on average military quality.

[5] Starting with Angrist (1990), an empirical literature has exploited the random assignment inherent in the draft to learn more about the benefits and costs of military service. This literature has looked at the effect of military service on short- and long-term earnings (Angrist 1990; Angrist et al. 2011; Card and Cardoso 2011); subsequent educational and health outcomes (Cipollone and Rosolia 2007; Maurin and Xenogiani 2007; Paloyo 2010; Keller et al. 2010; Bauer et al. 2012; Bedard and Deschenes 2006; Dobkin and Shaban 2009; Autor et al. 2011); and crime (e.g., Galiani et al. 2011). Recent theoretical work has investigated the dynamic costs of the draft (see, e.g., Poutvaara and Wagener 2007b; Lau et al. 2004). College deferments ameliorate these dynamic costs. Card and Lemieux (2001), for example, found that college deferments provided a strong incentive to remain in school during the Vietnam War.

[6] To formulate such a problem, we would need to know the value society places on national defense as well as the military production function and the substitution across inputs, i.e., we would have to specify the patterns of substitution between labor (or labor-types) and capital in the production of military services. These patterns are not easily determined; see Sandler and Hartley (1999, pp. 156–160).

2.1.1 A voluntary army

Individuals self-select between working in the civilian sector or joining the military. In the military, and for simplicity, soldiers work for a fixed number of hours, $\bar{h}$.[7] Our benchmark case assumes that military ability is not observed. (Remarks about observed military abilities are provided in an Appendix.) Thus, the government is restricted to compensate soldiers by paying a constant per-hour wage w. As we will see below, both assumptions imply that the participation constraint is type-independent.

While in the civilian sector, individuals supply $h(\theta)$ hours of work. Civilian taxes must only be a function of earnings $y(\theta) = \theta h(\theta)$ since civilian ability also is unobservable. The consumption of an individual with civilian ability θ is given by $c(\theta) = y(\theta) - T(y(\theta))$ with $T(y(\theta))$ as the labor income tax. All individuals have the same separable preferences defined over consumption c and labor supply h, $U(c,h) = u(c) - v(h)$.

Let $V(\theta)$ represent the value of participating in the civilian sector for an individual with civilian ability θ given the tax schedule $T(y(\theta))$. While in the civilian sector, labor supply decisions solve

$$V(\theta) \equiv \max_{h(\theta)} \{u(\theta h(\theta) - T(\theta h(\theta))) - v(h(\theta))\}. \tag{2}$$

This problem is standard.[8] An important property of (2) is that the agent-monotonicity condition of Mirrlees (1971) holds: *the gross income* $y(\theta)$ *and utility* $V(\theta)$ *for individuals with higher civilian ability are higher than for individuals with lower civilian ability* .

Consider next the *participation constraint*. The utility of individuals who join the military is $u(w\bar{h}) - v(\bar{h})$ where w is the untaxed military compensation. Let $V^v(\theta)$ denote the value an individual with civilian ability θ places on being in an economy that relies on a voluntary army:

$$V^v(\theta) \equiv \max\{V(\theta), u(w\bar{h}) - v(\bar{h})\}. \tag{3}$$

An individual with civilian ability θ would participate in the civilian sector if

$$V(\theta) \geq u(w\bar{h}) - v(\bar{h}), \tag{4}$$

and he would join the military otherwise.

The participation decision (4) can be represented by a cut-off ability $\bar{\theta}(w)$ which partitions the ability distribution into a subset of individuals $\theta \leq \bar{\theta}(w)$ who join the military and a set $\theta > \bar{\theta}(w)$ who participate in the civilian sector. We provide some particular remarks about the participation decision and several extensions in an Appendix not for publication.

[7] As noted by Sandler and Hartley (1999, p. 156), military employment has distinctive features compared to civilian employment that make the previous assumption desirable. For example, pay, working conditions, and duration of employment for individuals in the armed forces are solely determined by the state. Further, contractual commitments are subject to military discipline, breaches of which can involve severe punishment. These aspects imply less flexibility in military contracts compared to the civilian labor market. Also, military pay earned in combat zones is exempted from taxation; see Siu (2008, p. 1098).

[8] See, e.g., Mirrlees (1971), Ebert (1992), and Salanie (2003). As these authors do, we examine non-stochastic allocations and taxes. Individual randomization is sometimes welfare improving in the presence of indivisibilities in occupational choice; see, e.g., Bergstrom (1986). Random tax schedules have been studied by Stiglitz (1982) and Hellwig (2007).

In addition to the participation constraint (4), taxes must be set taking into account a series of *feasibility* constraints. A voluntary army requires

$$R = \int_0^\infty \int_0^{\bar{\theta}(w)} \mathbb{F}(d\theta, dm), \tag{5}$$

where the right-hand side is the fraction of soldiers who join the military. For instance, (4) and (5) imply that the relevant distribution of ability in the civilian economy is $\mathbb{F}_\Theta(\theta) = \int_{\bar{\theta}(w)}^{\theta} \int_0^\infty \mathbb{F}(d\theta, dm)/(1-R)$.

It is also necessary to cover the budgetary costs of the army. The government's *budget constraint* is

$$w\bar{h}R = \int_0^\infty \int_{\bar{\theta}(w)}^\infty T(y(\theta))\mathbb{F}(d\theta, dm). \tag{6}$$

The left-hand side represents the cost of the military (i.e., the per-hour wage times the number of hours worked times the number of soldiers) and the right-hand side is the revenue collected from the workers who remain in the civilian sector.

The *incentive compatibility* constraints are $V_\theta(\theta) = v_h(\theta)h(\theta)/\theta$ and $y_\theta(\theta) \geq 0$, for all $\theta \geq \bar{\theta}(w)$. An exposition of these conditions can be found in Salanie (2003, Chap. 4).[9]

The government maximizes a social welfare function

$$W^v \equiv G(u(w\bar{h}) - v(\bar{h}))R + \int_0^\infty \int_{\bar{\theta}(w)}^\infty G(V(\theta))\mathbb{F}(d\theta, dm), \tag{7}$$

where G is an increasing and concave function. The first term in (7) represents the welfare of soldiers and the second represents the welfare of civilian workers. Social welfare W^v does not take into account directly the quality of the military because the government's goal is to fulfill a quota R.

2.1.2 A military draft

Suppose now that a draft lottery selects individuals into the army. Individuals are no longer required to satisfy the participation constraint (4). Instead, soldiers are selected randomly from the population of adult males (typically 18 to 25 years old). In a draft, the budget constraint for the government is

$$w^d\bar{h}R = \int_0^\infty \int_0^\infty T^d(y(\theta))(1-R)\mathbb{F}(d\theta, dm), \tag{8}$$

where w^d represents the per-hour wage paid to draftees and $T^d(y(\theta))(1-R)$ is the revenue collected from individuals with income $y(\theta)$ who have not been drafted into service. Notice that w^d is exogenous and differs from the compensation in the volunteer military, w. In the quantitative section we will treat w^d as a choice variable for the government.

[9] The first condition follows from the individual's first-order condition whereas the second is a monotonicity and positivity requirement on earnings profiles associated with the second-order condition of the individual's problem.

The value an individual with ability θ places on being in a draft economy is

$$V^d(\theta) \equiv [u(w^d\bar{h}) - v(\bar{h})]R + V(\theta)(1-R), \tag{9}$$

where the value function $V(\theta)$ is equivalent to (2) with the tax function $T^d(y(\theta))$. This value function applies to the fraction $(1-R)$ of individuals who participate in the civilian sector. In other words, a draft in (9) imposes a "tax" of R on civilians. Finally, conditional on not being drafted, work decisions satisfy the optimality conditions obtainable under a volunteer military with $\bar{\theta}(w) = 0$.

The social welfare function is given by

$$W^d \equiv G(u(w^d\bar{h}) - v(\bar{h}))R + \int_0^\infty \int_0^\infty G(V(\theta))(1-R)\mathbb{F}(d\theta, dm), \tag{10}$$

which shall be maximized subject to (8) and the appropriate incentive compatibility conditions.

2.2 Self-selection, taxable income, and military quality

Taking as given the tax schedule and military compensation we first characterize the implications of self-selection for taxable incomes, i.e., the *tax base*. We also characterize differences in military quality between recruitment methods. The government's problem under a voluntary system can be partitioned into two parts. First, for a given tax schedule $T(y(\theta))$, there is a market wage w, determined from the manpower requirement (5), that ensures that the needed enlistment quota R is met. Second, given the participation decision and the pricing of military services w, the optimal income tax schedule $T(y(\theta))$ must cover the cost of the military as well as any redistributive spending. The problem under a draft deals only with the second part since there is no participation decision. Our focus in this section is on the participation margin.

The fact that individuals self-select into a voluntary army implies that average productivities in the civilian and military sectors will differ. These differences translate into differences in taxable incomes and military quality. In particular, let Y^v denote the (average) taxable income of civilians under volunteer enlistments. That is, $Y^v \equiv \mathbb{E}[y(\theta)|\theta > \bar{\theta}(w)]$. In turn, the taxable income of civilians under a fair draft is $Y^d \equiv \mathbb{E}[y(\theta)]$. Likewise, let M^v denote the (average) quality of the voluntary army, $M^v \equiv \mathbb{E}[m\bar{h}|\theta \leq \bar{\theta}(w)]$. The quality of a drafted army is $M^d \equiv \mathbb{E}[m\bar{h}] = \mathbb{E}[m]\bar{h}$.

It is straightforward to compare Y^v and Y^d, as we show below. One needs, however, additional assumptions in the distribution of ability $\mathbb{F}(\theta, m)$ in order to compare military quality in the two regimes. To compare M^v with M^d, for instance, it is crucial to understand the *association* between civilian and military abilities in the population. There are multiple ways to describe bivariate dependence between random variables. The weakest (but most useful) concept of dependence is that of *positive quadrant dependence in expectation*.[10] This concept requires that

$$\mathbb{E}[m|\theta \leq \hat{\theta}] \leq \mathbb{E}[m], \tag{11}$$

[10] A stronger concept of dependence is that of positive likelihood dependence. That concept implies that we are more likely to observe civilian and military abilities take larger values together and smaller values together than any mixture of these. See Balakrishnan and Lai (2009) for a discussion of these concepts.

for $\hat{\theta} > 0$; negative dependence is defined similarly. The idea in (11) is simply that knowing that civilian ability is low (i.e., $\theta \leq \hat{\theta}$) increases the chances of seeing low values of m in the population.

Proposition 1

(i) *The average taxable income of the civilian sector is higher under a volunteer military than under a draft. That is,* $Y^v \geq Y^d$.

(ii) *Suppose that civilian and military abilities are positively (resp. negatively) associated. The average quality of a voluntary army is lower (higher) than that of a drafted army. That is,* $M^v < (\geq) M^d$.

Proof (i) Individuals who voluntarily serve in the military have low civilian ability. Thus those who remain in the civilian sector invariably have higher ability that those who serve in the army. As a consequence of the agent monotonicity condition, i.e., $y_\theta(\theta) \geq 0$, we have that $\mathbb{E}[y(\theta)|\theta > \bar{\theta}(w)] \geq \mathbb{E}[y(\theta)]$. The proof of (ii) follows from (11) with $\hat{\theta} = \bar{\theta}(w)$. □

Proposition 1(i) states that the tax base under a volunteer system is larger than under a draft. Just as the draft takes the "wrong" people in terms of civilian opportunity cost, it also takes the "wrong" people for the purposes of low-distortion revenue generation. This is a consequence of self-selection and the agent's monotonicity requirement. Since the voluntary army is appealing to individuals with low civilian abilities, and since gross income is increasing in civilian ability, the individuals remaining in the civilian economy are necessarily more productive than the typical civilian under a fair draft. Notice, however, that (i) does not translate immediately into differences in tax revenues as taxes are nonlinear. For illustrative purposes, if tax rates are linear and equal across recruitment methods, total tax revenue in the voluntary system will be larger than total revenue with conscription. It would therefore be easier to raise tax revenues under a voluntary system than under a draft. (We will actually provide an example that validates this illustrative case.)

The first part of the previous proposition is concerned with the tax base in the civilian economy. Proposition 1(ii), in contrast, shows that a voluntary army need not be desirable from a military productivity point of view. If civilian and military abilities are positively associated in the population, those who serve voluntarily will have low military ability and therefore will create a relatively unproductive military. As in *adverse selection* models, the average quality of the military will be less than the average quality of a randomly selected sample. Under adverse selection, average quality can be increased by raising military wages, but this will require additional revenues from the civilian economy.

The previous comparisons in terms of gross income cannot be extended directly to a comparison of after-tax (i.e., net) civilian incomes or to comparisons between utility or social welfare. The reason is that $y(\theta) - T(y(\theta))$, $V^v(\theta)$, and $V^d(\theta)$ depend on the tax schedules and military compensation. We will therefore explore these scenarios numerically in the next section. Special cases exist in which such comparisons are possible, and we next provide an example with closed-form solutions based on linear taxes. As hinted before, if tax rates on civilian incomes are equal, Proposition 1(i) implies that tax revenues under a voluntary army are necessarily larger than under a draft. Sufficient conditions for equal linear tax rates are provided immediately below.

2.3 Linear taxes

Assume that linear taxes are proportional to income beyond a basic income Y_0 paid to every individual in the civilian economy. The tax schedule satisfies $T(y) = -Y_0 + \tau y$. The government must select the slope and intercept parameters τ and Y_0 to maximize social welfare given a set of feasibility (but not informational) constraints. The government solves a Ramsey tax problem in an economy with heterogeneous individuals who, in the voluntary army case, self-select into the military.

2.3.1 A voluntary army

Labor supply decisions solve $V^{\tau}(\theta) \equiv \max_{h(\theta)}\{u(y(\theta)[1-\tau] + Y_0) - v(h(\theta))\}$. As before, an individual with civilian ability θ would participate in the civilian sector if $V^{\tau}(\theta) \geq u(w\bar{h}) - v(\bar{h})$, and he would join the military otherwise. There is a cut-off ability $\bar{\theta}^{\tau}(w)$ that partitions the ability distribution into a set of individuals $\theta \leq \bar{\theta}^{\tau}(w)$ who join the military. Wages in the military ensure that the voluntary army size requirement is met, i.e.,

$$R = \int_0^{\bar{\theta}^{\tau}(w)} \mathbb{F}_{\Theta}(d\theta). \tag{12}$$

The government's *budget constraint* is

$$w\bar{h}R + Y_0(1-R) = \tau \int_{\bar{\theta}^{\tau}(w)}^{\infty} y(\theta)\mathbb{F}_{\Theta}(d\theta). \tag{13}$$

The government maximizes a social welfare function of the form stated in (7).

The multiplier associated with the budget constraint (13) is p. Let $b(\theta)$ denote the *net social marginal utility of income* for individual θ,

$$b(\theta) \equiv \frac{G'(V^{\tau}(\theta))}{p}\frac{\partial V^{\tau}(\theta)}{\partial Y_0} + \tau\frac{\partial y(\theta)}{\partial Y_0}.$$

The first term in $b(\theta)$ is the weighted marginal utility of individual θ when that individual receives an additional baseline income. This term recognizes that those individuals privileged by the government have a higher social marginal utility of income. The second term in $b(\theta)$ represents the increase in revenue collected when income for individual θ increases. In general, one should expect $b(\theta)$ to be a decreasing function of civilian ability (see, e.g., Salanie 2003, Chap. 3).

Using $b(\theta)$, the first-order condition with respect to Y_0 can be written as

$$\int_{\bar{\theta}^{\tau}(w)}^{\infty} b(\theta)\mathbb{F}_{\Theta}(d\theta) = 1 - R, \tag{14}$$

which equalizes the net social marginal utilities across individuals in the civilian economy, as in $\mathbb{E}[b(\theta)|\theta > \bar{\theta}^{\tau}(w)] = 1$. Let $\zeta^c(\theta)$ denote the compensated labor supply elasticities at θ. The first-order condition for τ, after some simple substitutions similar to those in Salanie (2003, Chap. 3), yields

$$\frac{\tau}{1-\tau}\int_{\bar{\theta}^{\tau}(w)}^{\infty} \zeta^c(\theta)y(\theta)\mathbb{F}_{\Theta}(d\theta) = \int_{\bar{\theta}^{\tau}(w)}^{\infty} [1-b(\theta)]y(\theta)\mathbb{F}_{\Theta}(d\theta),$$

which, from (14), can be simplified further to

$$\frac{\tau}{1-\tau}=-\frac{Cov[b(\theta),y(\theta)|\theta>\bar{\theta}^{\tau}(w)]}{\mathbb{E}[\zeta^{c}(\theta)y(\theta)|\theta>\bar{\theta}^{\tau}(w)]}. \tag{15}$$

2.3.2 A military draft

The optimal negative income tax under a draft, $T^d(y)=-Y_0^d+\tau^d y$, can be derived similarly. Under a draft, the budget constraint takes the form

$$w^d\bar{h}R+Y_0^d(1-R)=\tau(1-R)\int_0^{\infty}y(\theta)\mathbb{F}_{\Theta}(d\theta), \tag{16}$$

and the social welfare function is of the form stated in (10). The first-order condition with respect to Y_0^d yields, $\mathbb{E}[b^d(\theta)]=1$, and the first-order condition for τ^d is

$$\frac{\tau^d}{1-\tau^d}=-\frac{Cov[b(\theta),y(\theta)]}{\mathbb{E}[\zeta^{c}(\theta)y(\theta)]}. \tag{17}$$

The optimal linear tax under a draft thus follows the same formula as (15), but it considers unconditional moments of the distribution of civilian outcomes.

Both (15) and (17) are expressions of the classical formula for the optimal linear direct tax. (These expressions are identical to the optimal linear tax formula derived in Salanie (2003, pp. 173–174).) Tax rates τ and τ^d are higher when labor supply is less elastic. The covariance term in (15) and (17), however, likely differs between a voluntary system and a drafted system. The covariance $Cov[b(\theta),y(\theta)|\theta>\bar{\theta}^{\tau}(w)]$ represents the *distributive factor of the tax* in a voluntary system; $Cov[b(\theta),y(\theta)]$ is the *distributive factor of the tax* under a draft. In (15) and (17), the covariance term would obviously equal zero if there is a single individual-type in the economy. Distributional factors will also disappear from the tax rates if the government has Rawlsian preferences:

Proposition 2 *Assume that the government's preferences are Rawlsian and that there are no income effects in labor supply. Then, optimal linear taxes satisfy* $\tau=\tau^d$ *and government revenue is higher under a volunteer military than under a draft.*

Proof Rawlsian preferences imply that the government maximizes total revenue in order to increase the basic income Y_0, which supports those with the lowest incomes in the civilian economy. The distributional factors are dropped from (15) and (17) accordingly. Moreover, in an economy with quasi-linear preferences, the right-hand side in (15) and (17) would become $1/\zeta^c$ since there is a constant compensated elasticity of labor supply. This term would be equal among recruitment mechanisms so any difference in government revenue between them will be the result of differences in the tax base. In particular, total revenue under a voluntary system is $\tau(1-R)\mathbb{E}[y(\theta)|\theta>\bar{\theta}^{\tau}(w)]$, which exceeds the revenue of the conscription system, i.e., $\tau(1-R)\mathbb{E}[y(\theta)]$ due to the selection effects of the voluntary system stated in Proposition 1(i). □

Proposition 2 substantiates our claim that the tax base in the civilian economy differs considerably between manpower fulfillment methods, and that the voluntary system has a larger tax base. The case just described is special but no particular assumptions are made about the underlying distribution of civilian ability. The finding that optimal taxes under a voluntary system equal those under a draft is therefore somewhat general. Moreover, the optimal linear taxes recognize the traditional labor supply response to taxation associated with the labor supply elasticity. We nonetheless study distributional factors under optimal linear taxation in an Appendix not for publication.

2.4 Nonlinear taxes

2.4.1 A voluntary army

We have previously studied the implications of self-selection for the voluntary army (Proposition 1). We now complete our analysis of this recruitment method and describe the nonlinear tax schedule and military compensation. Notice that since w is determined from the size requirement (5), the term $G(u(w\bar{h}) - v(\bar{h}))R$ is not a choice for the government under voluntary recruitment. Notice also that the analysis of optimal income taxes is as in Mirrlees (1971) since the military manpower requirement is filled independently using the participation margin. Recall that $\zeta^c(\theta)$ denotes the compensated labor supply elasticity at θ and let $\zeta^u(\theta)$ represent its uncompensated version. Finally, let p be the (average) marginal social value of revenue, i.e., the Lagrange multiplier on (6).

Proposition 3

(i) *For a given tax schedule, there exists a unique military wage* $w > 0$ *that fulfills the quota* (5). *The military wage wis increasing in* the recruitment quota R.

(ii) *For a given military wage w, and for all* $\theta > \bar{\theta}(w)$, *the first-order condition for the optimal tax rate at a civilian income* $y(\theta)$ *satisfies*

$$\frac{T_y(y(\theta))}{1-T_y(y(\theta))}=\left(\frac{1+\zeta^u(\theta)}{\zeta^c(\theta)}\right)\frac{u_c(c(\theta))}{\theta\mathbb{F}_\Theta(d\theta)}\int_\theta^\infty\left[1-\frac{G_V(V(s))u_c(c(s))}{p}\right]\left(\frac{1}{u_c(c(s))}\right)\mathbb{F}_\Theta(ds). \tag{18}$$

Proof (i) Recall that $V(\bar{\theta}(w)) = u(w\bar{h}) - v(\bar{h})$. Assuming differentiability, $\bar{\theta}_w(w) = u_c(w\bar{h})\bar{h}/V_\theta(\bar{\theta}(w))$, which is positive. Let $\Xi(w) \equiv \int_0^{\bar{\theta}(w)} \mathbb{F}_\Theta(d\theta)$, with $\Xi(0) = 0$ and $\Xi(\infty) = 1$. By continuity, there is a wage that satisfies $\Xi(w) = R$. By monotonicity, this wage is unique and increasing in R. The proof of (ii) is omitted; the derivation and interpretation of the marginal taxes has been treated in several places, notably by Saez (2001). □

Proposition 3(i) simply notes that a voluntary army is always feasible, provided that there is enough revenue to pay for it. Moreover, to attract a larger fraction of individuals voluntarily into the military sector, the military must pay them higher rates. An interpretation of Proposition 3(ii) is unnecessary but it is useful to highlight the aspects that are specific to our problem.[11] First, since individuals have the option of joining the military or not, the lower tail of the distribution of civilian ability is truncated. Second, marginal taxes in (18) only depend on the marginal distribution of civilian ability $\mathbb{F}_\Theta(\theta)$. Thus, the distribution of military ability can be conditioned upon to determine marginal taxes in the civilian economy. This point allowed us to study civilian and military outcomes separately in Proposition 1. The reason for these simplifications is that selection into the voluntary army takes place independently of military ability, as per (4).

[11] Essentially, the shape of marginal taxes depends on three terms: the labor supply elasticity since an elastic labor response implies lower marginal taxes, the skill distribution since the aggregate distortion of taxation depends on the population affected by the marginal tax at each level, and the preferences for redistribution implicit in the welfare function; see, e.g., Salanie (2003) and Saez (2001).

One way to examine the importance of the tax distortions is to consider the Lagrange multiplier p:

$$p = \frac{\int_{\bar{\theta}(w)}^{\infty} G_V(V(s))\mathbb{F}_{\Theta}(ds)}{\int_{\bar{\theta}(w)}^{\infty}\left(\frac{1}{u_c(s)}\right)\mathbb{F}_{\Theta}(ds)}. \tag{19}$$

This multiplier measures the (average) marginal social value of revenue for the government. Notice that (19) takes into account the individuals who have joined the military. Their decision effectively eliminates the lower tail of the distribution of civilian earnings and this lowers the value of p (compared to a case with $\bar{\theta}(w) = 0$). Thus, as the fraction of individuals who join the military increases, the marginal social value of additional revenue likely declines.

2.4.2 A military draft

Let $T_y(y(\theta), p, \bar{\theta}(w))$ denote the marginal tax rate in (18) as a function of $(y(\theta), p, \bar{\theta}(w))$, and let p^d be the Lagrange multiplier on the budget constraint (8).

Proposition 4 *Under a draft, the first-order condition for the optimal tax rate at civilian income* $y(\theta)$ *satisfies* $T_y^d(y(\theta), p^d, 0) = T_y(y(\theta), p, \bar{\theta}(w))$, *for all* $\theta \geq 0$.

Proof Notice that the relevant distributional terms in (8) and (10) can be written as in (6) and (7) with $(1 - R)\mathbb{F}(d\theta, dm)$. In (18), however, the term $(1 - R)$ in the numerator and in the denominator would simply cancel since the draft is fair. □

The intuition behind the previous proposition is that a fair draft does not alter the distribution of ability in the civilian sector relative to the given distribution $\mathbb{F}(d\theta, dm)$. There are, however, important differences between the income tax needed to finance a volunteer military and that needed to finance a conscripted one. First, under the draft, a mass of individuals with $\theta \leq \bar{\theta}(w)$ now participate in the civilian sector. Similarly, the mass of individuals with civilian ability $\theta > \bar{\theta}(w)$ is smaller under a draft than under the volunteer military since a fraction R is taken from civilian activities. Second, the total budgetary cost of the drafted military can be lowered by reducing the compensation of soldiers, w^d. We will discuss these differences in our numerical analyses below.

Finally, notice that there should be differences in the value of a marginal social value of revenue, $p^d \neq p$. In particular,

$$p^d = \frac{\int_0^{\infty} G_V(V(s))\mathbb{F}_{\Theta}(ds)}{\int_0^{\infty}\left(\frac{1}{u_c(s)}\right)\mathbb{F}_{\Theta}(ds)}, \tag{20}$$

which, in contrast to (19), integrates over the entire domain of civilian ability. This implies that the marginal social value of revenue for the government is higher under a draft than under a volunteer army. The reason is that a fair draft and a voluntary system alter the distribution of civilian earnings in different ways.

2.5 Some remarks

In an Appendix not for publication we provide a number of remarks about the validity of the participation constraint in light of some empirical evidence about military enlistments, e.g., Sandler and Hartley (1999, pp. 160–162) and Kriner and Shen (2010, pp. 60–61). We also present a brief discussion of more general multidimensional screening models with alternative participation constraints (e.g., Jullien 2000; Rochet and Stole 2003; Basov 2005; Kleven et al. 2009; Frankel 2014; Rothschild and Scheuer 2013) and characterize the case of observable military ability. Finally, we discuss recent empirical tests for the possibility of adverse selection in the U.S. Army during World War II, when both voluntary enlistments and a democratic draft were in place. [In a companion paper, Birchenall and Koch (2015), we have examined the relative performance of draftees versus volunteers, using selection tests in the style of Chiappori and Salanie (2001)].

3 Quantitative findings

3.1 Parametrization

Our choice for functional forms and parameters relies on the existing literature on optimal income taxation. As we remarked after Proposition , knowledge of the marginal distribution of civilian ability, $\mathbb{F}_\Theta(\theta)$, is sufficient to determine marginal income taxes and all other civilian outcomes. We employ a lognormal distribution with mean 2.757 and and variance 0.5611, specified by Mankiw et al. (2009) to fit the distribution of wages (i.e., civilian ability) from the March Current Population Survey (CPS) of 2007.[12]

We use individual preferences of the form

$$U(c,h) = \frac{c^{1-\gamma}-1}{1-\gamma} - \frac{\alpha h^{\sigma}}{\sigma}, \tag{21}$$

with a coefficient of risk aversion of $\gamma = 1.5$ and with a Frisch elasticity of labor supply of $1/(\sigma - 1) = 0.5$. The parameter α specifies the value of non-market productive time for the individual. We assume that $\alpha = 2.55$ to obtain an average of 40 hours of work per week in the civilian sector, per Mankiw et al. (2009).

We use a social welfare function $G(V)$ given by

$$G(V) = -\frac{\exp\{-\xi V\}}{\xi}, \tag{22}$$

where ξ measures the degree of preference for equity. Higher values of ξ represent greater concern for equity. When $\xi \to 0$, $G(V) = V$ and we obtain a *utilitarian* case. We consider $\xi = 0$ and $\xi = 1$.

3.2 Military wages

Wages for the voluntary army w are endogenous. To determine the compensation for the drafted army we consider three scenarios. First, we assume that $w^d = w$. This implies that the total cost of the military is the same regardless of the recruitment method. Second, we

[12] This ignores the fact that those currently employed by the military are counted as receiving "civilian wages" and are thus included in this parameterizations. We performed several robustness checks with adjusted lower-ends of the ability distribution, and the distributional consequences were the same. We rely on an iterative procedure and assume a dense grid over the distribution of productivity. The bins begin at \$4.76, and are fifty cents wide. The bins continue until \$109.76, the 99.97th percentile. This allows for military sizes from zero to forty percent of the population.

assume that $w^d = (1 - R)w$. This assumption lowers the cost of the army but it preserves the amount of revenue that needs to be raised from the civilian sector. Third, we examine a wage-setting rule that maximizes social welfare, (10). In some instances we consider $w^d = 0$, which assumes that drafted soldiers receive no compensation at all.

3.3 Utilitarian case

First consider the utilitarian case, i.e., $\xi \rightarrow 0$ in (22). We are interested in two *social* outcomes: (i) the marginal social value of revenue p and p^d, which measure how valuable revenue is from a social point of view, and (ii) the social welfare functions W^v and W^d. We are also interested in two *individual* outcomes: (i) average tax rates $T(y(\theta))$ and $T^d(y(\theta))$, which measure the tax burden for different individuals, and (ii) value functions $V^v(\theta)$ and $V^d(\theta)$, which measure individual welfare, i.e., who gains the most from each recruitment method.

3.3.1 Marginal social value of revenue

Figure 1 plots p , the marginal social value of revenue for a volunteer army, against similar values for a draft economy, p^d. The figure varies military size from $R = 0$ to $R = 0.40$ and considers the three wage-setting mechanisms for w^d previously discussed. When the value of p^d is large, the marginal social value of additional revenue is large. This means that the government is more willing to distort the economy in order to raise revenue. At $R = 0$, $p = p^d$ trivially. As Fig. 1 suggests, however, p is smaller than p^d regardless of the wage-setting mechanism.

These results are consistent with our introductory remarks and our prior discussions of p and p^d. Under a voluntary system, the tax base is larger and the redistributive needs in the civilian economy are smaller. This reduces the marginal social value of revenue. In fact, p actually falls as the size of the army grows. This is because as the army requires more soldiers, it takes them from the bottom of the earnings distribution. The civilian economy

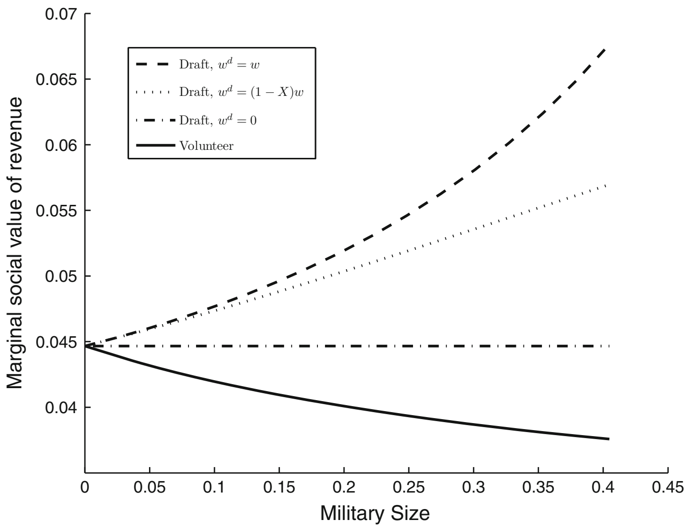


Fig. 1 Utilitarian social welfare, log-normal wage distribution, alternate wage settings

that is left behind has richer taxpayers and suffers from less earnings inequality. When the drafted army pays high wages, i.e., $w^d = w$, the value of p^d is larger than for lower wages, i.e., $w^d = 0$, because the government has greater expenses and engages in more redistribution. That is, under $w^d = 0$, the social marginal value of revenue is indeed lower than under $w^d = w$. However, p^d at $w^d = 0$ still exceeds p as long as $R > 0$ because a voluntary army transfers resources to all inframarginal soldiers.

3.3.2 Social welfare

There are broader consequences to paying a drafted army low wages. Lowering the military wage increases the *forgone earnings cost* of the draft. Figure 2 plots the average welfare of volunteer armies and drafted armies under the assumption that the government sets the military wage w^d to maximize the social welfare function, W^d. For completeness, we also consider the previous wage-setting rules.

Three results are clear: first, optimally setting the military wage in the draft economy provides greater social welfare than when the military wage is set at the value of the volunteer economy, i.e., $w^d = w$. The former economy is an unconstrained version of the latter, so this is a trivial result. Second, despite these gains, the volunteer economy is still better on average than either of the draft economies. In fact, having low military wages, $w^d = w(1 - R)$, fairs worst. The pulic budget gains from lowering military wages, and thus relaxing the tax burden on the civilian sector. Those gains, however, are small compared to the welfare loss owning to forgone earnings. The intuition for these differences is that to

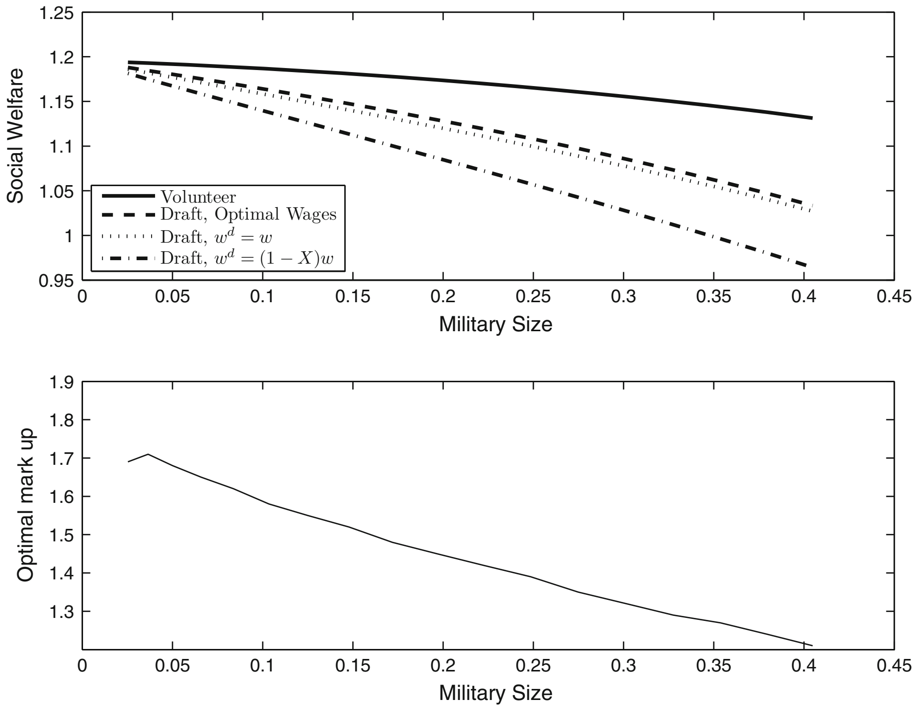


Fig. 2 Utilitarian social welfare, log-normal wage distribution

lower the social cost of the draft, the compensation given to soldiers w^d must be large since high military wages yield higher consumption values for draftees (i.e., a high military wage provides *partial insurance* against the draft).

Figure 2 also plots the ratio of the optimal draft economy military wage and the volunteer wage. The third result is that the optimal military wage exceeds the volunteer military wage. Starting at 1.7 times the volunteer wage, this mark-up falls as the military grows in size. As the military expands, agents face a greater chance of being drafted, so it makes sense to transfer resources to that state by increasing the military wage.

3.3.3 Individual tax burden

Figure 3 plots the average tax rates for the volunteer and drafted economies against the cumulative distribution of civilian ability. We plot armies of two sizes: two and a half percent and seventeen percent of the population, though the patterns we describe are consistent with those for the other army sizes we considered. The differences in the marginal social value of revenue correspond to differences in marginal taxes (see 18). In particular, since $p^d > p$, the draft leads to the higher marginal tax rates, and thus steeper average tax curves evident in Fig. 3. For low ability agents, a draft leads to a more negative average tax, i.e., a larger net transfer from the government. The average tax contribution of high-income earners is larger under the draft than under the voluntary

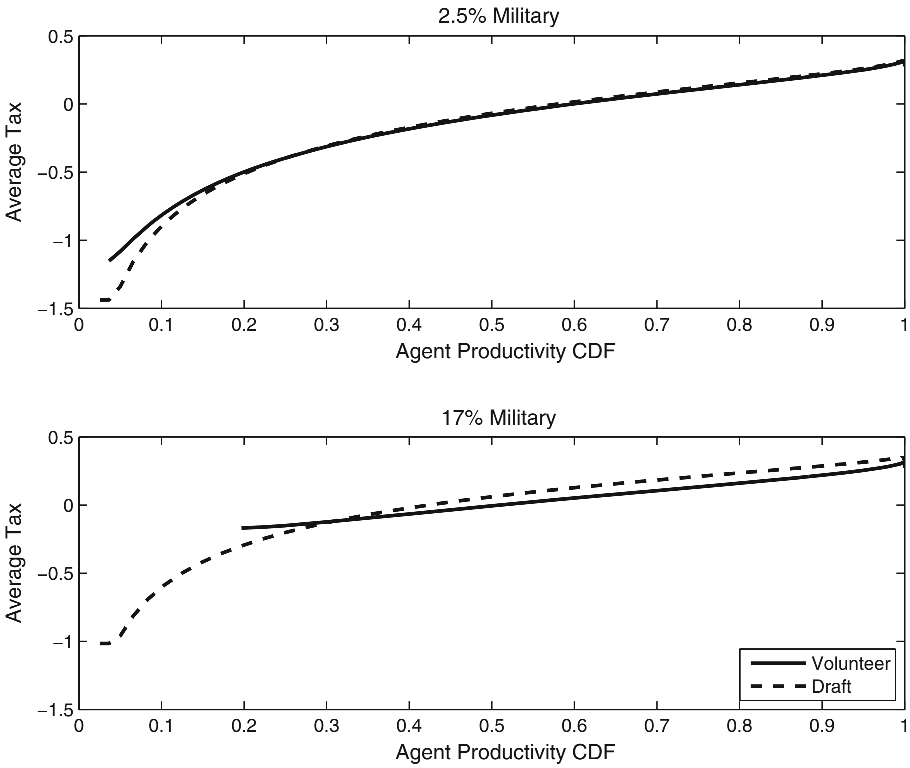


Fig. 3 Utilitarian social welfare, log-normal wage distribution

system, even at lower military wages.[13] These average tax curves cross, leaving some individuals with a larger net subsidy from the government with a draft. The crossing of the average tax curves has important consequences for individual welfare differences.

3.3.4 Individual welfare

Figure 4a plots the difference between the individual welfare in an economy with a drafted army versus one with a voluntary army, by civilian ability, and by army size. The vertical axis plots the percent consumption equivalent to $V^v(\theta) - V^d(\theta)$ (i.e., divided by the marginal utility and level of consumption). If this value is positive, then the agent prefers the voluntary army. If it is negative, the draft is preferred. The level values correspond to the amount of consumption in the volunteer economy that an agent would give up to avoid the level of utility he would have in a draft economy. The first of the other two axes represents the army size required, i.e., the fraction of the economy's agents required for service. The second axis indexes the individual's ability in the civilian economy.

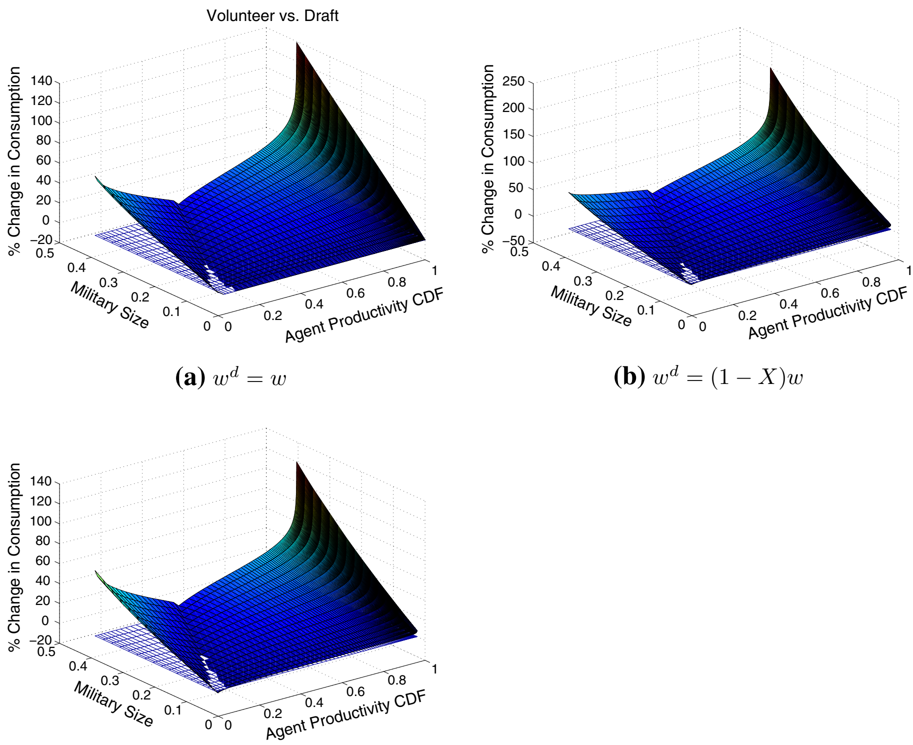
For armies of all sizes the individual welfare differences exhibit a V-shape. At one extreme, the individuals with the highest civilian abilities are better off with a voluntary army since they are able to exploit their comparative advantages. At the other extreme, the individuals with the lowest civilian abilities, those who would join the military, prefer the voluntary army as it keeps them out of their low-productivity civilian jobs in the event that they are not drafted.

For some individuals, a draft is preferred. These are the agents for whom volunteering for the military is near-marginal. In theory, the marginal individual who decides to participate in the military is indifferent between a voluntary system and a drafted one. These near-marginal individuals have valuable civilian options. That is why the left-side of the V slopes down as agent ability grows: the civilian options grow more lucrative, making the voluntary army relatively less attractive. Because the military earnings are close to the civilian options, the difference $V^v(\theta) - V^d(\theta)$ comes down to the average taxation. Thus, the low marginal gains from volunteer enlistments and the lower average taxes make the draft preferred for some.

Figures 4b and c plot the individual welfare difference between a volunteer economy and one with a draft, for alternative military wage-setting mechanism. The distributional consequences are essentially the same as in Fig. 4a: we get V-shaped utility differences, which leaves near-marginal agents better off with a draft economy when the military's needs are small. This shows that the distributional consequences of the drafted military are not tied to the size of military compensation.[14]

[13] We can make the previous argument a little bit more precise in the following sense. Suppose that $w^d = w(1 - R)$ and $p = p^d$. The first assumption implies that $\int_0^\infty T^d(y(\theta))\mathbb{F}_\Theta(d\theta) = \int_{\bar{\theta}(w)}^\infty T(y(\theta))\mathbb{F}_\Theta(d\theta)$, whereas the second assumption implies that $T_y^d(y(\theta))$ and $T_y(y(\theta))$ are differential equations that only differ in their initial condition; see Proposition 4. Since average taxes are represented by solutions of a differential equation (18), and because of the existence and uniqueness theorem for differential equations, one and only one integral curve passes through each point. That is, $T^d(y(\theta))$ and $T(y(\theta))$ cannot cross. It follows that $T(y(\theta)) > T^d(y(\theta))$ for all $\theta \in [\bar{\theta}(w), \infty)$. Under a budget-neutral draft with equal value of a marginal unit of public funds, the tax burden of high-ability civilians is heavier under a draft than under a voluntary system.

[14] Konstantinidis (2011) studied a political economy model of conscription with unidimensional abilities and lump-sum taxation. In Konstantinidis (2011), a medium-income constituency of civilians favor conscription. Low- and high-income individuals always find the voluntary army to be preferable, for the same reasons outlined here. Numerically, Konstantinidis (2011) showed that this "middle-class 'pocket' of pro-



(a) $w^d = w$

(b) $w^d = (1 - X)w$

(c) Optimal military wages

Fig. 4 Utilitarian welfare, log-normal wage distribution, alternate draft wages

Our findings are not just qualitatively instructive, but also quantitatively important. For example, when the military is five percent of the population, the average consumption equivalent is 4.3 % of consumption. The mean masks a larger cross-sectional difference between agents: the median agent would give up ten percent of civilian consumption in the economy with a voluntary army to avoid a draft. The magnitude of this difference should not be surprising, as the draft represents a five percent chance of consuming one quarter in the military of what he would have made in the civilian sector.

3.4 Sensitivity

The numerical findings to this point rely upon utilitarian welfare. Next we employ a social welfare function with stronger preferences for equity. As in Tuomala (1984), we set $\xi = 1$ in (22). Table 1 presents the results of this and our other robustness and sensitivity checks. In terms of welfare differences, the results are more noteworthy than before. That is, the volunteer military is better on average, and for all individuals. This can be seen in the final column of Table 1, which reports the fraction of the population that prefers a draft.

Footnote 14 continued
conscription civilians" is larger in a more egalitarian societies. In Konstantinidis (2011), however, tax burdens and redistributive needs are not explicitly taken into account as taxation is lump-sum.

Table 1 Robustness results for alternative model specifications

	Military size	Average tax at ability percentile				% Who prefer draft
		5th		95th		
		Draft	Volunteer	Draft	Volunteer	
A. Baseline results	2.5	−1.34	−1.08	0.26	0.25	5.84
	17	−0.96	–	0.31	0.25	0
B. Social Welfare Function ($\xi = 1$)	2.5	−8.78	−9.02	0.41	0.41	0
	17	−6.94	–	0.47	0.42	0
C. More elastic labor supply	2.5	−1.21	−0.82	0.17	0.16	12.5
	17	−0.69	–	0.21	0.15	2.49

Table 1 also reports the average tax functions for the same two military sizes as above, at the 5th and 95th percentiles of the ability distribution. The average tax function does not cross with stronger preference for redistribution, as opposed to the utilitarian case. Here, the average taxes with the draft are larger (i.e., less negative) for the lower productivity agents than in the voluntary army. The stronger redistribution motives remove any potential for some agents to be better off with a draft.

The labor supply elasticity is a key parameter in our model. We increase the labor supply elasticity to 3 ($\sigma = 1.33$), while targeting average hours worked consistent with the US data ($\alpha = 0.64$). The deadweight losses of a voluntary army are the largest owing to the distortionary costs of taxation. This specification provides the draft its largest group of advocates yet, over 12 %. This recedes as the military grows to its larger size. A more responsive labor supply increases the potential gains from a draft, but it is limited to small militaries.

While our focus has been on the bottom of the productivity distribution, the optimal tax literature has focused at the top, e.g., Saez (2001). For a second specification test, we directly adopt Mankiw et al. (2009) distribution of abilities, which appends a Pareto tail with coefficient 2 to the top of the wage distribution. A Pareto tail can be seen as a distribution of civilian ability with a larger fraction of high-earning individuals. The simulation results can be found in Table 2. The Pareto tail leads to much lower (negative) average taxes for the low ability agents. This relative difference, however, is not enough to make those low ability agents prefer the draft. This results in a Pareto preference for the voluntary army.

In addition to this, we studied simulations with another four civilian ability distributions: the first two adjust the mean of the civilian ability distribution (plus and minus 10%), while the second two adjust the standard deviation of the civilian ability distribution (also plus and minus 10%). The results are reported in Table 2. In practice, nothing changes; voluntary armies are still preferred by the vast majority of agents in the economy. Varying the ability distribution does lead to differences in redistribution, as is evident in the average taxes for the 5th and 95th percentiles in the ability distribution. These taxes are less burdensome in a volunteer economy.

3.5 Extensions

An Appendix not for publication considers a number of extensions. For example, the participation decision focused exclusively on pecuniary incentives. In reality, individuals

Table 2 Robustness results for alternative civilian ability distributions

	Military size	Average tax at ability percentile				% Who prefer draft
		5th		95th		
		Draft	Volunteer	Draft	Volunteer	
A. Pareto tail on the ability distribution	5	−12.45	−7.31	0.34	0.32	0
	18	−10.23	–	0.40	0.32	0
B. Increase mean ability ten percent	2.5	−1.26	−0.98	0.26	0.25	6.70
	17	−0.89	–	0.31	0.25	1.90
C. Decrease mean ability ten percent	2.5	−0.83	−0.83	0.24	0.24	2.25
	17	−0.53	–	0.29	0.25	3.53
D. Increase standard deviation of ability ten percent	2.5	−0.60	−0.60	0.29	0.29	2.25
	17	−0.36	–	0.33	0.29	3.53
E. Decrease standard deviation of ability ten percent	2.5	−0.82	−0.67	0.22	0.21	7.81
	17	−0.52	–	0.28	0.22	0

enlist due to non-pecuniary motives (i.e., patriotism and an affinity for the military lifestyle).[15] We consider non-pecuniary motives in a version of the model with random participation, as in Rochet and Stole (2002). We find that differences in efficiency between the draft and the voluntary military do not originate in the stark participation decisions of the baseline model. We also consider a more sophisticated recruitment system based on an optimal "in-kind" tax. We assume that the government taxes individuals' productive time directly and uses this time input in the production of government-related activities.[16] Since conscription taxes are an in-kind tax denominated in hours, this tax does not allow for any income redistribution. The inability to redistribute income leads to low consumption, and thus low levels of utility among the low civilian ability agents.

4 Concluding remarks

The main point of this paper has been to show that, contrary to conventional wisdom, a draft has a limited power to lower the tax distortions tied to the budgetary cost of the military. Using a Mirrleesian approach and a two-sector economy, we found that a draft reduces the tax base because some high-income earners are inducted into the army. This reduction in the tax base increases marginal taxes and the distortions associated with

[15] A recent study of participation and retention in the U.S. military suggest that non-pecuniary incentives play an important role in these decisions. In their study of information technology (IT) workers in and out of the military, Hosek et al. (2004) found that the recruitment into the U.S. military of these specialized workers held steady in spite of growing civilian market opportunities in the late 1990s. Likewise, "taste" for military service plays a central role in the econometric model of recruitment and retention estimated by Hosek and Mattock (2003).

[16] The government does not directly compete with the civilian labor market. As in *jury duty*, individuals are required to serve as members of a jury from time to time. As the use of money was rare, "in-kind" taxation including compulsory service in public works and defense was the common mode of taxation in ancient times; see, e.g., Salanie (2003, p. 2).

taxation in the civilian sector. We found that the efficiency losses of the draft are larger as military manpower requirements rise.

We considered additional costs. In general, we found that a volunteer force leads to a more productive civilian economy and is more socially desirable; this result was robust to a series of alternative specifications. Some individuals do prefer a draft because conscription may redistribute more income in the civilian sector. The size of this minority varies across specifications and declines as military needs increase. Although low military compensation under a draft reduce the military's budget cost, we found that such compensation is undesirable as these wages are the only form of insurance under a draft. We also considered a less stark random participation decision, where agents join the military for non-pecuniary reasons. The results under random participation are fully consistent with the baseline results. Further, we considered an optimal conscription tax. We found that this third option fares worst, as it does not allow for income redistribution fundamental to social welfare in Mirrleesian economies.

Our model was purposefully simple. In order to examine the many competing trade-offs associated with alternative recruitment methods, we abstracted from many additional margins that may be important for military recruitment in reality. For example, we have also abstracted from potential gains in training once in the army as well as other dynamic considerations. We leave these explorations for future work.

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