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# Monitoring Expenditures on Tax Collection and Tax Evasion: The Case of Iran

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**Abstract**

The main aim of this paper is analyzing the relationship between tax evasion and the monitoring expenditure on tax collection in Iran. For doing so, we have used a simulation model for determining optimal level of monitoring expenses on tax collection. The results showed that, a greater portion of government expenses must be allocated to monitor the tax collection, although do this reduces tax evasion, but have a negative effect on economic growth. Thus, instead of increasing monitoring expenses in line with reducing tax evasion, it is better to reduct taxes rate in a way that in addition not to decrease in motivation of economic agents activity, it also decreases motivation for tax evasion.

**Keywords**: Tax Evasion, Tax Rate, Monitoring Expenditure on Tax Collection, Economic Growth, Iran.

**JEL Classification:** C02, C11, C61, H26, O40.

## 1. Introduction

There are many factors affecting tax evasion. We can divide these factors into *economic* (e.g. tax rate, income of taxpayers, private sectors cost for tax evasion, inflation rate, unemployment rate, monetary circulation system, government size, and public services), and *institutional factors* (e.g. information, legal tenders, bureaucracy, specifying ridge tax, rewarding and punishing tax, complexity of tax laws, multiplicity of laws, the ability to audit, religiosity, tax justice, culture, and monitoring and tracking). A myriad of studies has been devoted to explain the role of these factors in the process of tax

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evasion, such as: *tax rate* (e.g. Crane & Nourzad, 1983; Clotfelter, 1990; Bloomquist, 2003; Fisman & Wei, 2004; Cebula & Saadatmand, 2005; Jafari Samimi & Hamzehi, 2005; Busato et al., 2010; Cebula & Feige, 2010; Hadian & Tahvili, 2013; Samadi & Tabandeh, 2013), *income of taxpayers* (e.g. Crane & Nourzad, 1990; Bloomquist, 2003; and Samadi & Tabandeh, 2013), *private sector costs for tax evasion* (e.g. Samadi & Sajedianfar, 2017), *inflation* (e.g. Crane & Nourzad, 1986; Caballe & Panades, 2004; Sookram & Watson, 2005; Samadi & Tabandeh, 2013; Hadian & Tahvili, 2013), *unemployment* (e.g. Bloomquist, 2003; Sookram & Watson, 2005; Ceb & Feige, 2010; Samadi & Tabandeh, 2013), *monetary circulation system* (e.g. Jafari Samimi & Hamzehi, 2005*;* Lehi & Mohammadkhanli, 2011), *government size* (e.g. Samadi & Tabandeh, 2013), *public services* (e.g. Vogel, 1974; Wearing & Headey, 1997; Levi, 1998; Feld & Frey, 2002; Slemrod, 2003; Jafari Samimi & Hamzehi, 2005; Uadiale et al., 2010; Moradi et al., 2013), *information* (e.g. Jafari Samimi & Hamzehi, 2005), *legal tenders* (e.g. Schneider & Enste, 2000; Moradi et al., 2013), *bureaucracy* (e.g. Zehi & Mohammadkhanli, 2011), *specifying ridge tax* (e.g. Zehi & Mohammadkhanli, 2011), *rewarding and punishing tax* (e.g. Zehi & Mohammadkhanli, 2011; and Samadi and Sajedianfar, 2017), *multiplicity of laws* (e.g. Johnson et al., 1997; Jafari Samimi & Hamzehi, 2005; Richardson, 2006; Zehi & Mohammadkhanli, 2011; and Hadian & Tahvili, 2013), *the ability to audit* (e.g. Zehi & Mohammadkhanli, 2011), *religiosity* (Uadiale et al., 2010; Moradi et al., 2013), *tax justice* (e.g. Moradi et al., 2013; and Jafari Samimi & Hamzehi, 2005), *culture* (e.g. Chan et al., 2000; and Zehi & Mohammadkhanli, 2011), and *monitoring and tracking* (e.g. Zehi & Mohammadkhanli, 2011).

In these studies, some economic and institutional factors are mentioned as the most important factors (such as tax rate, public services of the government, multiplicity of laws and inflation) affecting the tax evasion. Few studies can be found which pay attention to monitoring expenses on tax collection. Therefore, the aim of this paper is to fill this gap and care about the importance of monitoring in reduction of tax evasion in Iran. Also, we examine the effect of tax rate and monitoring expenses on tax evasion by using one sector standard growth model.

The rest of the paper is organized in four sections. In the second section, we explain the research methodology and structure of the model. In the third section the results are presented. The final section concludes.

## 2. Model

Following Kafkalas et al. (2014), suppose that the rate of tax evasion is affected by tax rate and monitoring expenses on tax collection. In other words:

$$h = h(\mu, \tau) \tag{1}$$

where h is tax evasion, $\mu$ is the ratio of monitoring expenses on tax collection on total government expenditure and $\tau$ is tax rate. Also the government loss function can be considered as Equation (2):

$$W_L = (g_y - \bar{g}_y)^2 + \gamma(\tau - \tau_e)^2 \tag{2}$$

where $\bar{g}_y$ is steady-state growth rate, $g_y$ is growth rate, $\tau$ is the tax rate and $\tau_e$ is effective tax rate and therefore $\tau - \tau_e$ indicates tax evasion rate. $W_L$ is objective function of government which is a function of square of difference between production growth rate from steady-state (long-term) growth rate and square of tax evasion rate. $0 < \gamma \leq 1$ reflects the importance of tax evasion rate.

The aim of government is to determine the tax rate at a level that minimize the cost of deviation of the growth rate and the tax evasion. Control variables are tax rate and monitoring expenses on tax collection. In other words, the government can control social disadvantage and minimize its with the change of tax rate and monitoring expenses. First order condition (FOC) for minimizing social loss are:

$$\frac{\partial W_L}{\partial \mu} = 0 \rightarrow (g_y - \bar{g}_y)\frac{\partial g_y}{\partial \mu} = -\gamma(\tau - \tau e)\frac{\partial(\tau - \tau e)}{\partial \mu} \tag{3}$$

$$\frac{\partial W_L}{\partial \tau} = 0 \rightarrow (g_y - \bar{g}_y)\frac{\partial g_y}{\partial \tau} = -\gamma(\tau - \tau e)\frac{\partial(\tau - \tau e)}{\partial \tau} \qquad (4)$$

where $\mu$ is the share of monitoring expenses on tax collection.

In order to determine the relationship between economic growth rate with anounced tax rate and monitoring expenses on tax collection, assumed that, the firm's technology of production as Equation 5:

$$Y_i = AK_t^{\alpha}(\frac{K_g}{L}\ L_t)^{(1-\alpha)} \qquad (5)$$

where $0 < \alpha < 1$ is the elasticity of capital, A is technology parameter, $K_t$ is private capital stock, $L_t$ is the labor used by representative firm, $K_g$ is the public capital stock and L is the labor force.

Assuming that the price of commodity is equal to 1 (Py=1) and amount of $(1 + \frac{\varphi}{2}\frac{I}{K})$ is equal to the cost of one unit investment, this firm is facing with the maximization of its profit, therefore:

$$\begin{aligned} &\text{Max} \quad \int_0^{\infty} e^{-rt}\left[(1-\tau_e)Y_t - \omega L_t - \left(1 + \frac{\varphi}{2}\frac{I}{K}\right)I_t\right]dt \\ &\text{s.t.} \quad \dot{K} = I - \delta_k K_t \end{aligned} \qquad (6)$$

where I is gross private investment, $\delta_k$ is capital depreciation rate, r is real rate of profit and $\omega$ is the real wage rate. Furthuremore, public capital stock reduces with fixed rate of $\delta_g$. If G represent gross public investment, therefore net stock of public capital is:

$$\begin{aligned} &\dot{K}_g = G - \delta_g K_g \\ &G = (1-\mu)\tau_e Y \end{aligned} \qquad (7)$$

From FOC, we have :

$$\mathcal{L} = e^{-rt}\left[(1-\tau_e)Y_t - \omega L_t - \left(1 + \frac{\varphi}{2}\frac{I}{K}\right)I_t\right] - \lambda\left[I - \delta_k K_t - \dot{K}\right]$$

$$\frac{\partial \mathcal{L}}{\partial I} = 0 \quad \lambda = 1 + \varphi\frac{I_t}{K_t} = q \qquad (8)$$

$$\frac{\partial \mathcal{L}}{\partial K} = 0 \quad r = \frac{1}{q}\left[\dot{q} + (1-\tau_e)\,\alpha\, A\,(\frac{K_t}{L_t})^{(\alpha-1)}(\frac{K_g}{L})^{(1-\alpha)} + \frac{\varphi}{2}(\frac{I_t}{K_t})^2\right] - \delta_k \tag{9}$$

where q is the shadow price of private investment.

Equation (9) makes equal the marginal cost of investment with shadow value of capital, while equation (8) is profitability conditions. By using equations (6), (7) and (8), we can calculate the growth rate of private and public stock as (10) and (11):

$$\frac{\dot{K}}{K} = \frac{(q-1)}{\varphi} - \delta_k \tag{10}$$

$$\frac{\dot{K}_g}{K_g} = (1-\mu)\,\tau_e\,(\frac{K}{K_g})^{\alpha} - \delta_g \tag{11}$$

Considering the ratio of public to private capital z $=K_g/K$ and using (8), (10), (11) and equation (9), the growth rate of public and private capital can be written as:

$$\frac{\dot{Z}}{Z} = -\delta_g - \frac{(q-1)}{\varphi} + (1-\mu)\,\tau_e\,A\,z^{-\alpha} + \delta_k \tag{12}$$

$$\dot{q} = (r+\delta_k)q - (1-\tau_e)\,\alpha\,A\,z^{(1-\alpha)} - \frac{(q-1)^2}{2\varphi} \tag{13}$$

Equations (12) and (13) are two differential equations based on the policy parameters $\tau$ and $\mu$. This system ($\dot{z} = \dot{q} = 0$) must have at least one real root. According to equation (8) and the fact that in the steady state, output and private capital growth rates are equal, the amount of private capital in steady-state will be as follows:

$$q^* = 1 + \varphi(g_y + \delta_k) \tag{14}$$

where $q^*$ represents the value of private capital and $g_y$ the growth rate of output in steady-state. For simplicity, it is assumed that, $\delta_k = \delta_g = \delta$.

Then from the equation (14) and $z^{\bullet} = q^{\bullet} = 0$, growth rate in steady-states, will be as Equation (15):

$$(1-\tau_e)\,\alpha\,A^{\frac{1}{\alpha}}\left[\frac{(1-\mu)\tau_e}{(g_y+\delta)}\right]^{\frac{(1-\alpha)}{\alpha}} = (r+\delta)\left[1+\varphi(g_y+\delta)\right]-\frac{\varphi(g_y+\delta)^2}{2} \tag{15}$$

According to equation (15), economic growth rate is function of tax rate and monitoring expenses on tax collection:

$$g_y = f\left((1-\tau_e)\left((1-\mu)\tau_e\right)^{\frac{(1-\alpha)}{\alpha}}\right) \tag{16}$$

By deviding equation (3) to equation (4) and using equation (16), the optimal tax rate can be written as follows:

$$\frac{\frac{\partial g_y}{\partial \mu}}{\frac{\partial g_y}{\partial \tau}} = \frac{\frac{\partial(\tau-\tau e)}{\partial \mu}}{\frac{\partial(\tau-\tau e)}{\partial \tau}} \rightarrow \frac{\partial\left((1-\tau_e)\left((1-\mu)\tau_e\right)^{\frac{(1-\alpha)}{\alpha}}\right)\Big/\partial\mu}{\partial\left((1-\tau_e)\left((1-\mu)\tau_e\right)^{\frac{(1-\alpha)}{\alpha}}\right)\Big/\partial\tau} = \frac{\frac{\partial(\tau-\tau e)}{\partial \mu}}{\frac{\partial(\tau-\tau e)}{\partial \tau}}$$

$$\tau_e = (1-\alpha) + \frac{(1-\alpha)(1-\tau_e)\tau_e}{1-\mu}\,\frac{\frac{\partial(\tau-\tau e)}{\partial \tau}}{\frac{\partial(\tau-\tau e)}{\partial \mu}} \tag{17}$$

## 3. Empirical Results

### 3.1 Data Sources

Tax evasion is derived from Samadi & Tabande (2013). Tax rate and monitoring expenses on tax collection have been calculated, as follows:

*Tax rate = direct tax rate + indirect tax rate* where the direct tax rate is equal to the ratio of the sum of the total tax on property and income to GDP. Also indirect tax rate is equal to the ratio of tax on importing and goods and services.

Following Kafkalas et al. (2014), monitoring expenses of government on tax collection is also calculated as follows:

*Expenses to monitoring tax collection = total government expenditure – (expenditure devoted on infrastructure, education, health and military).*

Thus, by deviding these expenses on total government expenses, the share which is allocated for tax collection monitoring is calculated.

The time series trends of tax evasion and expenses relate to monitoring the tax collection of total government expenses is shown in Fig. 1 for the years 2001-2008. As can be seen, tax evasion had an increasing trend and the share of monitoring expenses on tax collection had also a crowding increasing trend.

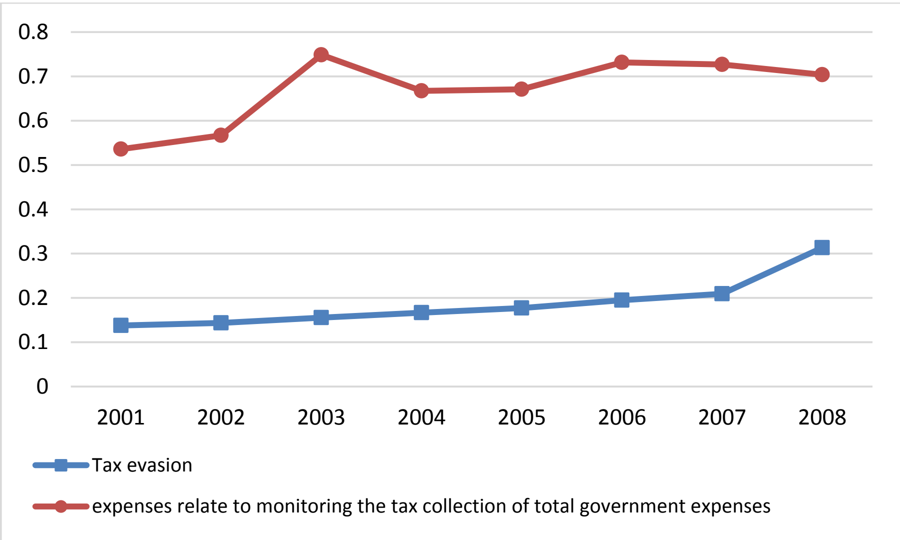


**Figure 1: Tax Evasion and Expenses Relate to Monitoring the Tax Collection**

Based on equation (16), the relationship between economic growth rate with tax rate and monitoring expenses on tax collection can be analyzed. For this purpose, the definition and value of parameters is shown in Table 1.

**Table 1: The Definition and Amount of the Parameters**

| Definition | Parameters | value | Source |
|---|---|---|---|
| Output elasticity of private capital stock | $\alpha$ | 0.42 | Samadi & Ostadzad (2013) |
| Depreciation rate of capital | $\delta$ | 0.05 | Goals of Iran's 1404 Vision Plan |
| Real interest rate | $r$ | 0.1275 | Average value of long-term interest rate (2000-2007), the central bank of Iran |
| Adjustment rate of investments | $\varphi$ | 0.01 | Rungsuriyawiboon & Stefanou (2007) |
| Steady-State growth rate of economy | $\bar{g}_y$ | 0.08 | goals of Iran's 2025 Vision Plan |
| Coefficient of productivity | $A$ | 0.33 | Percentage of economic growth (8%) that is dedicated to productivity (based on the Fifth Development Plan) |

### 3.2 Calibration

In order to determine the amount of monitoring expenses on tax collection which minimizes the loss function of government, initially for different levels of monitoring expenses ($\mu$) and using parameters in Table 1 and equation (18), the optimal tax rate is calculated. Then all parameters and tax rate and monitoring expenses on tax collection are replaced in equation (16) and then economic growth rate is calculated. After the above steps, using calculations for different $\gamma$ (1 , 0.75 , 0.5 and 0.25) left and right hand sides of the equation (3) is calculated separately for different valus of monitoring expenses. In the level of monitoring expenses on tax that both hand sides of equation (3) are equal, social loss is minimized. In other words, the optimal rate of monitoring expenses will be determined. The results are shown in Table 2.

It is obvious from the results in Table 2 that, if $\gamma$=0.25, loss function will be minimum where monitoring expenses on tax collection will be at intervals of 0.02 to 0.022. In this level of monitoring expenses, economic growth is in interval of 3.32 to 3.34 % and tax evasion is in interval of 0.59 to 0.6. If tax evasion has more importance ($\gamma$ = 0.5), loss function will be minimized at a point, that monitoring expenses on tax collection be at inteval of 0.032 to 0.03. In this case, economic growth will be in interval of 3.20 to 3.22 % and tax evasion will be 0.57.

With the increasing importance of tax to $\gamma$ = 0.75 tax expenses which reduces to minimum in that loss function, increases to inteval of 0.038 to 0.04. In this case, economic growth reduces to the level between 3.10 to 3.13. Also, the tax rate reduces to 0.56. Finally, when the importance ratio of tax evasion increases to $\gamma$=1, the optimal portion is in the interval of 0.044 to 0.046. In this level, economic growth is in the interval of 3.03 and 3.05 and tax evasion rate will be 0.55.

**Table 2: Equilibrium Values under Different Share of Monitoring Expenses and Relative Weight Factor of Tax Evasion**

| Share of Monitoring expenses $\mu$ | Tax Rate $\tau$ | Tax Evasion rate $\tau - \tau_e$ | growth rate $g_y$ | left hand side of equation (3) | right hand side of equation (3) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | $\gamma$ =0.25 | $\gamma$ =0.5 | $\gamma$ =0.75 | $\gamma$ =1 |
| 0.01 | 0.59455653 | 0.65116239 | 0.034417 | - | - | - | - | - |
| 0.012 | 0.59738125 | 0.63755829 | 0.034219 | 0.045323 | 0.1084176 | 0.2168352 | 0.3252528 | 0.4336704 |
| 0.014 | 0.60017811 | 0.62646584 | 0.034017 | 0.046443 | 0.0868631 | 0.1737261 | 0.2605892 | 0.3474522 |
| 0.016 | 0.60294751 | 0.61716858 | 0.033811 | 0.047575 | 0.0717247 | 0.1434494 | 0.215174 | 0.2868987 |
| 0.018 | 0.60568986 | 0.60921367 | 0.0336 | 0.048952 | 0.060578 | 0.1211561 | 0.1817341 | 0.2423122 |
| 0.02 | 0.60840555 | 0.60229733 | 0.03338 | 0.051282 | 0.0520711 | 0.1041422 | 0.1562133 | 0.2082844 |
| 0.022 | 0.61109497 | 0.59620635 | 0.03317 | 0.049171 | 0.0453935 | 0.090787 | 0.1361806 | 0.1815741 |
| 0.024 | 0.6137585 | 0.59078554 | 0.03294 | 0.054119 | 0.0400317 | 0.0800634 | 0.1200951 | 0.1601267 |
| 0.026 | 0.6163965 | 0.58591863 | 0.03272 | 0.052008 | 0.0356452 | 0.0712904 | 0.1069356 | 0.1425808 |
| 0.028 | 0.61900936 | 0.58151634 | 0.03249 | 0.054636 | 0.0320001 | 0.0640001 | 0.0960002 | 0.1280002 |
| 0.03 | 0.62159741 | 0.57750872 | 0.03226 | 0.054901 | 0.0289304 | 0.0578609 | 0.0867913 | 0.1157217 |
| 0.032 | 0.62416103 | 0.57384 | 0.032 | 0.056996 | 0.0263157 | 0.0526314 | 0.0789471 | 0.1052629 |
| 0.034 | 0.62670054 | 0.57046504 | 0.03178 | 0.058443 | 0.0240662 | 0.0481324 | 0.0721986 | 0.0962649 |
| 0.036 | 0.62921629 | 0.56734681 | 0.03154 | 0.058152 | 0.022114 | 0.0442279 | 0.0663419 | 0.0884558 |
| 0.038 | 0.63170861 | 0.5644546 | 0.03129 | 0.060887 | 0.0204065 | 0.040813 | 0.0612195 | 0.0816261 |
| 0.04 | 0.63417782 | 0.56176266 | 0.03105 | 0.058740 | 0.0189029 | 0.0378058 | 0.0567087 | 0.0756116 |
| 0.042 | 0.63662425 | 0.55924921 | 0.0308 | 0.061763 | 0.0175706 | 0.0351411 | 0.0527117 | 0.0702823 |
| 0.044 | 0.63904821 | 0.55689567 | 0.03054 | 0.062542 | 0.0163834 | 0.0327669 | 0.0491503 | 0.0655338 |
| 0.046 | 0.64145 | 0.55468609 | 0.0303 | 0.063489 | 0.0153203 | 0.0306407 | 0.045961 | 0.0612814 |
| 0.048 | 0.64382994 | 0.55260664 | 0.03 | 0.064426 | 0.0143639 | 0.0287279 | 0.0430918 | 0.0574558 |
| 0.05 | 0.64618831 | 0.55064532 | 0.02977 | 0.065345 | 0.0134999 | 0.0269998 | 0.0404997 | 0.0539996 |

| Share of Monitoring expenses $\mu$ | Tax Rate $\tau$ | Tax Evasion rate $\tau - \tau_e$ | growth rate $g_y$ | left hand side of equation (3) | right hand side of equation (3) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | $\gamma$ =0.25 | $\gamma$ =0.5 | $\gamma$ =0.75 | $\gamma$ =1 |
| 0.052 | 0.64852541 | 0.5487916 | 0.02951 | 0.066255 | 0.0127163 | 0.0254326 | 0.038149 | 0.0508653 |
| 0.054 | 0.65084153 | 0.54703623 | 0.02924 | 0.068537 | 0.0120032 | 0.0240063 | 0.0360095 | 0.0480126 |
| 0.056 | 0.65313694 | 0.54537102 | 0.02897 | 0.068890 | 0.011352 | 0.0227039 | 0.0340559 | 0.0454078 |
| 0.058 | 0.65541193 | 0.54378871 | 0.02871 | 0.066677 | 0.0107555 | 0.0215111 | 0.0322666 | 0.0430221 |
| 0.06 | 0.65766676 | 0.54228282 | 0.02844 | 0.069606 | 0.0102077 | 0.0204155 | 0.0306232 | 0.0408309 |
| 0.062 | 0.6599017 | 0.54084755 | 0.02816 | 0.072576 | 0.0097033 | 0.0194065 | 0.0291098 | 0.038813 |
| 0.064 | 0.66211702 | 0.5394777 | 0.02789 | 0.070348 | 0.0092376 | 0.0184751 | 0.0277127 | 0.0369502 |

**Source**: Research findings by the Mathematica 10

These results are summarized in Table 3. As can be seen, spending the more to control the tax collection and in order to prevent tax evasion (pay more attention to tax evasion in loss function) although cause reducing tax evasion, but also reduces economic growth.

**Table 3: Summary of Results: Equilibrium Values**

| $\gamma$ | Share of Monitoring expenses | growth rate | Tax evasion |
|---|---|---|---|
| 0.25 | 0.020 - 0.022 | 0.0334 - 0.0332 | 0.6 - 0.59 |
| 0.50 | 0.030 - 0.032 | 0.0322 - 0.0320 | 0.57 |
| 0.75 | 0.038 - 0.04 | 0.0313 - 0.0310 | 0.56 |
| 1 | 0.044 - 0.046 | 0.0305 - 0.0303 | 0.55 |

**Source**: Research findings

## 4. Concluding Remarks

In this study, the optimal level of monitoring expenses on tax collection was determined. The results showed that more importance to tax evasion in loss function, a greater share of government expenses must be allocated to control the tax collection. In this case, tax evasion decreases.

It should be noted that the increase in monitoring expenses on tax collection, the resources that could be spent on productive investments, will reduce and therefore economic growth rate also will reduce, which in turn leads to an increase in loss function.

Thus, instead of increasing monitoring expenses in line with reducing tax evasion, it is better to deduct taxes ratio and taxes rate in a way that in addition not to cause decrease in motivation of economic agent activities, decreases motivation for tax evasion that needs areas such as cultural policies in community and informing to change negative view and restoring taxation culture.

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