



# **Costly Tax Enforcement and Financial Repression**

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# Costly Tax Enforcement and Financial Repression

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## Abstract

Using an overlapping generations production-economy model characterised by financial repression, purposeful government expenditures and tax collection costs, we analyse whether financial repression can be explained by the cost of raising taxes. We show that with public expenditures affecting utility of the agents, modest costs of tax collection tend to result in financial repression being pursued as an optimal policy by the consolidated government. However, when public expenditures are purposeless, the above result only holds for relatively higher costs of tax collection. But, more importantly, costs of tax collection cannot produce a monotonic increase in the reserve requirements. Of critical importance in this regard, are the weights the consumer assigns to the public good in the utility function and the size of the government.

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Keywords: Overlapping Generations Model; Costly Tax Enforcement; Financial Repression.

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# 1 Introduction

Using an overlapping generations production-economy model, characterised by costly tax enforcement, we analyse the relationship between the costs of tax collection and financial repression. We follow the dominant trend in the literature<sup>1</sup> in defining financial repression through an obligatory “high” reserve deposit ratio requirement, that the banks in the economy need to maintain.<sup>2</sup> Specifically, we analyse whether the “high” reserve requirements in a closed economy characterised by costly tax collection, are a fall out of a welfare maximising decision of the government, which has access to income taxation and seigniorage as sources of revenue.

Given that the concern is not whether financial repression is prevalent, but rather the associated degree to which an economy is repressed, since both developed and developing economies may resort to such restrictive policies (Espinosa and Yip (1996)). The pertinent question is why, if at all, would a government want to repress the financial system? This seems paradoxical, especially when one takes into account the well documented importance of the role of financial intermediation process in economic activity, mainly via the finance-growth nexus.<sup>3</sup> High cash reserve requirements enhance the size of the implicit tax base and, making financial repression lucrative for the government. Alternative explanations of financial repression (with varied levels of success) have ranged from:

- Inefficient tax systems (Cukierman *et al* (1992)) and Giovannini and De Melo (1993)) and tax evasion (Roubini and Sala-i-Martin (1995), Gupta (2005, 2006, 2008b) and Gupta and Ziramba (2008a)).
- Degree of financial development (Di Giorgio (1999)) and asymmetric information (Gupta (2006)) and banking crisis (Gupta (2005)).
- Productive public expenditure (Basu (2001)) and bureaucratic corruption (Gupta and Ziramba (2008b)).
- Currency substitution (Gupta (2008a)).

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<sup>1</sup>See for example, Drazen (1989), Bacchetta and Caminal (1992), Haslag and Hein (1995), Espinosa and Yip (1996), Haslag (1998), Haslag and Koo (1999), Bhattacharya and Haslag (2001), Gupta (2005, 2006, 2008a) and Gupta and Ziramba (2008a, b) amongst others.

<sup>2</sup>Financial repression, though, can involve other sets of government legal restrictions, such as interest rate ceilings and compulsory credit allocation with “high” reserve requirements, that prevent the financial intermediaries from functioning at their full capacity level. However, given the wave of interest rate deregulation in the 1980s, and the removal of credit ceilings some years earlier, the major form of financial repression is currently via obligatory reserve requirements (Caprio *et al.* (2001)).

<sup>3</sup>See Roubini and Sala-i-Martin (1992), Rousseau and Wachtel (2002), Agbetsiafa (2004), Acaravci and Ozturk (2007) and Bose *et al.* (2007).

In this paper, we analyse whether we can add costs of tax collection to this list.

The motivation for believing that costly tax collection can be a possible rationale for financial repression, can be outlined as follows: If tax collection is costly and is increasing at an increasing rate in taxes (Bird and Zolt (2005) and Agénor and Neanidis (2007)), with two sources of revenue, namely, taxation and seigniorage, the government might want to increase either the money supply growth rate (rate of the inflation tax) and the reserve requirements (the seigniorage base), or only one of these revenue sources, as part of a welfare-maximising strategy. Given that the size of the reserve requirement is our metric for financial repression, we could thus check if increases in costs of tax collection can be a rationale for a more restrictive policy as a welfare maximising outcome. To the best of our knowledge, this is the first study to analyse costly tax collection as a rationale for financial repression.

Alternatively, the current study can also be viewed as an analysis that looks into the optimal mix of explicit and implicit taxation of a consolidated government in the presence of costs of collecting direct taxation. In this regard, this paper is comparable to Agénor and Neanidis (2007). In this paper, the authors show that in the presence of positive and endogenous costs of tax collection, i.e., with the cost of tax collection depending on the resources spent by the government to improve monitoring of tax payers, growth-maximising direct and (consumption) indirect taxation are negatively related to their respective (and cross) costs of tax collection. However, the growth-maximising value of the consumption tax rate is zero when collection costs do not exist, and hence, the government relies completely on direct taxes. Further, with no costs of tax collection, the welfare optimising outcome indicates the direct and consumption taxes to be substitutable, which is also the case with exogenous cost of tax collection.

Finally, under exogenous costs of tax enforcement, the growth-maximising consumption taxation is found to be negatively related to its “own” degree of inefficiency in collecting indirect taxation, and an increase in collection costs associated with direct (indirect) taxation leads to a reduction (increment) in the optimal income tax rate. By adding money to the model, we analyse the role of seigniorage (the implicit tax) relative to the explicit direct tax in the presence of cost of tax enforcement. Thus, though the main motive of our analysis is to relate financial repression to the cost of tax collection. As stated previously, our study is quite similar to what Agénor and Neanidis (2007) do, especially in terms of the issues we address on ‘optimal’ explicit and implicit taxation when there are costs involved in raising direct taxes. Our framework though, is much simpler than the one adapted by Agénor and Neanidis (2007). The remainder of the paper is organised as follows: Section 2 outlines the economic environment, while section 3

derives the optimal policy decisions for the benevolent government under alternative sizes of the cost of tax collection. Finally, Section 4 concludes.

## 2 Economic Environment

The economy is populated by four types of agents, namely, consumers, entrepreneurs, banks (financial intermediaries), and a consolidated government-monetary authority. All consumers are endowed with a fixed amount of resources,  $y$ , which is normalised to 1. Entrepreneurs are also endowed with a fixed amount of resources,  $W$ , which is also normalised to 1 and have access to a production technology. Both consumers and entrepreneurs are uniformly distributed in the  $[0, 1]$  interval: agents within each class are a continuum with a population normalised to 1. Each agent lives for two periods. When consumers are old, their preferences are defined over a consumption good and a public good.<sup>4</sup> Financial intermediation has a crucial role to play, because on the one hand it provides the consumers with a safe way of transferring resources to the future, while on the other hand, banks provide external finance to entrepreneurs who need it to implement their investment projects. Time is discrete and there is an infinite sequence of agents indexed by  $t = 1, 2, 3, \dots, \infty$ .

### 2.1 Agents' behaviour

#### 2.1.1 Consumers

When the consumer is young, he or she is endowed with  $y$  units of the consumption good. The consumer invests the net tax endowment in bank deposits. When the consumer is old, he or she retires, and consumes the savings accumulated over his or her lifetime. Thus, at time  $t$ , there are two coexisting generations of young and old.  $N$  people are born at each time point  $t = 1$ . At date  $t = 1$ , there exist  $N$  people in the economy, called the initial old, who live for only one period. At each date  $t \geq 1$ ,  $N$  people are born (the young generation) and  $N$  people are beginning the second period of their life (the old generation). Note, the population is constant and hence  $N$ , is normalised to 1.

Formally, the consumer does not choose anything. What he or she consumes is directly determined from the budget constraint, as follows:

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<sup>4</sup>Our economic environment is similar to that of Bacchetta and Caminal (1992) and Di Giorgio (1999).

$$U(c_{t+1}, g_{t+1}) = \psi \frac{c_{t+1}^{1-\sigma}}{1-\sigma} + (1-\psi) \frac{g_{t+1}^{1-\sigma}}{1-\sigma} \quad (1)$$

subject to:

$$p_t d_t = (1 - \tau_t) p_t y \quad (2)$$

$$c_{t+1} = \frac{p_t}{p_{t+1}} (1 + i_{dt+1}) d_t \quad (3)$$

To check for the robustness of our results, we also look at a scenario where the utility of the consumer only depends on the consumption good. Specifically,

$$U(c_{t+1}) = \frac{c_{t+1}^{1-\sigma}}{1-\sigma} \quad (4)$$

where  $U(\cdot)$  is the utility function, with the standard assumption of positive and diminishing marginal utilities in both goods;  $\psi(1-\psi)$  is the weight the consumer assigns to the consumption (public) good in the utility function;  $c_{t+1}$  ( $g_{t+1}$ ) are the old age consumption of the consumption good (public good);  $d_t$  are the real deposits held in period  $t$ ;  $\tau_t$  is the tax rate at period  $t$ ;  $p_t$  is the price of the consumption good at period  $t$ ;  $i_{dt+1}$  is the nominal interest rate on bank deposits. Each unit of the consumption good placed into deposits at date  $t$  yields a real deposit rate  $(1 + r_{dt+1}) = \frac{(1+i_{dt+1})}{1+\pi_{t+1}}$  with  $(1+\pi_{t+1}) = \frac{p_{t+1}}{p_t}$  as the gross inflation rate, units of the consumption good at date  $t+1$ . As consumption only takes place in the second period of life, the savings function is inelastic with respect to its return. This assumption makes computations much easier and seems to be a good approximation of the real world.<sup>5</sup>

### 2.1.2 Entrepreneurs

All entrepreneurs are endowed with  $W$  units of the consumption good. The technology is such that, by investing one unit of the consumption good at time  $t$ ,  $\alpha > 1$  units are produced at time  $t+1$ . Let  $\alpha$  be the marginal product of capital of a single technological unit and let  $y_{t+1}$  be the level of output at time  $t+1$ . Then:

$$y_{t+1} = \alpha K_t \quad (5)$$

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<sup>5</sup>See Hall (1988).

Let  $L_t$  be the nominal quantity of loans that entrepreneurs can borrow from banks. Capital investment,  $K_t$ , is constrained by the available sources of financing:

$$K_t = W + l_t \quad (6)$$

where  $l_t = \frac{L_t}{p_t}$ . The entrepreneurs pay a gross interest rate  $(1 + i_{t+1})$  on the amount borrowed in time period  $t$ . The entrepreneur's problem can be formalised as follows:

$$p_{t+1}C_{t+1}^e = p_{t+1}y_{t+1} - (1 + i_{t+1})p_t l_t \quad (7)$$

where  $C_{t+1}^e$  represents the entrepreneur's consumption in the second period.

Banks receive the deposits  $d_t$  and are subjected to a standard cash reserve requirements, which constrain the banks to hold at least  $\gamma_t$  of each unit of the consumption good deposited, in the form of money. In equilibrium, with money being return-dominated, banks will hold exactly a fraction  $\gamma_t$  in fiat money. Let  $M_t$  denote nominal money balances per young person, then  $M_t = \gamma_t p_t d_t$  holds. The remaining deposits are invested into loans that are given to entrepreneurs.

$$L_t \leq (1 - \gamma)(1 - \tau)y \quad (8)$$

An investment of one unit of the consumption good in period  $t$  produces  $1 + x_{t+1} = \frac{1+i_{t+1}}{p_t}$  units of consumption good in period  $t + 1$ . The depositors cannot lend directly to the entrepreneurs, and hence require the banks to perform a pooling function on their behalf. Thus, the only available form of savings for the consumers is the deposits with the financial intermediaries. Because fiat money does not pay any interest rate, the gross real return on money between  $t$  and  $t + 1$  is  $\frac{1}{1+\pi_{t+1}}$ . Throughout the analysis, we restrict our attention to equilibria where money is return dominated, or  $1 + x_{t+1} > (1/(1 + \pi_{t+1}))$ . Alternatively,  $(1 + i_{t+1}) > 1$ .

The banking sector is assumed to be perfectly competitive and banks have access to a costless intermediation technology. Profit maximisation on behalf of the banks causes the gross real return on deposits to be a weighted average of the returns from the investment and money, with the weights being the defined reserve-deposit ratio. Formally,

$$1 + r_{dt+1} = (1 - \gamma_{t+1})(1 + x_{t+1}) + \gamma_{t+1} \frac{1}{1 + \pi_{t+1}} \quad (9)$$

must hold. Further, for the entrepreneurs to have an incentive to invest, the following constraint must bind in equilib-

rium:

$$\alpha[W + l_t - (1 + x_{t+1})l_t] \geq \alpha W \quad (10)$$

which, in turn, implies that  $(1 + x_{t+1}) = \alpha$ .

## 2.2 The consolidated government

The government is assumed to be infinitely-lived. It purchases  $g_t$  units of the consumption good. In the first scenario, the public good is assumed to be useful in the sense that it yields direct-utility to the agents, while, in the second scenario, government expenditures are useless. These expenditures are financed through income taxation and seigniorage. Moreover the government faces explicit costs of raising taxes,  $\frac{1}{2}\phi\tau_t^2 y$ . As in Agénor and Neanidis (2007), we assume these costs are increasing with the tax rate at an increasing rate, and also increasing at a constant rate with the endowment. In real per capita terms, the government budget constraint can be written as follows:

$$g_t = \tau_t y + \gamma \left(1 - \frac{1}{1 + \theta}\right) (1 - \tau) y - \frac{1}{2} \phi \tau_t^2 y \quad (11)$$

with  $M_t = (1 + \theta_t)M_{t-1}$  and  $\phi \geq 0$ , where  $\theta$  is the net money growth rate and  $\phi$  is the cost parameter. Note, the consolidated government coordinates the activities of the treasury and the central bank, both of which are “equally subservient to the government”. The benevolent government maximises the steady state level of welfare for all future generations, obtained by substituting the equilibrium decision rules into the agents’ utility function(s) to determine the optimal levels of the policy variables.<sup>6</sup>

## 3 Optimal Policy Decisions

In this section, we analyse the optimal policies for the government in the face of a rise in the cost of tax collection. For this purpose, we study the behaviour of a benevolent government or social planner who maximises the utility of all consumers, evaluated at the steady state, by choosing  $\gamma$ ,  $\tau$  and  $\theta$ , following alternative values of  $\phi$ . Specifically, using  $\sigma$

<sup>6</sup>A competitive equilibrium for this model economy is a sequence of prices  $\{p_t, i_{dt}, i_{lt}\}_{t=0}^{\infty}$ , allocations  $\{c_{t+1}\}_{t=0}^{\infty}$ , stocks of financial assets  $\{m_t, d_t\}_{t=0}^{\infty}$ , and policy variables  $\{\gamma_t, \tau_t, \theta_t, g_t\}_{t=0}^{\infty}$  such that: The consumer’s optimal choices are made via (2) and (3); banks maximise profits such that (5) holds; the goods and money markets clear, i.e.,  $y + W - \frac{1}{2}\phi\tau_t^2 y = c_{t+1} + c_{t+1}^e + g_{t+1}$ , and  $M_t = \gamma_t p_t d_t$ , respectively, holds, and the government budget, equation (11) is balanced on a period-by-period basis.



= 1, the problem for the social planner, with the discount rate  $0 < \beta < 1$ , is captured by:  $\sum_{i=0}^{\infty} \beta^i [\psi \log(c_{t+1+i}) + (1 - \psi) \log(g_{t+1+i})]$ , in the case where public good is useful, and  $\sum_{i=0}^{\infty} \beta^i [\log(c_{t+1+i})]$ , when public expenditures are pure government consumption. The respective welfare functions are reduced to  $\frac{\psi}{1-\beta} \log(c_t) + \frac{1-\psi}{1-\beta} \log(g_t)$  and  $\frac{1}{1-\beta} \log(c_t)$ . Equations (3) and (11) are substituted into the respective welfare functions to give the following:  $\frac{\psi}{1-\beta} \log[(1 + r_{dt+1})(1 - \tau_t)y] + \frac{1-\psi}{1-\beta} \log(\tau y + \gamma(1 - \frac{1}{1+\theta})(1 - \tau)y - \frac{1}{2}\phi\tau_t^2 y)$  and  $\frac{1}{1-\beta} \log[(1 + r_{dt+1})(1 - \tau_t)y]$ . Where  $1 + r_{dt+1} = (1 - \gamma_{t+1})(1 + x_{t+1}) + \gamma_{t+1} \frac{1}{1+\pi_{t+1}}$ .

The respective welfare functions are maximised subject to the following inequality constraints:  $\tau \geq 0, \tau \leq 0.99; \gamma \geq 0, \gamma \leq 0.99; \theta \geq 0$ . In the case where the public good does not enhance welfare an additional constraint  $\frac{g_t}{y} = \tau_t + \gamma(1 - \frac{1}{1+\theta})(1 - \tau) - \frac{1}{2}\phi\tau_t^2$  is added. Further, we assume that the government follows time invariant policy rules, which means that the institutionally determined tax rate,  $\tau_t$ , the cash reserve ratio,  $\gamma_t$ , and the money growth rate,  $\theta_t$  are constant over time.

The problem of the social planner is non-linear in  $\tau, \gamma$ , and  $\theta$ , and hence cannot be solved analytically. Numerical solution of the problem, in turn, requires values for the structural parameters of the model. For our experiments below, we use the following set of values:  $y$  is normalised to 1;  $\sigma = 1.0$ , as seen above; <sup>7</sup>  $\beta = 0.98$  (Chari *et al.*(1995)) ;  $x = 2$  percent (Bhattacharya and Haslag (2001));  $\psi = 0.75, 0.50$  and  $0.25$ . Based on  $\tau = 25.00$  percent,  $\gamma = 17.30$  percent and,  $\theta = \pi = 21.40$  percent, obtained from Haslag and Young (1998),<sup>8</sup> the results yield a value of  $\phi = 33.66$  percent, when we take into account, that costs of tax collection amounts to 3 percent of total revenue in developing countries (Bird and Zolt (2005) and Agénor and Neanidis (2007)). Given the values of  $\tau, \gamma, \theta, \phi$  and  $y$ , the size of the government, derived from the government budget constraint, is equal to 21.77 percent. For deducing that financial repression is positively correlated with the cost of tax enforcement, we start with our benchmark case of  $\phi = 0$ . Finally, to check the robustness of our results, we also use  $\phi=0.01, \phi = 0.05$  and  $\phi = 0.09$ .<sup>9</sup>

The results of the experiments have been reported in Table 1. Column 1 of the table reports the alternative sizes of the cost parameter. Columns 2 to 4, 6 to 8 and 10 to 12 report the respective optimal values of  $\gamma, \theta$  and  $\tau$  under  $\psi = 0.75, 0.50$  and  $0.25$ , i.e, these columns correspond to the three cases where the government expenditure is valued less, equally and more than the consumption good, by the consumer. Columns 5, 9 and 13 report the respective levels of the

<sup>7</sup>Our basic results continued to hold for  $\sigma = \frac{1}{2}$  and 2.0.

<sup>8</sup>The authors derive these values as averages based on 82 countries.

<sup>9</sup>See below for further details, on the choice of these values of  $\phi$ .

welfare value under the different values of  $\psi$  as the cost of tax collection,  $\phi$ , increases. The optimal policy parameters and obtained social welfare, when the government expenditures are pure government consumption, are reported in Columns 14 through 17.

**[INSERT TABLE 1]**

The following observations can be made from Table 1:

*Useful Public Expenditures (Columns 2 through 13):* (a) When  $\phi = 0$ , i.e., there is no cost of tax collection, the optimal money growth rate is always set at infinity, while reserve requirements are always set at zero, irrespective of the weight the consumer assigns to private consumption and the public good in the utility function. Given that the reserve requirement, which measures the size of the seigniorage base, is equal to zero, the optimal seigniorage is zero in this case. The optimal value of the tax rate, is, however, set equal to the weight of the government good in the utility function. (b) When  $\phi = 0.01$ , the basic results are reversed, when compared to (a). Now all the revenue is raised via seigniorage, with money growth rate set at infinity and the reserve requirement set to the weight of the government good in the utility function.  $\phi = 0.01$ , thus serving as a threshold for the switch from explicit to implicit taxation. (c) Moreover, with  $\phi = 0.05$  and  $\phi = 0.3366$ , and beyond, the results in (b) stay the same. (d) Across the different weights on the consumption and public good, the size of the optimal value of the welfare, though, remains unaffected following changes in the optimal policy decisions with varying costs of tax collection.

*Useless Public Expenditures (Columns 14 through 17):* (a) The optimal policy decisions of the government are qualitatively the same as above. However, the threshold required for the switch from direct to indirect taxation takes place at a higher threshold value of  $\phi$ , specifically, 0.09, beyond which the results continue to be the same. Intuitively, this is because, in this case, the government expenditure is not useful to the consumers, and hence higher costs of tax collection do not directly affect the utility in an adverse manner. So, unless the cost parameter is high enough to adversely affect the government budget constraint, the switch does not take place. Thus, understandably the cut-off value for the cost parameter to cause the government to move to seigniorage completely is higher, when compared to the case of productive public expenditures. (b) Further, note that the tax rates and the reserve requirements, when positive, are tied to the size of the government, i.e.,  $\frac{g}{y}$ . (c) Until the threshold level of  $\phi = 0.09$ , the optimal money growth rate continues to stay at zero, and then rises to infinity. (d) Finally, the size of the optimal value of the welfare,

as in the case of purposeful public expenditures, remain unaffected following changes in the optimal policy decisions with varying costs of tax collection.

Thus, in summary, one can draw the following general conclusions:

- Small costs of tax collection can ensure positive levels of financial repression.
- However, the cost of tax enforcement cannot produce monotonic increases in financial repression.
- Beyond a certain level of the cost of tax collection, movements in the reserve requirements are governed by weights attached to the government good, or by the size of the government.
- So, as far as the reliance on indirect taxation, in our case seigniorage, is concerned, we show that positive (minor) costs of tax collection can lead to positive levels of indirect taxation, as a welfare maximising outcome. Interestingly, in Agénor and Neanidis (2007), the welfare optimising outcome indicated the direct and consumption taxes to be substitutable irrespective of whether the exogenous cost of tax collection was zero or positive.
- Our results, are, however, relatively comparable to when we consider the case of positive and endogenous cost of tax collection discussed in Agénor and Neanidis (2007). The authors show that growth-maximising direct and (consumption) indirect taxation are negatively related to their respective (and cross) costs of tax collection. However, the growth-maximising value of the consumption tax rate is zero when collection costs do not exist, and hence the government completely relied on direct taxes. In contrast to Agénor and Neanidis (2007), our results are based on a welfare optimising outcome, and the fact that our model cannot account for a positive monotonic relationship between seigniorage and the costs of direct tax collection.

## 4 Conclusion

When numerically analysed for a world economy, the following basic conclusions are made: (i) Beyond a threshold value, positive costs of tax collection result in financial repression as a welfare maximising outcome. (ii) However, costs of tax collection and financial repression do not possess a monotonic positive relationship. On and beyond the threshold level, the role and size of the government is critical in the analysis. In fact, as pointed out above, beyond a certain level of the cost of tax collection, movements in the reserve requirements are governed by weights attached

to the government good or the size of the government. So, in general, the paper shows that a benevolent social planner would only rely on seigniorage once the cost of tax enforcement crosses a threshold limit, with the latter being relatively higher, when public expenditures are not valued by the consumers.

An immediate extension of the current study would be to revisit our results using an endogenous growth framework similar to the one used by Agénor and Neanidis (2007), and to include a monetary side, for we strongly believe that such a framework will help us to produce the monotonicity in the relationship between the cost of tax collection and the policy parameters.

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**Table 1: Optimal Policy Decisions**

Cost	Useful Public Good						Useless Public Good					
	$\psi = 0.75$			$\psi = 0.5$			$\psi = 0.25$					
	$\gamma^*$	$\theta^*$	$\tau^*$	$W$	$\gamma^*$	$\theta^*$	$\tau^*$	$W$	$\gamma^*$	$\theta^*$	$\tau^*$	$W$
$\phi = 0.00$	0	$\infty$	0.25	-0.5475	0	$\infty$	0.5	-0.6832	0	0	0.75	-0.5574
$\phi = 0.01$	0.25	$\infty$	0	-0.5475	0.5	$\infty$	0	-0.6832	0.75	$\infty$	0	-0.5574
$\phi = 0.05$	0.25	$\infty$	0	-0.5475	0.5	$\infty$	0	-0.6832	0.75	$\infty$	0	-0.5574
$\phi = 0.09$	0.25	$\infty$	0	-0.5475	0.5	$\infty$	0	-0.6832	0.75	$\infty$	0	-0.5574
$\phi = 0.3366$	0.25	$\infty$	0	-0.5475	0.5	$\infty$	0	-0.6832	0.75	$\infty$	0	-0.5574

W = Value of the social welfare function.  
 Policy Parameters defined as above.