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Economic Consequences of Tax Noncompliance: Evidence from Indonesia

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Abstract

Tax noncompliance is often viewed as a significant problem because it causes shortfalls in government revenue, weakens government's ability to provide public goods and services as well as hampers economic growth. This perspective, however, is not the only approach to examine the impact of noncompliance on economic growth. If noncompliance enabled the private sector to invest in productive assets than otherwise could be wasted by the government, then it might deserve a more benign scrutiny. This paper examines how tax noncompliance may affect capital accumulation and economic growth within the framework of endogenous growth theory. It is found that the economic effect of tax noncompliance may depend more on how the available capital is utilized, rather than its impact on capital accumulation per se. Empirical results in this paper also show that private investment has higher productivity than public investment. Further, it seems that the role of private investment in growth process is much larger and more important than public investment and these results are robust across several specifications. The central thesis of this paper is that expansionary fiscal policies may need to consider the productivity constraint of public sector investment.

1. Introduction

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Generally, there are two ways in which taxes may affect economic growth. On the one hand, taxes provide government with resources to finance the supply of public goods. If these financial resources were spent on productive activities, they would speed the accumulation of capital (Barro, 1990; Turnovsky, 1997). Since private agents are not charged by the use of public goods such as roads or public education, government spending can create positive externalities for the private sector in the form of a relatively high marginal productivity from private capital. In standard production functions, higher marginal productivity of capital would lead to higher output and thus make perpetual capital accumulation possible (Caballé & Panadés, 1997; Ercolani & e Azevedo, 2014).

On the other hand, taxes might distort the accumulation of capital. Capital accumulation is influenced by savings rate and the rate of savings is influenced by, among others, taxes. Taxation is one of the essential factors affecting the rate of savings because its impact on the return savers receive in exchange for delaying consumption (Feldstein, 2009, p. 1). Studies in the framework of standard growth models with infinite time horizon generally found that high tax rates on income can be associated with low economic growth (see, for example, in Robert E. Lucas (1988); Robert E Lucas (1990); Rebelo (1990)).

Therefore, striking the right balance between financing public spending and minimizing the disincentive to capital accumulation (hence, economic growth) might be a perennial challenge for any government trying to design pro-growth tax policies. At one extreme economic growth would be restricted when the share of government in the economy is zero percent, while at the other extreme, economic growth would also be limited when government's share in the economy is closer to 100 percent. In the former, the economy would be in a state of chaos since there are no rule of law, protection of property rights, etc.. In the latter, economic growth would be hampered by, among others, distortions in economic agents' decision due to the excess burden of taxation imposed to finance the increasing government's activities, distortions in incentive system, crowding-out effects and government inefficiencies (Afonso & Jalles, 2011; Bajo-Rubio, 2000; Barro, 1991).

2. Government share in Indonesian economy

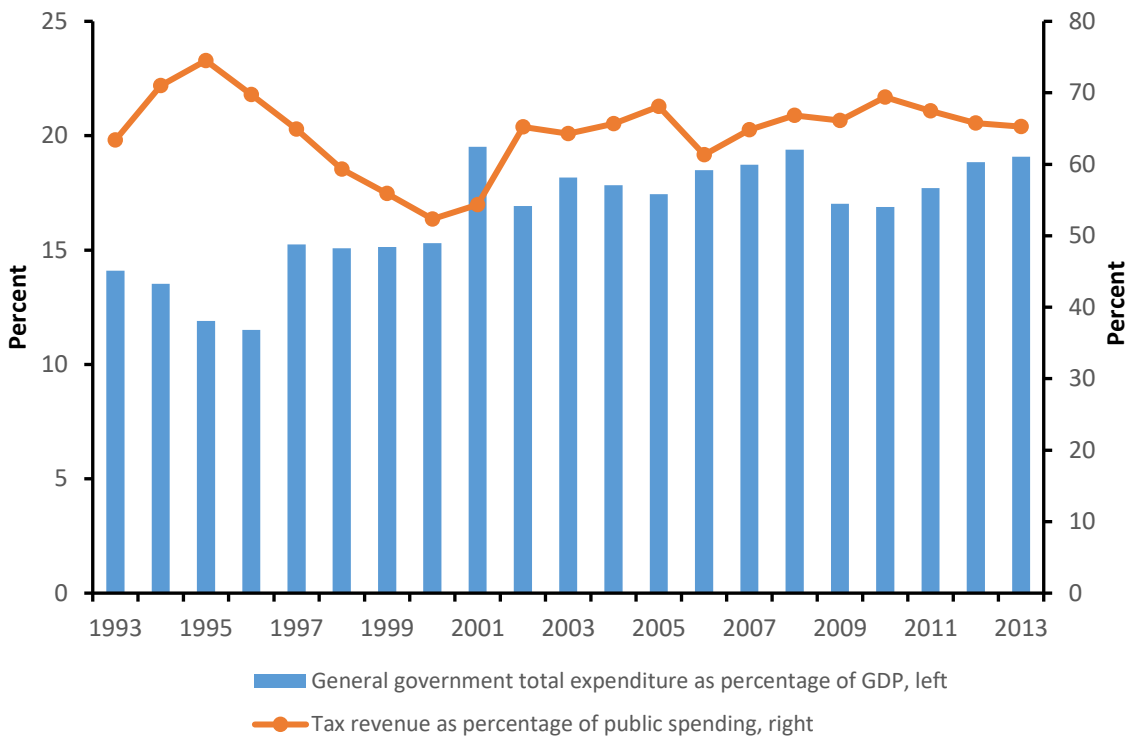
Barro (1989) proposed a theoretical framework in which to analyze the impact of public expenditures and taxation on long-run rates of economic growth and saving. One of the crucial concepts in the framework of Barro (1989) was that to maximize the rate of economic growth, the marginal productivity of public expenditure should equal to one. Empirical studies within this framework, however, have provided mixed results. For example, Karras (1997) examined panel data from 20 European countries and suggested that the optimal share of public expenditure for maximum economic growth should be around 16 percent of the economy. Another example, analyzing data from 20 transition countries, Gunalp and Dincer (2005) found that the optimal share of government in these countries should be around 17 percent.

Friedman (1997) argued that government has positive contribution in an open and free society but this contribution would become negative when public share increases from 15 percent to 50 percent of GDP. Hence, Friedman (1997) suggested that the threshold for optimal level of public spending is between 15-50 percent of national income, depending on the development level of a country. Thanh and Hoai (2015) studied the relation between the size of government and economic growth in ASEAN countries, including Indonesia. Empirical results of their study showed that for these countries, the optimal threshold for government size in the economy was 25.69 percent of GDP. Hence, they suggested that increasing government spending would promote economic growth when government size was below this threshold. On the other hand, economic growth would be impeded when government size was above the threshold.

Data for Indonesia show that public expenditure as percentage of GDP increased significantly since the early 2000s, as shown in Figure 1. In period 1993-1999 government spending was, on average, 14 percent of GDP, whereas in period 2000-2013 this share increased to 18 percent. Hence, the size of Indonesian government in the economy was below the

threshold suggested by Thanh and Hoai (2015) and still between the optimal threshold as suggested by Friedman (1997). These data might suggest that there is still room to increase the size of government without impeding economic growth.

Figure 1. Public expenditure and tax revenue in Indonesia



Sources: Bank of Indonesia (various years); World Economic Outlook (2016).

As seen in Figure 1, the majority of Indonesian government spending was financed from tax revenue. For the period 1993-2013, on average, 65 percent of government spending was financed from taxation. However, increasing taxes to finance increases in government spending may pose some risks and one of them is increasing tax evasion due to higher tax rate. Most experimental and econometric research found positive association between higher tax rate and greater evasion. Manipulation through varying tax rates in laboratory experiments frequently

found that increases in tax rate lead to decreases in compliance (Alm, Jackson, & McKee, 1992; Collins & Plumlee, 1991; Friedland, Maital, & Rutenberg, 1978; Park & Hyun, 2003). Similarly, empirical research often found that higher marginal tax rates was associated with increases in tax noncompliance (Clotfelter, 1983; Pommerehne & Weck-Hannemann, 1996; Slemrod, 1985).

Moreover, increases in tax rate could exacerbate the problem of underground economy. The experience of Chile under Salvador Allende and of Peru under Alan Garcia may serve as precaution against 'macroeconomic populism' (Dornbusch & Edwards, 1990). Emphasizing economic growth and income redistribution while deemphasizing the risks of deficit finance, both countries embarked on strong expansionary policies which involved the transfer of massive subsidies. This resulted in deteriorations of budget deficit and increases in tax revenue were required to plug the gap. Efforts to increase tax revenue, however, were futile as activities moved out of the official economy and moving into underground economy – which is very hard to tax. This condition may prompt a vicious cycle; as sources of tax revenue moving underground budget deficit widens, requiring the government to increase tax rates further. These increases in tax rate encourage more and more sources of tax revenue to move into underground economy, depriving tax revenue and widening budget deficit further.

The tax rate, however, may not be the only factor affecting tax compliance and the next section provides an overview these other factors.

3. Causes of tax noncompliance: A literature review

Tax noncompliance is a universal and important subject which frequently serves as a major preoccupation of taxpayers, designers, administrator and the general public (Ahmad & Stern, 1989). The term 'underground economy', among others, has been coined to depict those part of the economy concealed from tax authority. Legally, tax noncompliance consists of avoidance and evasion with the difference between them is that the former does not 'break the law' in some sense and the latter does. In public finance perspective, however, both have the same

effect – a dollar or Rupiah lost revenue through tax avoidance is the same as a dollar or Rupiah lost revenue through tax evasion (Merks, 2006).

Within the tradition of tax compliance studies, some factors – in addition to the level of tax rates as discussed previously – have been suggested as important in explaining noncompliance (see Kirchler, Hoelzl, & Wahl, 2008). Overview of the available literature of these factors is as follow:

3.1. *Probabilities of audit*

Theoretically, higher probabilities of tax audit should be able to deter taxpayers from noncomplying to tax laws since there would be higher probabilities that they would get caught. Nevertheless, although available studies found that audit probability may affect the level of compliance, they generally concluded that the relationship was, at best, weak. Literature review by Fischer, Wartick, and Mark (1992) revealed inconsistent findings on the association between audit probabilities and tax compliance. Slemrod, Blumenthal, and Christian (2001), for example, examined how increases in probability of audit may affect taxpayers' compliance behavior by conducting field experiment. They found that threats made to 'closely examine' taxpayers' returns increased compliance only for low and middle-income taxpayers, while the opposite effect could be observed for high-income taxpayers. Further, by varying the probability of audit in laboratory experiment, Spicer and Thomas (1982) found that precise information on the percentage of audit probabilities (instead of indicating high, middle and low probabilities) given to taxpayers has low negative effects on noncompliance. Other experiments, however, found that increases in tax compliance could be observed when imprecise information on the probabilities of audit were provided to taxpayers (Friedland, 1982). In general, it is not uncommon for survey studies to find weak (at times, even non-significant) positive correlation between audit probabilities and compliance (see, for example, in Mason and Calvin (1978); Song and Yarbrough (1978); Spicer and Lundstedt (1976); Wärneryd and Walerud (1982)).

3.2. *Fines*

The magnitude of fines has been proposed as one of the factors affecting compliance with increased penalties was argued as one of the deterrents to evasion (Jackson & Jones, 1985). However, empirical studies on the relation between fines and tax compliance have provided less than clear results. Fischer et al. (1992) examined the available literature and concluded that there are inconsistent findings on this subject. Some experiments, for example in the work of Park and Hyun (2003), found that fines has a higher deterrence effect than audit probabilities. Another example, experiment conducted by Friedland et al. (1978) found that noncompliance decreased significantly when there were higher fines, while higher audit probabilities did not have the same effect. On the other hand, other experiments found that compliance was weakly related to fines. Friedland (1982) experimented with game simulation and found that the size of fines were less effective to deter noncompliance behavior while increases in the probability of being fined was more effective in deterring noncompliance. Further, experiment study conducted by Webley, Robben, Elffers, and Hessing (1991, p. 51) found no evidence that large fines lead to less tax noncompliance.

3.3. *Tax knowledge and participation*

A relatively large body of literature seemed to confirm that tax compliance is positively related to the extent of tax knowledge among citizens. From an empirical study, Niemirowski, Baldwin, and Wearing (2003) maintained that tax compliance behavior was significantly related to tax-based values, beliefs, attitudes and knowledge. Further, without considering the content of one's education, some research found that knowledge about taxation increased as citizens' education got longer; in other words longer education can be associated with more knowledge about taxation (Kinsey & Grasmick, 1993; Song & Yarbrough, 1978; Spicer & Lundstedt, 1976; Vogel, 1974). In an experiment conducted to assess the relation between tax knowledge and compliance, Eriksen and Fallan (1996) concluded that, controlling for the tax knowledge of the subjects, additional knowledge about tax rules has the effects of decreasing tax evasion and increasing tax compliance. Other research suggested that combining higher knowledge on

taxation with reduced tax complexities would improve compliance (Clotfelter, 1983; Groenland & Van Veldhoven, 1983; Kirchler & Maciejovsky, 2001; Park & Hyun, 2003; Wahlund, 1992; Wärneryd & Walerud, 1982).

Moreover, the degree of citizens' participation in the political process concerning fiscal matters – particularly political decisions on taxation to finance government budget – may affect the level of compliance. When citizens have higher degree of influence over budgeting process, then it would be more likely for them to learn about the tax system and to consider the long-run consequences for noncompliance behavior (Feld & Frey, 2002). Thus, direct democracies were argued to have positive effects on tax compliance (Kirchler et al., 2008). For example, Pommerehne and Weck-Hannemann (1996) studied how different level of political participation in different cantons in Switzerland may affect the level of tax compliance. Their study found that in cantons where citizens can directly influence the budgetary legislation tax compliance was higher than in cantons where citizens lacked such influence. Direct democracy is also argued to be able to generate different types of communication among citizens and also between citizens and their representatives compared to purely representative system. In a direct democracy, citizens have the incentives to collect more information since they have to decide political issues (such as fiscal policy) for themselves. Further, tax increases would be easier to be accepted by public when informed citizens perceive that increases in government expenditures are justified (Frey & Kirchgässner, 2002 as cited in Kirchler et al., 2008). As such, tax evasion in direct democratic systems could be lower than in representative systems because citizens feel more responsible for their society (Feld & Kirchgässner, 2000).

3.4. *Attitudes toward taxes*

Studies in the field of economic psychology have proposed attitudes as one of the factors affecting tax compliance. Reasoned action theory (Fishbein & Ajzen, 1975) and planned behavior theory (Ajzen, 1991) maintained that one of the determinants of behavior is attitudes. In both theories, it is assumed that attitudes stimulate people to act according to their positive

or negative evaluations of objects. Hence, higher noncompliance could be expected when a taxpayer has positive attitude toward tax noncompliance. Some research suggested that positive attitude toward tax noncompliance was quite common. For example, results from survey conducted by Orviska and Hudson (2003) found that large proportion of population condoned tax noncompliance behavior. Similarly, in a controlled experimental study of tax compliance conducted by Trivedi, Shehata, and Mestelman (2004), positive attitudes toward tax noncompliance could be identified among participants, particularly when they perceived that there was genuine reason for certain noncompliance behavior such as condition of economic distress.

Weigel, Hessing, and Elffers (1987) proposed a model of tax evasion behavior which incorporated social and psychological aspects such as attitudes and moral beliefs. Nevertheless, examination of data on fined noncompliant tax payers and honest tax payers suggested that although attitudes might partially explain self-reported noncompliance, they were statistically insignificant as predictors of actual noncompliance behavior. Further, although self-reported noncompliance correlated significantly with attitudes, this correlation was fairly weak. These results may suggest that evidence on the relation between attitudes toward taxes and tax noncompliance provides mixed results. There might be some grains of truth, however, in what Lewis (1982, p. 177) said: "we can be confident in our general prediction that if tax attitudes become worse, tax evasion will increase''.

3.5. *Personal, social and national norms*

Norms have also been proposed as one of the important factors explaining tax compliance since they affect behavioral intentions of individuals (Ajzen, 1991; Fishbein & Ajzen, 1975). Kirchler et al. (2008) defined norms as behavioral standards which prevailed at three different levels: individual, social and national levels. On individual level, Kirchler et al. (2008) argued that individual norms were affected by, among others, moral reasoning, egoism and values. Several authors argued that individual norms, values and tax ethics are interconnected thus

voluntary compliance would be more likely for individuals with more developed moral reasoning or tax ethics (Baldry, 1987; Jackson & Milliron, 1986; Trivedi et al., 2004).

On the social level, reference group (such as friends and acquaintances) may affect taxpayer's compliance behavior (Wenzel, 2005). It would be likely for a taxpayer to not comply to tax laws if he believes that noncompliance is extensive and accepted behavior in his reference group (Kirchler et al., 2008). Through an in-depth, semi structured interviews, Sigala, Burgoyne, and Webley (1999) proposed that social norms were among the most important factors explaining taxpaying behavior. On the national level, norms develop into cultural standards and actual law often reflected these standards (Kirchler et al., 2008). When favorable national norms exist, trust in political leadership and administration will spur voluntary compliance (Fjeldstad, 2004; Pommerehne & Frey, 1992).

3.6. *Perceived fairness*

Enquiries into the tax system often revealed public concern over issue of fairness, i.e. whether the wealthy and privileged class of the society pay their fair share of tax (Braithwaite, 2003; Hobson, 2002). Wenzel (2005) argued that fairness can be classified into three areas: distributive justice, procedural justice and retributive justice.

In the perspective of distributive justice, tax compliance would likely to decrease when individuals or income groups perceive that their tax burden are heavier than other individuals or groups with similar economic capacity (De Juan, Lasheras, & Mayo, 1994; Spicer & Becker, 1980; Spicer & Lundstedt, 1976). Further, if taxpayers believe that the national tax system is unfair then compliance would be low (Cowell, 1992). Within the perspective of procedural justice, T. R. Tyler and Lind (1992) maintained that neutrality of procedures, trustworthiness of tax authority as well as polite, dignified and respectful treatment for taxpayer were essential in influencing taxpayer's perception of fairness. Regarding retributive justice, perception of unfair retributive justice (such as intrusive audits and unfair penalties) may lead to increased distrust and negative attitudes toward the tax authority as well as the tax system in general; in the end,

these could result in deteriorations of compliance (Spicer & Lundstedt, 1976; Wenzel & Thielmann, 2006).

3.7. *Trust*

Kirchler et al. (2008) suggested that taxation condition in a society can lay on a continuum between antagonistic climate and synergistic climate. When the tax climate in a society is antagonistic taxpayers and tax authority will work against each other. This condition is characterized by an attitude of "cops and robbers" (Kirchler et al., 2008, p. 211) – tax authority regards taxpayers as 'robbers' who have to be held in check because they will try to evade paying taxes whenever there are chances. On the other side, taxpayers perceive that they are being persecuted by tax authority ('cops') and feel that noncompliance is the right thing to do. This climate is characterized by large societal distance in which, on the one side, authority has little respect and little positive feeling toward individuals and, on the other side, taxpayers resort to 'rational' weighing the benefits and costs of nonconforming to tax laws thus leading to negligible voluntary compliance.

In synergistic climate, the attitude can be described as "service and client" (Kirchler et al., 2008, p. 211) – the existing perception is that tax authority and taxpayers are belong to the same community and that in its job to collect taxes, the authority performs a service for the community. Tax authority treats taxpayers respectfully and supportively as well as ensures transparent procedures in all taxation aspects. This climate is characterized by low social distance and tax compliance is likely to be high since taxpayers, out of a sense of obligation, tend to pay their fair share of taxes and less likely to contemplate the chances of not conforming to tax laws.

To sum up, when a government aims to maximize economic growth, its policymakers need to understand how the decisions they make may affect the compliance behavior of taxpayer. Changes in factors affecting tax compliance might translate into changes in the level of evasion and this may lead to changes in economic growth (Alm, 2012; Alm & Jacobson, 2007; McClellan,

2013). Hence, how tax noncompliance may affect Indonesia's economic growth will be discussed in the next section.

4. Tax noncompliance and economic growth

Tax noncompliance is often viewed as a significant problem because it causes shortfalls in government revenue, hence weakens government's ability to provide public goods and services. Ultimately, lack of public goods and services may hamper economic growth. This perspective, however, is not the only approach to examine the impact of noncompliance on growth. Resources spent in dealing with noncompliance might be warranted if noncompliance created a drag on economic growth. On the other hand, if noncompliance enabled the private sector to invest in productive assets than otherwise could be wasted by the government – via inefficiency or corruption, for example – then noncompliance might deserve a more benign scrutiny (McClellan, 2013).

Within the framework of endogenous growth model, theoretical studies have examined the effects of tax compliance and evasion on economic growth. Wrede (1995) employed an overlapping generations (OLG) model to examine the impact of tax evasion on economic growth in the long run. His model showed that if tax revenues were spent on increasing the productive capacity of the economy, then tax evasion may adversely affect the long-run growth rate. In contrast, if government spent its tax revenues on consumption, its effects on economic growth was ambiguous – it depends on the inter-temporal elasticity of substitution between capital and labor. If the elasticity equals one, then long-run growth will not be affected by tax evasion. If the elasticity is lower (higher) than one, an increase in enforcement parameter will shift long-run capital-labor ratio upwards (downwards).

Caballé and Panadés (1997) used OLG model within the framework of rational criminal behavior to analyze the effects of changes in the tax enforcement policy on economic growth. Their study showed that the effects of greater enforcement on growth depend on the relative productivity of private and public capital. When private capital is more productive, increases in enforcement efforts may reduce growth. On the other hand, when public capital is more productive, greater enforcement would increase economic growth.

In his study, Eichhorn (2004) built a model which assumed that government spending is purely consumptive therefore has no impact on growth. Under this assumption, evading tax would leave households with higher amounts of income for saving, thus it could be beneficial for economic growth. Nevertheless, when government reacts to evasion by increasing tax rate then the impact of tax evasion on growth would be neutral.

Gahramanov (2009) employed OLG model to analyze the effects of income tax evasion, which emanated from a low penalty rate, on economic growth. It showed that when the fine imposed on tax evasion was set at a sufficiently small rate, the economy may face an over-accumulation of capital and this would result in unsustainable growth. One of the implications of the study is that in an economy where the saving rate exceeds the golden-rule level, increasing the enforcement mechanism for concealed tax liabilities could reduce saving rate thus might bring the economy back to a more balanced growth path.

Freire-Serén and i Martí (2013) took into account the role of human capital accumulation in intensifying tax evasion. In their model, taxpayers were assumed to be able to improve their ability to evade taxes by investing in human capital. Hence, tax evasion could positively or negatively affect economic growth depending on the intensity of evasion, i.e. the productivity of human capital in evading taxes, and also depending on the value of nominal tax rate. One of the implications of their model is that when nominal tax rates are set at low levels, human capital accumulation could reduce economic growth if taxpayers (using their accumulated investment in human capital) intensify their efforts to evade taxes.

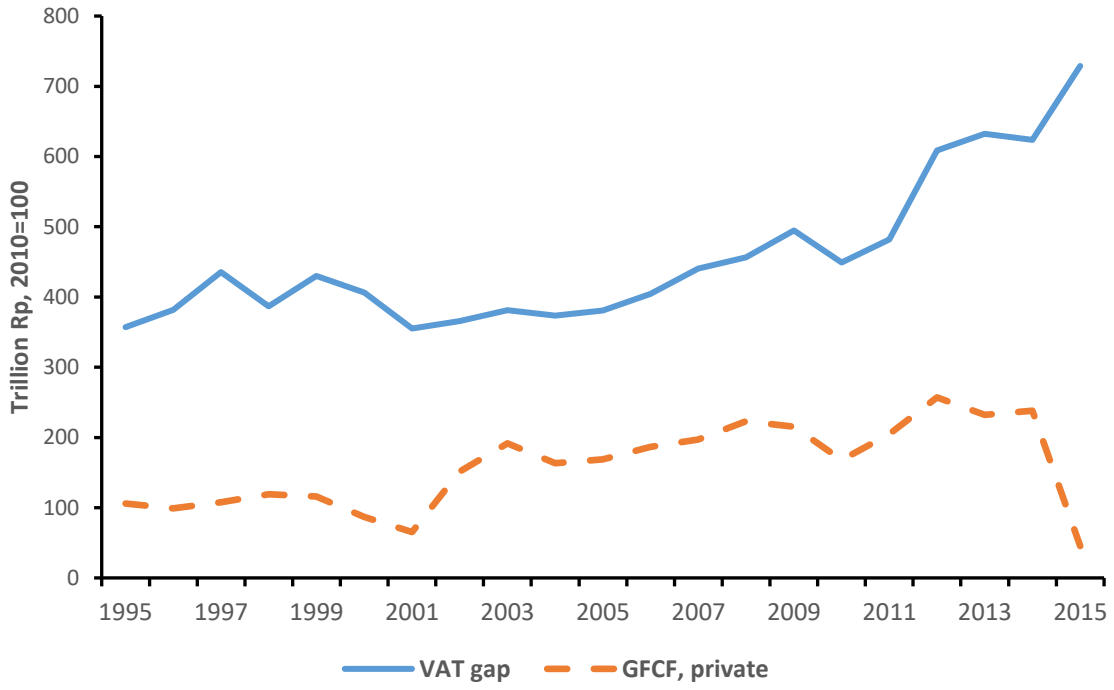
While a wide body of literature has focused on theoretical studies on the effects of tax noncompliance on economic growth by building models, empirical studies on this subject is sparser. Nevertheless, it can be inferred from the theoretical literature that tax noncompliance may affect economic growth through its impact on capital accumulation. Further, the transfer mechanism for this impact may depend on the relative marginal productivity of capital of the government vis-à-vis private. In other words, the effect of tax noncompliance on economic growth may be determined by which party, public or private, can provide the greatest return to capital.

4.1. *Tax noncompliance and capital accumulation in Indonesia*

As suggested by theoretical literature discussed previously, tax noncompliance may affect the accumulation of capital. This is because the proceeds gained from nonconforming to tax laws could be invested by private agents, thus increasing private sector's capital accumulation. It is difficult to determine the cause of increases or decreases in capital accumulation as solely the result of tax noncompliance since many other factors could affect them. Nevertheless, examination on the patterns of tax noncompliance with the patterns of private capital investment for the same period might provide some insights into the effects of noncompliance on capital accumulation.

Figure 2 exhibits Indonesia's Value Added Tax (VAT) noncompliance and gross fixed capital formation (GFCF) of private sector, both are measured at constant 2010 prices. Data on VAT noncompliance are from Iswahyudi (2017) which estimated VAT gap due to noncompliance as the difference between actual VAT revenue and VAT total theoretical liability. Iswahyudi (2017) employed national accounts figures (Input – Output table) to estimate the theoretical VAT liability generated by different sub-aggregates of the economy. GFCF data from the Indonesian Central Board of Statistics cover yearly gross capital outlays (thus reflect investment).

Figure 2. VAT gap and private capital investment

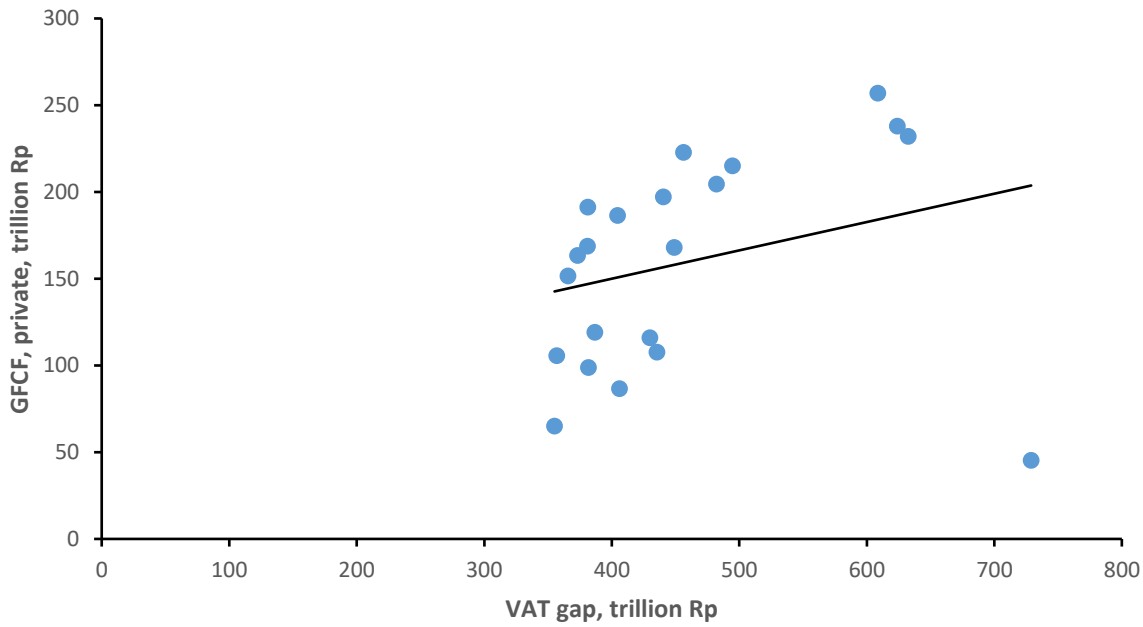


Sources: Indonesia Central Board of Statistics (various years); World Development Indicators (Various Years); Iswahyudi (2017)

VAT gap may serve as a benchmark for estimating the level noncompliance. This is because noncompliance to VAT tends to be followed by noncompliance to other taxes, particularly income tax. Theoretically, the invoice-and-credit design of VAT would make noncompliance to this type of tax easier to detect than other types of tax. Hence, Iswahyudi (2017) argued that "…when taxpayers failed to report or underreport their VAT liabilities, it is likely that they would also fail to report or underreport their income tax liabilities in order to avoid detection."

The graph in Figure 2 shows that noncompliance and capital investment moved in generally the same direction for the majority of period 1995-2013. It was in 2014 and 2015 that both were moving at opposite direction. These were years when Indonesia experienced slowing economic growth. Previously, annual average growth during 2010-2013 was 6 percent. In 2014 the growth slowed to 5 percent and in 2015 it slowed even more and only reached 4.7 percent. It is likely that during times of slow economic growth capital investment would also decline while tax noncompliance may continue its increasing trend. This might partially explain the divergent path of noncompliance and investment in 2014 and 2015.

Figure 3. Correlation between noncompliance and private capital investment



Sources: World Development Indicators (Various Years); Iswahyudi (2017)

Figure 3 presents the correlation between noncompliance and private capital investment which shows a positive slope. Nevertheless, the coefficient of correlation between these two is found to be 0.28, indicating a weak relation. It could be inferred that for the period under study, the data show that increases in tax noncompliance is weakly related to increases in capital accumulation. Hence, periods of high tax noncompliance would not necessarily translate into

higher accumulation of capital (or investment) by private sector. This result may indicate that the economic effect of tax noncompliance may depend more on how the available capital is utilized, rather than its impact on capital accumulation. Since taxes basically transfer resources from private to public, how both parties utilize their available resources would be examined in the next section.

4.2. *Private and public sectors in Indonesia, which one is more productive?*

As the effect of noncompliance on economic growth may depend on which party – private or government – has higher marginal productivity of capital, in this section I estimate the marginal productivity of both sectors. The model here follows that of Khan and Reinhart (1990), with production function in the economy is assumed to be as follows:

$$Y = A\,.\,F\,(K, L, Z) \tag{1}$$

where Y, A, K and L denote the level of output, factor productivity, capital stock and labor input respectively. Z is a vector which denotes other factors affecting growth. In this model, factor productivity is assumed to grow at a constant (exogenous) rate.

For Z, Khan and Reinhart (1990) used exports and imports as independent variables. As argued by, among others, Balassa (1978), W. G. Tyler (1981) and Ram (1985), growth of exports may facilitate development of other goods and services, thus expanding the output of the economy. Moreover, imports are also important for developing countries due to their heavy dependency on the imports of capital and intermediate goods as inputs into production (Bardhan & Lewis, 1970).

Equation (1) can be rewritten in growth terms as:

$$dY/Y = a_0 + a_1\, I/Y + a_2\, dL/L + a_3\, dZ/Z \tag{2}$$

where a_0 is productivity growth and assumed to be constant, a_1 denotes the marginal productivity of capital, I is the growth in investment ($I = dK$). a_2 and a_3 are the elasticities of output with respect to labor and other factors, respectively.

To test the relative marginal productivity of private sector investment and public sector investment, I can be split into I_p and I_g, while the growth of exports and imports[2] are used alternatively to arrive:

$$dY/Y = b_0 + b_1\, I_p/Y + b_2\, I_g/Y + b_3\, dL/L + b_4\, dX/X \tag{3a}$$

and

$$dY/Y = b_0 + b_1\, I_p/Y + b_2\, I_g/Y + b_3\, dL/L + b_4\, dM/M \tag{3b}$$

where b_1 and b_2 are the marginal productivity of private sector and public sector respectively, while I_p/Y and I_g/Y are the corresponding rate of investment. If investment in private sector is more productive than investment in public sector then $b_1 > b_2$, vice versa. X denotes the volume of exports and M denotes the volume of imports.

Data for Equation (3a) and (3b) were compiled from the Statistical Yearbook of Indonesia published yearly by the Indonesian Central Board of Statistics as well as from the World Development Indicators of the World Bank and cover the period 1995-2015.[3] Total Gross Fixed Capital Investment (GFCF) is deducted by public sector's GFCF, data for both are available in the publication, to arrive at private sector's GFCF. The results of estimation are reported in Table 1.

Table 1. Estimation results

[2] Following Khan and Reinhart (1990), it is assumed that the proportion of imported inputs from total imports is at a constant rate.

[3] Some missing data are estimated using moving average method.

Constant	Total Investment	Private Investment	Public Investment	Growth of Labor	Growth of Exports	Growth of Imports	R^2	S.E.
3.184	0.301*	--	--	-0.155	0.041	--	0.381	4.666
2.795	0.334*	--	--	-0.145	--	-0.002	0.372	4.701
3.598*	--	0.264*	0.008	-0.158	0.025	--	0.423	4.643
3.302*	--	0.296*	0.013	-0.150	--	-0.012	0.422	4.649
3.704*	--	0.253*	--	-0.157	0.031	--	0.421	4.514
3.445*	--	0.275*	--	-0.147	--	-0.004	0.416	4.534

Note: * significant at 5% level of confidence, R^2 is the coefficient of determination, S.E. is the standard error.

Sources: Indonesia Central Board of Statistics (various years); World Development Indicators (Various Years); own calculations.

The first two equations in Table 1 treat total investment as independent variable in the growth model. When the growth of exports is treated as the third independent variable, it is found that the coefficient of total investment has the correct sign and statistically significant at 5 percent level of confidence. The coefficient of the growth of labor has a negative sign, nevertheless, one cannot make too much of this sign. At best all that can be said is that the growth of labor as well as exports and, more importantly, factor productivity do not seem to exert significant effect on the growth of output.

In the case where the specification incorporates the growth of imports, as proxy for imported inputs, the coefficient of total investment rises and continues to be significant. As in the case of exports as explanatory variable, the growths of imports, labor and factor

productivity have insignificant effects on output growth. Moreover, the fit of the equation is reduced once the growth of imports is included in the equation.

The results so far show that a one percent increase in total investment would raise output by around 0.3 percentage point. Private and public investment is aggregated into total investment to provide a benchmark against which to compare the results when both sources of investment are disaggregated. Hence, one would be able to examine whether this marginal productivity comes from investment in private sector or public sector, as specified in Equations (3a) and (3b).

Results for these equations in Table 1 show that investment in private sector consistently has higher marginal productivity than public sector investment. Furthermore, it is found that private investment has significant impact on output growth, while the impact of public investment on output growth is statistically not significant. These estimates may suggest that private sector investment has a more prevalent direct effect on output growth than public investment.

What is interesting is that when investment is separated into private sector and public sector, the productivity coefficients show sizeable increases and become statistically significant. This separation of investment also improves the explanatory power of the models. To test whether these increases in factor productivity have something to do with private investment, further analyses on Equations (3a) and (3b) were done by leaving the variable of public investment out of the specifications, thus allowing $b_2 = 0$.

Previous regression results in Table 1 indicate that public investment is statistically insignificant, thus omitting this variable does not seem to affect the overall goodness-of-fit of the models. When the growth of exports and imports are used alternatively, the coefficient of private investment still maintains its significance. These results underline the importance of the direct effects of the marginal productivity of private investment on output growth. As additional note, the lack of statistical significance of the growths of labor, exports and imports is maintained in all of the equation presented in Table 1.

In summary, estimation results in Table 1 demonstrate that in the case of Indonesia – at least for the period under study – the marginal productivity of private investment seems to be higher than the marginal productivity of public investment.

5. Concluding remarks

This paper has reviewed the effects of tax noncompliance on capital accumulation and on economic growth within the framework of endogenous growth theory. It is found that the economic effect of tax noncompliance may depend more on how the available capital is utilized, rather than its impact on capital accumulation per se.

Empirical results in this paper also show that private investment has higher productivity than public investment. Further, public investment is found to have no statistically significant effect on economic growth. It seems that the role of private investment in growth process is much larger and more important than public investment and these results are robust across several specifications. These do not necessarily mean that tax noncompliance should be left uncontrolled by the tax authority. It does mean, however, that a rather more benign approach could be exercised by policy makers in dealing with tax noncompliance considering the relatively poor marginal productivity of public investment.

Nevertheless, as Khan and Reinhart (1990) explained, there are qualifications to this result. First, the model only examines the direct effects of private and public investment. Economic growth can be indirectly affected by public investment. Public expenditures on essential infrastructure such as roads, electricity, telecommunications and schools as well as on human capital (education) can strongly influence the level and productivity of private capital accumulation. Private investment may suffer when there are eliminations or reductions in public investment. Second, public sector investment may also have negative effects on growth. Expansions in public investment – whether financed through taxes, debt issuance, or inflation –

may crowd out physical and financial resources available to the private sector, depressing private investment activity.

When consideration is only given to the direct effects of private and public investment, then careful evaluation of the optimum level of government spending in the economy might need to be exercised. Hence, the central thesis of this paper is that expansionary fiscal policies may need to consider the productivity constraint of public sector investment.

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