THE DYNAMIC COST OF THE DRAFT

MORTEN I. LAU
PANU POUTVAARA
ANDREAS WAGENER

CESIFO WORKING PAPER NO. 774
CATEGORY 1: PUBLIC FINANCE
SEPTEMBER 2002

CESifo *Working Paper No. 774*

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Abstract

We propose a dynamic general equilibrium model with human capital accumulation to evaluate the economic consequences of compulsory services (such as military draft or social services). Our analysis identifies a so far ignored dynamic cost arising from distortions in time allocation over the life-cycle. We provide conservative estimates for the excess burden that arises when the government relies on forced labor rather than on income taxation to finance public expenditures. Our results suggest that eliminating the draft could produce considerable dynamic gains, both in terms of GDP and lifetime utility.

JEL Classification: H20, H57, J22, C68.

Keywords: conscription, draft, time allocation, distortionary taxation, computable general equilibrium models.

Morten I. Lau
Centre for Economic and Business Research (CEBR)
Langelinie Alle 17
DK-2100 Copenhagen
Denmark
mol@cebr.dk

Panu Poutvaara
Centre for Economic and Business Research (CEBR)
Langelinie Alle 17
DK-2100 Copenhagen
Denmark
panu.poutvaara@cebr.dk

Andreas Wagener
VWL IV, FB 5
University of Siegen
Hölderlinstr. 3
57068 Siegen
Germany
wagener@vwl.wiwi.uni-siegen.de

1 Introduction

To recruit military manpower, governments can rely on conscription (the draft), on voluntary enlistments, or on a combination of both. The United Kingdom and the United States have historically relied on a volunteer military while many countries in continental Europe traditionally got most of the military personnel through conscription. Recently a number of countries, including France, Spain, the Netherlands, Belgium, and Italy, have abolished or started to phase out conscription; other countries such as Germany or Poland are discussing such a move. As a corollary to the military draft, most democratic countries offer conscripts who object to bearing arms the option of civil service, i.e., to take active duty in social services, elsewhere in the public sector or in certain associations rather than in the army. In several countries (notably in Germany) draftees in the social sector make substantial or, according to some supporters of conscription, even indispensable contributions to the welfare system.

In its common form a draft system with compulsory military or social service has two specific features: First, it only affects males (Israel being a prominent exception).[1] Second, draftees are paid well below market rates for similar types of services, both in the military and in the social sector.[2] This second feature leads many observers to believe that the draft opens an inexpensive way for the government to provide military or other services. Yet economists have argued since long that the cheap-labor argument is misleading since it confuses accounting (money) costs with opportunity (real) costs. The main economic arguments against the draft are the following (Hansen and Weisbrod, 1967; Fisher, 1969; Lee and McKenzie, 1992; Sandler and Hartley, 1995, Chapter 6; Warner and Asch, 2001):

- The draft imposes opportunity costs on conscripts which do not show up in fiscal budgets. The opportunity costs exceed budgetary costs by the maximum amount draftees are willing to pay to avoid compulsory service. This can be calculated as the difference between potential market income and the lower pay during the service plus the monetarized disutility from

[1] However, even in countries with a draft system not every young and able-bodied man is required to actually do the service: E.g., when a universal draft (of males) delivers too many personnel, ballots might be used to determine whom to actually call up. Moreover, certain classes of individuals (e.g., clergymen or cases of special hardship) are automatically exempt in most draft systems.

[2] Currently, young conscripts in Germany are paid between 7.41 and 8.95 euros per day plus some allowances for food and clothing. In Finland, daily pay varies between 3.60 during the first 6 months and 8.25 euros after 9 months. People doing civil service are also provided housing and 8.90 euros per day in case the employer provides no meals. Denmark is a less drastic case: Draftees do not get free meals, but receive 359 euros per month for living expenses, and the taxable salary varies between 526 euros during the first 4 months and 1,722 euros after one year.

having to work in an occupation and under circumstances that draftees would otherwise not have chosen.

- Independently on how it is acquired, manning an army or the welfare industry comes at the cost of labor input foregone in other sectors of the economy. Productivity-based market wages reflect this cost while a purely fiscal perspective based on draftees' arbitrary and low pay understates them.

- The draft leads to an inefficient match between people and jobs and thus to an avoidable loss in output. Young men are rather arbitrarily allocated to military or social work without consideration of productivity, comparative advantages, and outside options.

- The allocation of labor within the military may be inefficient for two reasons. First, cheap labor may lead to an excessive use of personnel and thus a waste of resources. Second, the productivity of draftees in military and social sectors is lower than the productivity of professionals due to shorter periods of training, higher turnover rates and lack of motivation and incentives.

While the static efficiency losses of a draft system are sizeable,[3] we argue in this paper that the draft also involves additional dynamic costs that have been ignored so far. The draft creates an intertemporal excess burden on the economy by distorting the allocation of time over the life cycle for conscripts, and by front-loading the cost of financing public services to the early years of life. In particular, the system postpones or interrupts draftees' education and training, shortens their work careers, and reduces the present value of lifetime income. The draft system thus slows down the accumulation of both human and physical capital, with negative and lasting impacts on labor productivity and aggregate output.

Conscription has a negative impact on human capital formation since young men (and sometimes women) typically are called up to compulsory service during a period of their lives which they otherwise would devote to learning or gathering first experiences on the job. In many countries, male high-school graduates do compulsory military service immediately after leaving school and begin university studies or vocational training after finishing the duty.[4] Firms may even be reluctant to train high-school graduates unless they have finished or are exempt from military service, because military and civil service authorities do not always

[3]E.g., Kerstens and Meyermans (1993) estimate that the social cost of the (now abolished) Belgian draft system amounted to twice the budgetary cost. Reviewing several studies, Lutz (1996) reports that the opportunity cost of conscription in the German army is between euro 2.2 and 6.7 billion per annum.

[4]In 1998, compulsory military service in Germany (which lasted 12 months then) on average delayed the start of university studies by 16 to 18 months (DSW, 2000; Lewin et al., 2000).

refrain from calling young men to service during their formal vocational training. Most young men without high-school degrees are drafted shortly after finishing their apprenticeship or vocational training. The draft prevents them from deepening or acquiring relevant professional experience, and freshly gained job-specific skills depreciate during compulsory service.[5]

Apart from distorting human capital accumulation, there is a second channel through which the draft might impose a dynamic burden on society. Draftees typically earn a low payment, and the difference between this payment and the market value of their labor supply corresponds to a supplementary income tax levied exclusively on draftees during the service. Taxes could alternatively be collected from all age cohorts alive in a certain period (possibly including the non-drafted part of the population). This is basically the way how a voluntary military is financed. Appropriately designed, such a general tax could, in every period, earn the same revenue for the government as the specific tax on draftees' income. However, by spreading tax liabilities more evenly over the life cycle the general tax would come at a much smaller cost in terms of the present value of lifetime income than a single and non-recurring supplementary tax on income during conscription. In the presence of consumption smoothing, a more even spread of tax liability over the life cycle would increase private saving and the accumulation of physical capital.

The adverse effects of the draft system on human and physical capital have not received much interest in the literature. To our knowledge, no study exists that deals with the impact of the draft on physical capital while only few studies discuss human capital issues of the draft. In passing, Fisher (1969) mentions the impact of the American draft lottery in the 1960s on human capital decisions and suggests that uncertainty might impose a dynamic cost on the economy. In an econometric analysis, Imbens and van der Klaauw (1995) find that conscription in the Netherlands during the 1980s and early 1990s reduced earnings for conscripts by 5 per cent relative to the non-drafted men of the same cohort. Similar results are obtained by Angrist (1990) for American Vietnam War conscripts. In an empirical study of wage effects due to career interruptions in Germany, Kunze (2002) finds that compulsory service increases wage income for men by 3.2 percent during the first year after conscription and depresses wage income beyond the first year, where the gap in wages increases with time.[6] To the extent that earning differentials reflect differences in human capital formation, empirical evidence

[5]Time spent in the military or in the social sector is not entirely wasteful with respect to human capital accumulation, but the skills aquired there are of only limited value to most draftees.

[6]Kunze (2002) suggests that the increase in wage income during the first year after conscription is driven by effects unrelated to human capital, e.g. by signalling effects. Alternatively, the wage increase immediately after conscription might be caused by lower wage offers before conscription since the authorities sometimes call up people during apprenticeship or vocational training.

thus supports the view that the draft involves dynamic costs from postponement of education and shorter work careers.

We identify and assess dynamic costs of conscription in a general equilibrium model based on individual life cycle decisions. Individuals allocate time across work, learning and leisure and maximize intertemporal utility subject to an intertemporal budget constraint. We calibrate first the model to a steady state equilibrium without compulsory service. The production of final goods combines labor services and physical capital, and aggregate output is either invested or consumed by both individuals and the public sector. Public expenditures are financed by a proportional tax rate on labor income, and the government operates with a dynamic budget constraint that is balanced in each period. Conscription is then introduced as an obligation by a share of the population to spend the first economically active year doing work instead of being allowed to freely allocate time between work, learning and leisure. We distinguish two features of the draft. First, we assume that labor services during conscription are paid at the market wage rate. Second, we introduce a supplementary tax on income during conscription.

Our results show that both the constraint on time and the supplementary income tax during conscription create dynamic excess burdens (output and utility losses). Ignoring general equilibrium effects, the constraint on allocation of time distorts investment in human capital, while the supplementary tax on income has a negative impact on private saving and physical capital accumulation. The impact of the draft is significant at the individual level. More than a decade after completion of conscription, former conscripts have not caught up in productivity compared to non-conscripts at the same age. The economic burden of the draft may also have negative income effects for non-conscripts due to general equilibrium effects.

2 The Model

We apply a dynamic life cycle model in which individuals spend time on labor supply, learning and leisure. Private and public agents have perfect knowledge about current and future economic events, and individuals maximize lifetime utility from consumption and leisure subject to an intertemporal budget constraint. Labor income taxes are collected by the public sector to satisfy a given revenue requirement, which is spent on public provision of goods and services.

The model represents a closed economy where the production technology combines labor services and physical capital. Perfect competition prevails in each market, and private and public agents take output and factor prices as given. Individuals are economically active for 60 years, beginning at age 18 and ending at age 77.

Including human capital formation provides one way of explaining the existence of wage differentials over the life cycle. Individuals can invest in human capital or invest in financial assets. Investment in human capital is costly and specific to each individual, and it is therefore concentrated at the beginning of the life cycle and ends when retirement sets in.[7] Human capital depreciates at a constant rate, and the wage rate per unit of working time thus declines when learning ends.

There are two different types of individuals in the model: conscripts (indexed by subscript c) and non-conscripts (subscript n). Conscripts are subject to draft and are forced to spend their time on work in the first period of the life cycle, possibly with a low income. Non-conscripts do not face the time constraint or the supplementary tax.

2.1 Intertemporal Optimization

In each period of the life cycle, individuals divide time between work, q, learning, s, and leisure, v. The economic life-span of each individual consists of 60 periods, each period representing one year, and the periods are indexed from 0 to 59. Total use of time in each period cannot exceed the endowment of time:

$$v_{i,t} + q_{i,t} + s_{i,t} \leq e, \tag{1}$$

where e is the constant endowment of time in each period. The endowment of time denotes hours available to work, learning and leisure, and it is therefore interpreted as the normal length of a work week, say 40 hours. Subscript t refers to the person's age, and subscript i indicates whether the individual is or has been subject to conscription ($i = c$) or not ($i = n$).

Gross investment in human capital is determined by learning, and the stock of human capital evolves according to the following law of motion:

$$h_{i,t+1} = (1 - \delta^H) \cdot h_{i,t} + s_{i,t}^{\eta}, \tag{2}$$

where h is the individual stock of human capital, δ^H is the rate of depreciation with respect to human capital, and η measures the elasticity of new human capital with respect to learning, where $0 < \eta \leq 1$. This specification implies that learning is spread more evenly across time when η falls. The initial stock of human capital, h_0, is positive and every person enters the economy with some productive skills.

The effective supply of labor services depends on time devoted to work and the stock of human capital:

$$l_{i,t} = q_{i,t} h_{i,t}^{\beta}, \tag{3}$$

where l is the individual supply of labor services, and β denotes the elasticity of labor services with respect to the stock of human capital. We assume that

[7] New human capital can be produced through education and formal/informal on-the-job training, together referred to as learning.

$0 < \beta < 1$, implying diminishing marginal productivity of human capital in the supply of labor services. Marginal and average labor productivity is independent of working time and equal to human capital raised to the power of β.[8]

The individual maximization problem is based on an explicit representation of the utility function:

$$U_i = \sum_{t=0}^{59} \frac{1}{(1+\rho)^t} \cdot \left[\left(\frac{c_{i,t}^{1-\gamma}}{1-\gamma} \right) + \alpha \cdot (v_{i,t} - \mu v_{i,t}^2) \right], \tag{4}$$

where c is consumption of goods, v is demand for leisure, ρ is the rate of time preference, γ is the inverse of the intertemporal elasticity of substitution (σ), α measures the weight assigned to leisure in the instantaneous utility function, and the coefficient μ reflects the rate at which the marginal utility of leisure decreases as the amount of leisure is increased.

The specification of the instantaneous utility function implies that individuals smoothe consumption over the life cycle, whereas leisure is not necessarily consumed in every period. Marginal utility from leisure is $\alpha \cdot (1 - 2\mu v_{i,t}), i \in \{c, n\}$, where marginal utility is constant if μ is equal to zero. A natural upper bound for μ is $1/2e$, which implies that the marginal utility of leisure goes to zero if time is spent entirely on leisure. Contrary to popular constant elasticity of substitution formulations of the utility function, the additively separable utility function allows the point in time at which the individual begins to retire to be endogenous. Retirement begins when the individual starts to demand a positive amount of leisure, which means that less time than the normal work week is devoted to work and human capital formation.

The quadratic utility function with respect to leisure allows us to capture two labor market features. First, the demand for leisure is concentrated at the end of the life cycle. Active labor market participation is phased out at old age since labor productivity falls. The fall in productivity at old age follows from intertemporal maximization of lifetime utility. Since the return to investment in human capital depends on remaining lifetime, human capital accumulation is concentrated in the beginning of the life cycle and phased out towards the end of life. Human capital depreciates at a constant rate, and the opportunity cost to leisure thus declines when learning ends. Second, the model captures the idea that people typically require a higher marginal wage compensation when leisure time is scarce.

Individuals are born without financial wealth, and they can save and borrow without liquidity constraints at the market interest rate, r. The lifetime budget constraint states that the present value of lifetime expenditures on consumption

[8] Marginal and average labor productivity will also depend on working time if we use homothetic Cobb-Douglas or CES specifications. If one of these specifications is applied, labor productivity may increase at the end of the life cycle when working time decreases.

cannot exceed the present value of lifetime wage income:

$$\sum_{t=0}^{59} \frac{1}{(1+r)^t} w(1-\tau^l) \cdot l_{i,t} \geq \sum_{t=0}^{59} \frac{1}{(1+r)^t} \cdot c_{i,t}, \tag{5}$$

where w is the marginal productivity of labor services, and τ^l is the tax rate on wage income. Therefore, $w(1-\tau^l)$ is the return to labor services after tax. The price of the consumption good is chosen as numéraire and normalized at unity. Each individual maximizes the present value of lifetime utility, U, subject to the time endowment constraint, the law of motion with respect to human capital, and the intertemporal budget constraint.

2.2 Conscription

Having established the intertemporal maximization problem for each individual, we next describe how the draft system is introduced in the model. We assume that conscripts are forced to spend available time in the first period of the life cycle on work, i.e. $q_{c,0} = e$. Wage income during conscription can be subject to supplementary taxation, and the intertemporal budget constraint for conscripts changes to:

$$\sum_{t=0}^{59} \frac{1}{(1+r)^t} w(1-\tau^l) \cdot l_{c,t} - \tau \cdot w(1-\tau^l) \cdot l_{c,0} \geq \sum_{t=0}^{59} \frac{1}{(1+r)^t} \cdot c_{c,t}, \tag{6}$$

where τ is the supplementary tax rate on wage income during conscription. Since $w(1-\tau^l)$ is the return to labor services after tax, $\tau = 0$ corresponds to a situation where conscripts receive the market value of labor (net of income taxes), whereas $\tau = 1$ corresponds to a situation where conscripts receive no pay. The true value of τ is difficult to estimate; it furthermore varies with family and educational status.[9]

The use of time is constrained to work in the first period of the life cycle for conscripts, and the extra payments from conscripts do not further distort the allocation of time. However, the extra payment reduces private saving by conscripts since private consumption is determined by lifetime income and follows an exponential pattern over the life cycle, where the consumption growth rate is determined by the Euler condition (the difference between the real interest rate and the rate of time preference divided by the intertemporal elasticity of substitution).

The intertemporal budget constraint for non-conscripts is:

$$\sum_{t=0}^{59} \frac{1}{(1+r)^t} w(1-\tau^l) \cdot l_{n,t} \geq \sum_{t=0}^{59} \frac{1}{(1+r)^t} \cdot c_{n,t}. \tag{7}$$

[9] Schleicher (1996) estimates that net income foregone for an average German conscript in 1993 was 2.4 times the pay during conscription — which implies that $\tau = 2.4/3.4 = 0.7$.

2.3 General Equilibrium

The life cycle model is used to simulate steady state equilibrium effects of the restriction on time allocation and the supplementary tax. Since population growth is not important to the analysis, each cohort size is kept constant and normalized at unity. Prices and aggregate quantities are constant in steady state, and the variables do not carry time indices unless necessary.

Consumption and investment decisions by the representative individuals reflect the behavior of current generations in the steady state equilibrium. It is therefore simple to derive the aggregate supply of labor services to the labor market and the aggregate private demand for leisure, learning and consumption in the steady state. The aggregate supply of labor services is equal to the weighted sum of the supply of labor services over the life cycle for the two different types of individuals:

$$L = \varepsilon \cdot \sum_{t=0}^{59} l_{c,t} + (1-\varepsilon) \cdot \sum_{t=0}^{59} l_{n,t}, \tag{8}$$

where L is the aggregate supply of labor services in steady state, and ε is the share of the population subject to conscription.

The production of final goods combines labor services and physical capital, and the technology is represented by a Cobb-Douglas specification:

$$Y = K^{\phi} \cdot L^{(1-\phi)} \tag{9}$$

where Y is aggregate output, K is the aggregate stock of physical capital, and ϕ is the value share of physical capital. Each producer of goods maximizes profits subject to the production technology (9), and the first order conditions imply that the marginal product of a particular factor input is equal to the producer price of that factor input.

Physical capital depreciates at rate $\delta^K > 0$. The capital stock in period t is equal to the capital stock at the beginning of the previous period less depreciation plus investment in the previous period. As the capital stock is constant in the steady state, gross investment I in physical capital is given by:

$$I = \delta^K \cdot K. \tag{10}$$

Aggregate output is either invested or consumed by individuals or the public sector, and the market clearing condition for output is:

$$Y = C + I + G, \tag{11}$$

where C is aggregate private consumption and G is the public consumption. Finally, the government operates with a dynamic budget constraint that is balanced in each period:

$$\tau^l \cdot w \cdot L + \varepsilon \cdot (\tau \cdot w(1-\tau^l) \cdot l_{c,0}) = G. \tag{12}$$

The total tax revenue from the proportional and supplementary tax rates on wage income on the left-hand side is equal to the cost of public provision of goods and services on the right-hand side.

2.4 Welfare Effects

We use the equivalent variation measure to assess the welfare effects of introducing conscription. This measure is derived as the percentage change in lifetime earnings necessary to yield the utility level reached in the new steady state. More formally, it is determined by:

$$\hat{U}_i(E_{i,0} \cdot (1 + \chi_i), r_0, w_0) = \hat{U}_i(E_{i,1}, r_1, w_1) \tag{13}$$

where $\hat{U}_i$ denotes the indirect utility function for group $i = c, n$, and E_i is the net present value of group i's lifetime income. As we focus on the factor prices faced by individuals, we define w_0 and w_1 to measure after-tax wage rates. Therefore, they combine the changes in gross wage rates and in wage tax rates. The subscripts 0 and 1 denote initial steady state values without and with conscription, respectively. The variable χ_i measures the change in group i's welfare between the two steady states. This welfare measure can be compared across different steady states and is applicable for changes of any size and not only differential approximations.

3 Calibration

There is no draft system in the initial steady state equilibrium, i.e. there is initially no distinction between conscripts and non-conscripts. The model is calibrated to the data set presented in Table 1, and the following standard parameter values are applied in the baseline scenario. Capital income accounts for 31.2 percent of GDP and labor income accounts for 68.8 percent of GDP, which implies that the labor-capital income ratio is equal to 2.2. The level of investment is equal to 20.8 percent of GDP, given a net interest rate of 5 percent and a 10 percent depreciation rate with respect to physical capital. To achieve a sufficiently high private saving rate, the rate of time preference is set equal to 3.1 percent. We assume that the intertemporal elasticity of substitution is equal to 0.667, which is within the range from 0.5 to 1 that is used in most numerical studies.

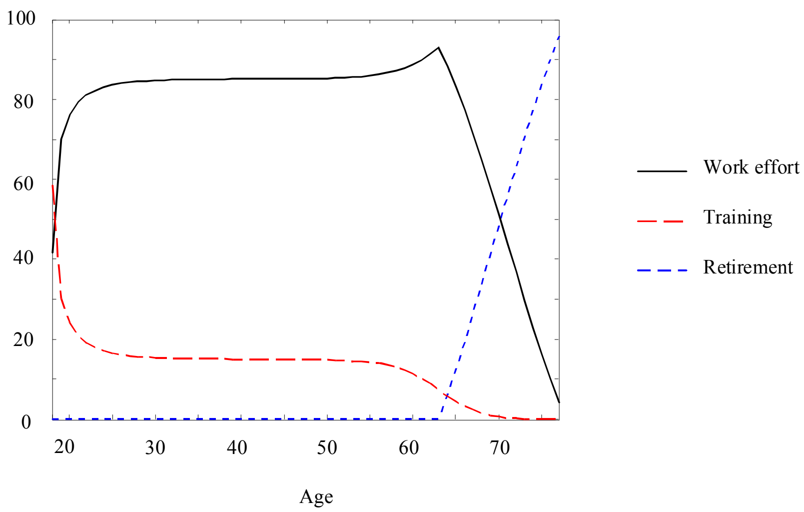
The tax revenue from the wage income tax in the initial steady state is equal to 25.8 percent of GDP. This revenue is achieved by a 37.5 percent tax rate on wage income.

Table 1. Parameter values, tax rates and factor prices in the initial steady state equilibrium.

Parameter values:		
ρ	Time preference rate	0.031
σ	Intertemporal elasticity of substitution	0.667
μ	Coefficient in quadratic utility function	0.250
α	Weight parameter in quadratic utility function wrt. leisure	0.750
η	Elasticity of human capital wrt. time devoted to learning	0.750
δ^H	Depreciation rate for human capital	0.100
β	Elasticity of labor services wrt. human capital	0.350
φ	Value share of physical capital in production of goods	0.312
δ^K	Depreciation rate for physical capital	0.100
h_0	Initial human capital stock	1.000
e	Endowment of time in each period	1.000
Tax rates:		
τ^l	Tax rate on labor income	0.375
Factor prices:		
r	Annual interest rate	0.050
w	Wage rate before tax	1.600

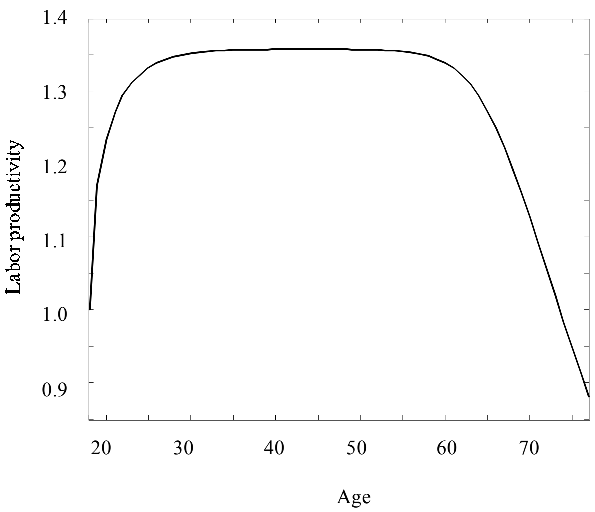
We choose parameter values such that the average individual labor supply profile resembles the estimated average individual labor supply profile (measured in hours worked) for recent generations in McGratten and Rogerson (1998). Figure 1 illustrates the allocation of time over the life cycle for the representative agent in the initial steady state. Human capital formation is highest at the beginning of the life cycle, roughly constant between the age of 25 and 55, and then phased out. Retirement starts at the age of 63, and time spent on leisure exceeds time spent working around the age of 70.

Figure 1. Allocation of time over the life cycle



Investment in human capital is costly and specific to each individual, and it is concentrated in the beginning of the life cycle. The marginal product of human capital investment falls with the level of learning, and the buildup of human capital is thus spread over several periods. Figure 2 shows that labor productivity in the first period of the life cycle is normalized at unity, and it increases during the first 10 years of the life cycle. The level of labor productivity is maintained during the next 30 years and falls when the individual begins to retire from the labor market. Human capital depreciates at a constant rate, and the wage rate per unit of working time is falling during the last third of the life cycle.

Figure 2. Labor productivity over the life cycle



4 Results

We next introduce a draft system and analyze the economic effects of the reform. Conscripts are constrained in the use of time in the first period of the life cycle, and they may be paid less than what would be the value of their labor services after the ordinary wage tax. This is formalized as a supplementary tax being imposed on their net wage income in the first period, net wage income meaning the after-tax value of their labor supply. Public spending on goods and services is held constant, and the proportional tax rate on wage income is determined endogenously to balance the public budget. To assess the long run impacts of the policy reform, the simulated policy changes are compared with a baseline simulation reflecting the initial steady state.

4.1 Income and Welfare Effects

Introducing a draft system has negative effects in the long run on income and consumption. This is driven partly by direct effects on draftees, and partly by indirect general equilibrium effects of changes in factor prices on the behavior of non-draftees. Table 2 shows that GDP and consumption decrease with 0.2 percent when 25 percent of the population is subject to draft and the supplementary tax rate is equal to 0. The reduction in private saving is more significant than the fall in labor services, and the capital intensity goes down. The decrease in capital intensity drives up the return on physical capital and drives down the gross wage rate. The reduction in labor income erodes the tax revenue from the tax rate on labor income, and the tax rate on labor income goes up. The negative impact on the economy is more significant when the share of the population subject draft increases, and GDP decreases by 0.7 percent when the entire population is subject to draft and the supplementary tax rate is equal to 0.

Table 2. Effects of move to draft system (percentage change from initial steady state equilibrium)[a]

	Share of population subject to draft								
	25 percent			50 percent			100 percent		
	Supplementary tax rate			*Supplementary tax rate*			*Supplementary tax rate*		
	0%	50%	100%	0%	50%	100%	0%	50%	100%
GDP	-0.2	-0.5	-0.8	-0.4	-0.9	-1.5	-0.7	-1.9	-3.0
Consumption	-0.2	-0.6	-1.0	-0.5	-1.1	-1.9	-0.9	-2.3	-3.7
Physical capital stock	-0.3	-0.8	-1.3	-0.5	-1.5	-2.6	-1.0	-3.1	-5.2
Labor services	-0.1	-0.3	-0.6	-0.3	-0.7	-1.1	-0.6	-1.3	-2.1
Rental rate on physical capital	0.08	0.29	0.51	0.16	0.61	1.07	0.33	1.24	2.23
Wage rate	-0.04	-0.13	-0.23	-0.07	-0.28	-0.48	-0.15	-0.56	-1.00
Tax rate on labor income[b]	0.18	0.12	0.08	0.35	0.23	0.13	0.69	0.45	0.26

Note: (a) the initial tax rate on wage income is 37.5 percent, (b) measured in percentage points.

Table 2 also shows that supplementary tax payments by conscripts increase the negative effects on income and consumption. The revenue from the supplementary tax rate is spent on a reduction in the tax rate on labor income, and the reform thus transfers income from conscripts to non-conscripts, and from young generations to old generations who are not subject to draft. The impact on the economy may be significant. For example, GDP falls by 3 percent if the entire population is subject to draft and no income is paid during conscription. Most of the decrease in GDP is due to reduced private saving, and the capital intensity in the economy drops further. Changes in net factor prices thus move further apart, with an increase in the return on physical capital and a decrease in the net wage rate.

Figures 3a and 3b illustrate the effects on individual learning decisions when 25 percent of the population is subject to conscription and the supplementary tax rate on net wage income is 50 percent. Conscripts are forced to spend available time on work in the first period of the life cycle, where labor productivity is low and a significant share of their time otherwise would be spent on learning. They compensate for the initial loss in learning by raising learning efforts in the first couple of years after conscription. Lifetime income is reduced by the inefficient allocation of time and the supplementary tax payments during conscription, and conscripts raise learning efforts late in the life cycle to compensate for the income loss.

Non-conscripts, on the other hand, marginally reduce their learning period. The increase in the interest rate reduces the present value of the return to learning and leads to a reduction in human capital accumulation. Investment in human capital is also reduced by the decrease in the net wage rate. The reduced net wage rate leads to an increase in the demand for leisure. Earlier retirement reduces the amortization period for investment in human capital and leads to less learning. Hence, the opposite changes in net factor prices both have negative impacts on learning efforts by non-conscripts.

Figure 3a. Training for conscripts (g = 0.25 and J = 0.50)

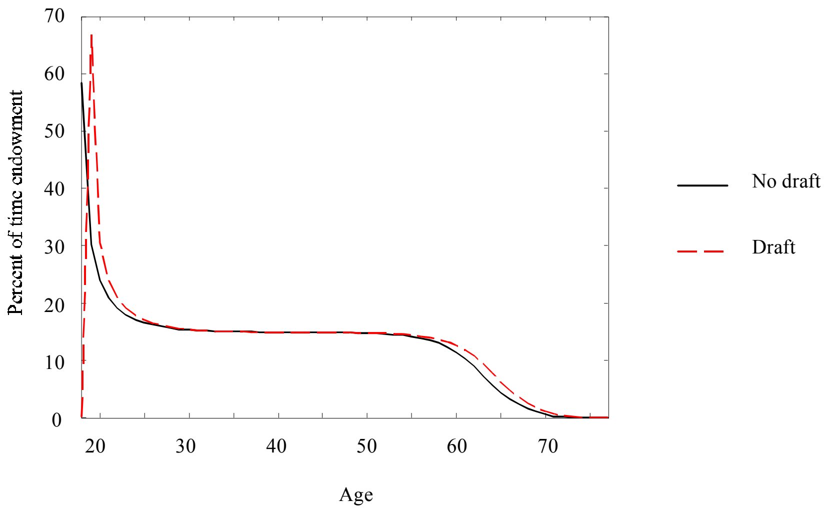
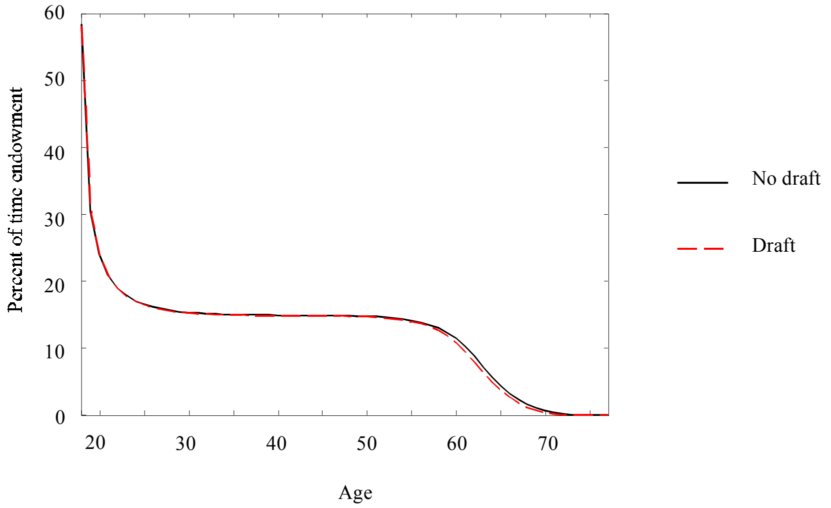


Figure 3b. Training for non-conscripts (g = 0.25 and J = 0.50)



Individual human capital depreciates over time, and the lack of learning in the first period of the life cycle has a negative impact on labor productivity for conscripts during the first ten years on the labor market compared to the initial labor productivity profile (Figure 4a). Labor productivity is unchanged at middle-age, and the extended learning period increases labor productivity at the end of the life cycle. The small negative impact on labor productivity at the end of the life cycle for non-conscripts follows from the reduction in learning (Figure 4b).

Figure 4a. Labor productivity for conscripts (g = 0.25 and J = 0.50)

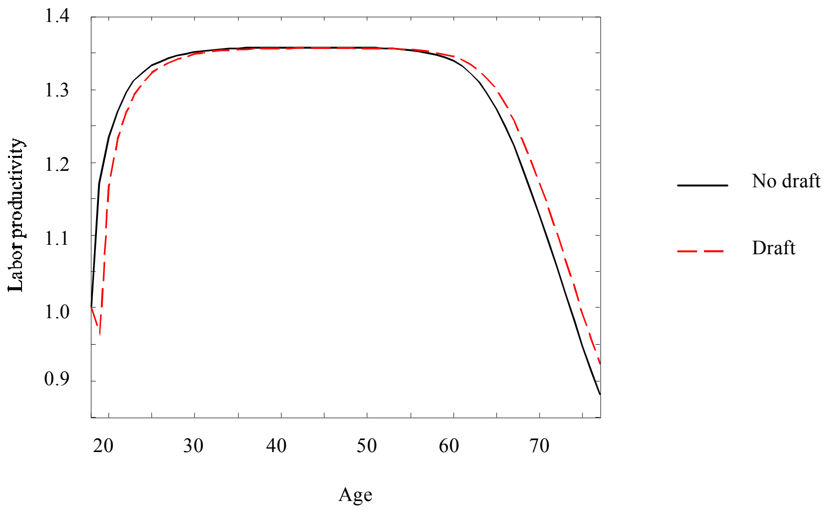
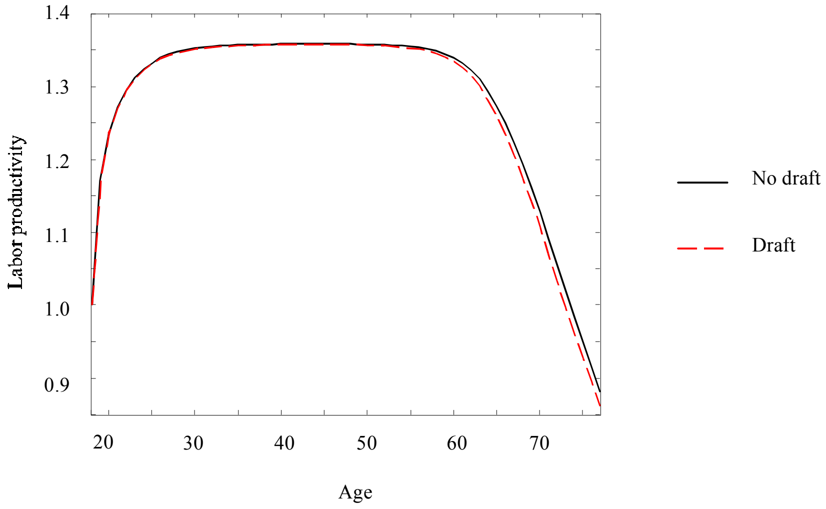


Figure 4b. Labor productivity for non-conscripts (g = 0.25 and J = 0.50)



Figures 5a and 5b show the effects on individual labor supply decisions for conscripts and non-conscripts, respectively. Conscripts reduce their labor force participation rates during the first couple of years after conscription has ended and build up human capital instead. Labor force participation rates return to normal at middle-age, and the increased labor productivity at the end of the life cycle provides an incentive to postpone retirement and stay longer in the labor market. Non-conscripts retire a little earlier compared to the initial steady state equilibrium, which reflects the small reduction in labor productivity at the end of the life cycle.

Figure 5a. Work effort for conscripts (g = 0.25 and J = 0.50)

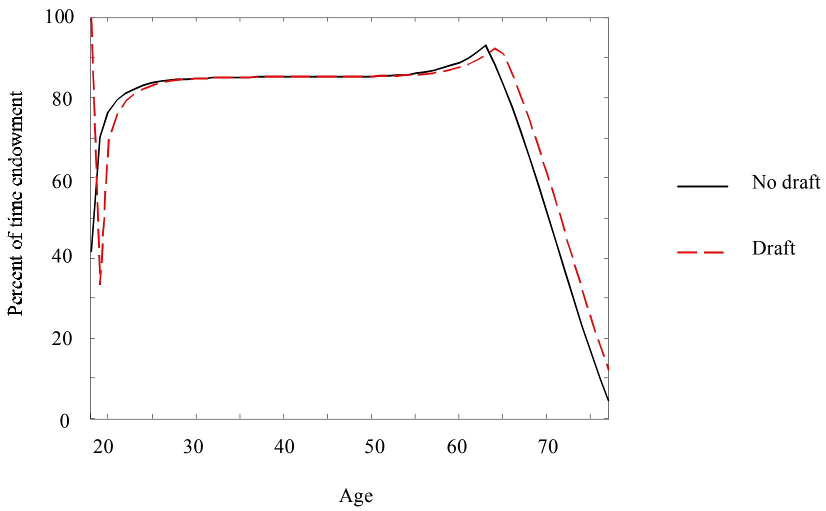


Figure 5b. Work effort for non-conscripts (g = 0.25 and J = 0.50)

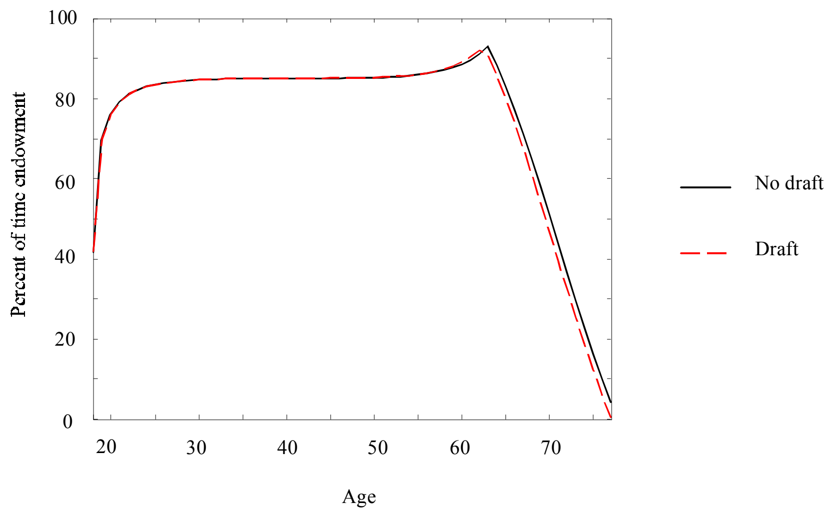


Table 3 presents the welfare effects for conscripts and non-conscripts for different initial proportional tax rates on labor income and supplementary tax rates. We keep the supply of physical capital and labor services constant across different initial levels of public spending, i.e. the capital-labor ratio is unchanged. Net factor prices are kept unchanged as well, and the cost of labor services varies with the initial tax rate on labor income. I.e. the capital value share falls when the initial tax rate on labor income increases.[10] Finally, the level of output is adjusted to meet the changes in public spending requirements. This method implies that the tax base with respect to the supplementary tax rate is unchanged across the different initial steady state equilibria.

Table 3. Effects of move to draft system across initial public expenditure levels (percentage change from initial steady state equilibrium)[a]

	Supplementary tax rate					
	0 percent		50 percent		100 percent	
	Welfare of conscripts	*Welfare of others*	*Welfare of conscripts*	*Welfare of others*	*Welfare of conscripts*	*Welfare of others*
Initial tax rate on labor income:						
16.7 percent	-0.9	-0.1	-3.3	0.0	-5.6	0.2
37.5 percent	-1.0	-0.1	-3.4	-0.1	-5.8	-0.1
50.0 percent	-1.1	-0.2	-3.6	-0.3	-6.1	-0.3

Note: (a) 25 percent of the population is subject to draft.

The results indicate that conscripts may experience a significant welfare loss, while the welfare effects for non-conscripts are less certain. The reform leads to a reduction in labor income and thus erodes the tax revenue from the tax rate

[10] If capital value share were kept constant, then tax base to finance public spending or some of the parameters present in individual maximization problem would have to be adjusted.

on labor income. The erosion in tax revenue is more significant when the initial tax rate on labor income is high, and the adjustment in the tax rate on labor income increases when public spending requirements are higher. Hence, welfare falls for both conscripts and non-conscripts when the initial tax rate on labor income increases. This pattern is reflected in the last six columns in Table 3.

Moving across rows in Table 3, the results show that supplementary tax payments not surprisingly reduce welfare for conscripts. For example, the welfare loss for conscripts in the new steady state is 1 percent when the initial tax rate on labor income is 37.5 percent and the supplementary tax rate is 0 percent, while the welfare loss for conscripts is 5.8 percent when the supplementary tax rate is increased to 100 percent. Welfare effects are less certain for non-conscripts when supplementary tax payments by conscripts increase. The tax base with respect to the supplementary tax rate is unchanged for different public spending requirements. However, private income falls relative to total income in the economy when public spending increases, and relative income transfers between generations due to supplementary tax payments increase. Non-conscripts may therefore experience a welfare loss in the long run from supplementary tax payments by conscripts when the initial tax rate on labor income is high. Our results suggest that the welfare effect of using a draft tax generally is negative for non-conscripts, although they may experience a marginal gain when a low wage tax rate is accompanied by a high supplementary tax rate on conscripts.

The analysis is based on a stylized model, and the specific quantitative results should be interpreted with caution. The model does not examine the dynamic transition, and future generations may suffer because earlier generations benefit. The only way to consider this inter-generational redistribution is to examine the dynamic transition from the initial steady state to the final steady state. It seems evident that such a move could require using public debt during the transition in order not to increase the total tax burden of the transition generations, or tax rates differentiated according to age during the transition. Specifically, the oldest cohorts having been subject to draft should see their tax burden being left unchanged, while young transition generations escaping draft tax might be required to pay a slightly higher share of their income in ordinary income taxes to finance transition. In order to find political support for the elimination of draft, accepting such compensation mechanism might be attractive also for the young otherwise subject to draft, as well as for the youngest generations exempt from draft tax due to positive general equilibrium effects in the long run.

4.2 Sensitivity analysis

The qualitative results above hold within a wide range of public expenditure shares in relation to GDP. Also changing the initial stock of human capital, the production function of human capital or preferences with regard to utility leave the qualitative conclusions unchanged. As reported in Table 4, reducing the initial stock of human capital without any other changes in exogenous parameters leads into a slight increase in the interest rate, while the welfare effects of the supplementary tax rate, measured using equivalent variation, change only marginally. The welfare effects of draft system with a given level of supplementary draft tax are robust to variation in the elasticity of new human capital with respect to time devoted to learning. Our final reported experiment shows that the welfare effects of supplementary tax rate on draftees remain unchanged when the parameters related to leisure in the utility function are changed so that the economy ends up in the same interest rate as in the initial steady-state.

Table 4. Effects of move to draft system across different initial parameter values (percentage change from initial steady state equilibrium)[a]

	Supplementary tax rate					
	0 percent		50 percent		100 percent	
	Welfare of conscripts	*Welfare of others*	*Welfare of conscripts*	*Welfare of others*	*Welfare of conscripts*	*Welfare of others*
Initial stock of human capital:						
$h_0 = 1.00$; $r = 5.00\%$	-1.0	-0.1	-3.4	-0.1	-5.8	-0.1
$h_0 = 0.75$; $r = 5.07\%$	-1.3	-0.2	-3.5	-0.1	-5.7	-0.1
$h_0 = 0.50$; $r = 5.14\%$	-1.8	-0.2	-3.8	-0.2	-5.8	-0.2
$h_0 = 0.25$; $r = 5.21\%$	-2.6	-0.3	-4.2	-0.3	-5.8	-0.3
Elasticity wrt. training (η):						
$\eta = 0.90$	-0.6	-0.1	-3.2	0.0	-5.8	0.0
$\eta = 0.75$	-1.0	-0.1	-3.4	-0.1	-5.8	-0.1
$\eta = 0.60$	-1.3	-0.2	-3.6	-0.1	-5.8	-0.1
Preferences wrt. utility:						
$\mu = 0.15$; $\alpha = 0.66$	-1.0	-0.1	-3.4	-0.1	-5.8	-0.1
$\mu = 0.25$; $\alpha = 0.75$	-1.0	-0.1	-3.4	-0.1	-5.8	-0.1
$\mu = 0.35$; $\alpha = 0.85$	-1.0	-0.1	-3.4	-0.1	-5.8	0.0

Note: (a) 25 percent of the population is subject to draft and the initial tax rate on wage income is 37.5 percent.

5 Conclusion

Our results show that the widely held view of the draft as a socially cheap method to recruit personnel for public services is a myth. To economists, such an observation may not be surprising, since volunteer recruitment via labor markets traditionally is considered as the most effective way to realize gains from the division of labor and specialization. Adam Smith made a clear case against conscription and found an "irresistible superiority which a well-regulated standing [=all-volunteer] army has over a militia [= conscription]" (Smith 1976 [1776], p. 701). Smith's observation and most other arguments against the draft mainly rely on differences in comparative advantages between citizens. What is striking in our findings is that the inefficiency of the draft also emerges in the absence of any such differences.

In our approach, the inefficiency of the draft results from its specific incidence over the life-cycle: The draft hits individuals in the early stages of their economically active life, thereby postponing the accumulation of human capital and slowing down the growth in labor productivity. Moreover, the supplementary tax on income during conscription involves a higher present value burden compared to tax schemes with a more even distribution of tax payments over the life cycle. It has a negative impact on saving and physical capital. It is noteworthy that the draft also may harm people who are exempt due to the reduced build up of human and physical capital.

By deliberately ignoring foregone gains from specialization and the division of labor, our analysis tends to underestimate the true costs of the draft system. We also ignore some potential benefits that a draft system might have relative to voluntary enlistment. E.g., advocates of the draft like to argue that draftees make the military more "representative" or bring liberal and critical thinking to soldiery.[11] Furthermore, some proponents of conscription consider it a quicker way of raising large numbers of troops and the only way to sustain large military reserve forces. We do not wish to discuss the validity of these arguments here (see Warner and Asch, 2000, for a more elaborate discussion), but emphasize that any potential benefits of the draft have to be weighed against the considerable static and dynamic costs identified here and in the economic literature.

Two omissions in our analysis open potential avenues for further research. First, our assumption of a one-sector economy blurs an important aspect in the comparison of conscription versus all-volunteer services: the substitution of equipment and weaponry for labor that typically goes along with the abolition of the draft (Sandler and Hartley, 1995, pp. 172f). A complete model should account for such shifts in the input factor mix and the general equilibrium effects. Second, our focus on steady state equilibria ignores economic effects during the transition to the final steady state. As budgetary needs are likely to rise with all-volunteer forces, some age cohorts might be burdened twice during such a transition. First, by being drafted when young, and second by being taxed more heavily when the volunteer system is installed. Analyzing whether and how the elimination of conscription could produce a Pareto improvement is left for future research.

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[11] Similarly, it is argued that draftees in civil or social service gain civic competences and a greater awareness of social problems, items that also contribute to welfare in a broader understanding.

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