

GALATASARAY UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

**OPTIMAL TAXATION AND THE INFORMAL SECTOR WITH
ADMINISTRATION COSTS**

A MASTER'S THESIS

Ayça AYDIN

Supervisors:

Assoc. Prof. Dr. İrem ZEYNELOĞLU

Assoc. Prof. Dr. Burak GÜRBÜZ

MARCH, 2014

ACKNOWLEDGEMENTS

The writing of this dissertation has been one of the most significant academic challenges I have ever had to face. Without the support, patience and guidance of the following people, this study would not have been completed. It is to them that I owe my deepest gratitude.

İrem Zeynelođlu who acts as my supervisor despite her many other academic and professional commitments, her patient, wisdom, knowledge and commitment to the highest standards inspired and motivated me all the time. Besides her academic guidelines, she has been acted as a light of my road with her powerful energy.

Burak Grbz and the other faculty members in Galatasaray University that supported me on my academic learning process during my master's degree.

Ceyhun Elgin for his interesting and comprehensive academic researches which all of them were great examples for my study.

My friend and colleague, Ceyda stn who inspired me during my whole of the study despite her enormous work pressures and difficulties.

Atilla Erman Barın and Gnce Selen Őıralı, as my parents, who have always supported, encouraged and believed me during the whole research period.

Ceyhun Kılınç as my one of the real friend that supported me his motivating messages even from the far end of the world and especially Burak Erpehlivan for his enthusiastic efforts which make the study to come its final form.

Finally this dissertation is dedicated to My Mom and Taksim Gezi Park.

Ayça AYDIN

Bomonti, 2014

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
ABBREVIATIONS	v
LIST OF SYMBOLS	vi
LIST OF FIGURES	vii
LIST OF TABLES	ix
RÈSUMÈ	x
ABSTRACT	xvi
ÖZET	xxi
INTRODUCTION	1
CHAPTER 1 THE INFORMAL SECTOR, TAX RATES AND TAX ADMINISTRATION COSTS IN TURKEY	3
1.1 The Definition of the Informal Sector	3
1.2 The Possible Causes of High Informal Sector	6
1.3 Informal Sector Size and the Related Macro Indicators in Turkey	9
1.3.1 GDP Per Capita.....	12
1.3.2 Unequal Income Distribution.....	14
1.3.3 Inflation.....	16
1.3.4 Sectoral Differences	17
1.4 Informal Sector Size and Tax Administration in Turkey	21
1.4.1 Main Indicators	21
1.4.2 Action Plans	26
CHAPTER 2 AN OPTIMAL TAXATION MODEL FOR ANALYZING THE TAX ADMINISTRATION COSTS EFFECTS ON RELATIVE SIZE OF THE INFORMAL SECTOR	32
2.1 The Setup.....	32
2.1.1 Households.....	33
2.1.2 Firms	33

2.1.2.1 The Formal Sector.....	33
2.1.2.2 The Informal Sector	35
2.1.3 Household's Optimal Decisions	35
2.1.4 The Government	36
2.1.4.1 Government's Optimal Decision and Tax Administration Costs	37
2.2 Solving the Model	38
2.2.1 A Competitive Equilibrium.....	39
2.2.2 Sub-game Perfect Equilibrium.....	41
2.3 Numerical Analysis	42
2.3.1 Firm's Reaction When Government Choice Is Given	42
2.3.1.1 Total Tax Administration Costs.....	43
2.3.1.2 Net Tax Revenues	44
2.3.1.3 Relative Size of the Informal Economy.....	47
2.3.2 Optimal Government Choice Given the Firm's Reaction.....	49
CHAPTER 3 DISCUSSION: EFFICIENCY AND OPTIMALITY OF TAXES	
.....	53
3.1 Welfare Efficiency	53
3.2 Production Efficiency.....	57
3.2.1 The Effect of Taxes on Production Efficiency through the Informal Sector	59
3.2.2 The Effect of Taxes on Production Efficiency When Taxation is Costly.	64
CONCLUSION	68
REFERENCES	72
APPENDICES	78

ABBREVIATIONS

ACT	: Tax Administration Costs
GDP	: Gross Domestic Product
MATLAB	: Matrix Laboratory
MIMIC	: Multiple Indicators Multiple Causes
NTR	: Net Tax Revenues
OECD	: Organization for Economic Co-operation and Development
RS	: Relative Size of the Informal Economy
TR	: Tax Revenues
TURKSTAT	: Turkish Statistical Institute

LIST OF SYMBOLS

$U(\cdot)$: A strictly increasing, concave, and twice continuously differentiable function
$\Pi(i)$: Household i 's profits
$K(i)$: Capital level
$N(i)$: Labor
α	: Capital share
$z(i)$: Exponential productivity level
$\theta(i)$: Individual productivity
Θ	: Some known distribution
$\mathbb{E}\Pi_F(i)$: Expected profits in formal sector
$Y_F(i)$: Formal sector production
r	: Interest rate
$\mathbb{E}T(i)$: Expected tax payments
$Y_I(i)$: Informal sector production
$\mathbb{E}\Pi_F(i)$: Formal sector expected profits
$u[\Pi_I(i)]$: Informal sector profits
λ	: Commitment level
τ	: Tax rate
$\theta(v)$: Threshold productivity value

LIST OF FIGURES

Figure 1.1: The Shadow Economy (%GDP).....	8
Figure 1.2: The Share of Informal Sector in GDP	10
Figure 1.3: The Growth Rate of Informal Employment and Total Employment	11
Figure 1.4: The GDP per capita (in dollars)	12
Figure 1.5: Per capita GDP, 2012-Purchasing Power Parity AB-27=100	13
Figure 1.6: Share of Informal Economy (% of GDP) in Various Countries.....	14
Figure 1.7: Annual CPI and the Share of Informal Sector.....	16
Figure 1.8: Annual CPIs	16
Figure 1.9: Gini Coefficient.....	17
Figure 1.10: Distribution of Employment by Economic Activity (%)	18
Figure 1.11: Workers in Agriculture (Million, 4-Quarter Moving Average)	18
Figure 1.12: Unemployment Rate (%)	19
Figure 1.13: Share of Worker without an Employment Contract, 2006.....	19
Figure 1.14: Central Government Budget Deficit (% of GDP)	22
Figure 1.15: Total Taxes, Indirect and Direct Taxes (% of GDP).....	23
Figure 1.16: The Share of Indirect and Direct Taxes in Total Tax Revenues by Excluding Social Security Payments	24
Figure 1.17: The Growth Rate of Number of Taxpayers.....	24
Figure 1.18: The Growth Rate of Tax Revenues and Expenditures	25
Figure 1.19: Tax Burden (Tax revenues as percentage of GDP).....	26
Figure 1.20: The Number of Audits.....	28
Figure 1.21: The Total Expenditures Divided by Detected Workers	29
Figure 1.22: The Amount of Expenditure to Collect 100 TRY	30

Figure 2.1: Administration Costs with Varying Taxes	43
Figure 2.2: Administration Costs with Varying Public Trust.....	44
Figure 2.3: Net Tax Revenue with Varying Taxes	45
Figure 2.4: Net Tax Revenue with Varying Taxes and Varying Public Trust.....	46
Figure 2.5: Relative Size of the Informal Economy with Varying Taxes	48
Figure 2.6: Relative Size of the Informal Economy with Varying Public Trust	49
Figure 2.7: Public Trust and the Optimal Tax Rate	50
Figure 2.8: Equilibrium Relative Size of the Informal Sector and the Optimal Tax Rate	51
Figure 2.9: Net Tax Revenue and the Optimal Tax Rate.....	52
Figure 3.1: The Laffer Curve	60

LIST OF TABLES

Table 1.1: A Taxonomy of Underground Economic Activities	4
Table 1.2: Main Causes of the Increase of the Shadow Economy.....	6
Table 1.3: The Estimations on Informal Sector Size in Turkey.....	9
Table 1.4: Informal Employment in Years (1000 people)	11
Table 1.5: GDP per capita (in dollars) and the Share of Informal Economy in GDP	13
Table 1.6: Alternative Measurement of Informal Employment and Undeclared work, 2006.....	20

RESUME

LA TAXATION OPTIMAL SOUS L'EFFET DES COUTS DE TAXE ORGANIZATIONELLE ET L'ECONOMIE SOUTERRAINE.

L'économie informelle est un problème important pour les pays développés et aussi, pour les pays en voie de développement. Depuis longtemps, les experts et les économistes ont confronté l'existence de la fraude fiscale et de l'économie informelle. La lutte contre ces problèmes a commencé de posséder une importance au cours du procès économique et aussi politique.

S'il faut la définir courtement, l'économie informelle est l'organisation d'une série des activités économiques en dehors du secteur public ou privé. Elle est aussi appelée comme l'économie parallèle, secondaire ou souterraine. La production dans l'économie informelle est restée en dehors du contrôle et de la régulation étatique. C'est pourquoi, les états perdent des revenus fiscaux. Les états prennent de différentes mesures et examinent les raisons sous-jacentes afin de prévenir l'informalité. Comme on montrera pendant ce travail de thèse, les facteurs qui donnent lieu à la formation de l'économie informelle varient.

Dans ce travail, on a préféré concentrer sur les problèmes probablement appartenant au secteur financier en termes de facteurs de la formation de l'économie informelle et on a essayé d'analyser la relation entre l'économie informelle et les taxes. Quand on a regardé la relation entre les taxes et l'économie informelle, on a vu que les taux d'impôt élevés ne peuvent pas être associés à l'informalité dans les études empiriques conduites au cours des années dernières (Johnson et al., 1997, 1998; Friedman et al., 2000; Torgler and Schneider, 2007; Elgin, 2011 and Elgin and Solis-Garcia, 2011). On a formé un modèle fiscal optimal théorique pour analyser la nouvelle relation présente et on a ajouté une variable représentant les coûts

de l'administration fiscale au modèle pour analyser la relation mise en évidence par Garcia et Elgin. On a examiné les impôts, les revenus fiscaux et l'économie fiscale avec la méthode d'analyse numérique sous la lumière de ces coûts.

La thèse a été formée autour de trois sections dans cette perspective. Dans la première section, la définition de l'économie informelle, les sujets de la taxation, du contrôle et de la gestion fiscale sont examinés pour le cas de la Turquie. Dans la deuxième section, l'influence des coûts en question sur l'économie informelle est analysée par la présentation du modèle fiscal optimal sous les coûts de l'administration fiscale. La troisième et la dernière section se développe par une forme d'une discussion sous les rubriques du bien-être et de l'efficacité productive.

Ce qu'il est visé, dans la première section, est d'obtenir au certain nombre de résultats qualitatifs et descriptifs sur les sujets de la gestion fiscale et l'économie informelle et sur le modèle fiscal optimale qui va être présenté dans la deuxième section, dans le cadre des informations et des rapports présents sur la Turquie. Pour ce but, premièrement, la notion de l'économie informelle est discutée et les actions qui pourraient être dans le cadre de l'économie informelle et les méthodes pour mesurer l'informalité sont incluses. Après, de divers indicateurs macro-économiques considérés liés à l'économie informelle pour la Turquie sont discutés et on a considéré que l'économie informelle crée un grand problème en Turquie et que la part de l'économie informelle en PIB était 26,5% en 2013. Dans notre modèle, l'économie informelle est exprimée comme le secteur qui ne paie pas de taxes et qui est en dehors du contrôle de l'Etat. Ce taux représente la fraction qui ne paie pas ses primes, ni ses taxes et qui est en dehors de l'économie formelle. Pourtant, on sait que le taux de 26,5% ne reflète pas la réalité de l'économie turque et que l'économie informelle présente une plus grande part de l'économie. Ce taux devrait être plus grand si les activités illégales sont incluses.

Lors d'une analyse en termes des secteurs réels, on voit que l'organisation de l'informalité concentre principalement dans le secteur agricole et on peut considérer que n'importe quelle politique appliquée au secteur agricole peut influencer directement de l'économie informelle en Turquie. Tandis que la dissolution agricole a donné lieu à la mobilité de la main-d'œuvre de la zone rurale vers la zone urbaine,

l'emploi agricole a donné lieu à une organisation plus souple dans le secteur des services. En plus, on peut dire que la répartition inégale des revenus, la croissance rapide de la population et les taux de chômage élevé contribuent à l'économie informelle. Toutes ces causes sont aussi les conditions des problèmes de l'accès aux offres d'emplois formel vécus par les fractions venant du niveau d'éducation et de revenu faible.

Dans les parties du travail sur l'économie informelle et la gestion fiscale où les facteurs financiers sont observés, il est vu que les parts d'impôt indirect sont élevés en matière des types d'impôt et il est aussi observé que l'augmentation de la part d'impôt indirect dans le système fiscal a un effet adjuvant pour l'informalité. Dans la partie sur la gestion fiscale, les relations descriptives sont obtenues sous la lumière des données fournies par le Ministère de l'Administration des Revenus à propos des nombres de contribuables liée à la taxation, des revenus fiscaux acquis, et des dépenses fiscales. Le cadre turque de la nouvelle variable que nous avons formée dans notre modèle comme les dépenses de l'administration fiscal peut être observé dans la partie sur l'administration des impôts sous les dépenses de la perception. Après 2008, il y avait une augmentation évidente à propos du contrôle fiscal, du nombre des contrôleurs et des rapports préparés. En plus, l'importance du besoin des dépenses fiscales méthodologiques sous des programmes de lutte contre l'économie informelle était accentuée. Le succès d'une politique fiscale dépourvue du contrôle était contesté et l'importance de la gestion fiscale afin d'éviter les pertes fiscales était comprise en pensant que les taux fiscaux élevés encouragent l'informalité.

Dans la deuxième section du travail, comme cela a été souligné auparavant, le modèle fiscal optimal est présenté et la relation d'échange entre les taux fiscaux dans l'intervalle fiscal optimal et l'informalité est analysée. Dans la littérature, il y a des travaux qui apportent l'idée que les taux fiscaux élevés ont un effet adjuvant pour l'informalité (Frey et Pommerehne, 1984; Rauch, 1991; Loayza, 1996; Fortin et al., 1997; Schneider, 1994,1997; Tanzi, 1999; Ihrig et Moe, 2004; Busato et Chiarini, 2004; David et Henrekson, 2004; Amaral et Quintin, 2006 and Delipalla, 2009). Cependant, il y a aussi des travaux empiriques qui ne soutiennent pas cette relation. Elgin et Garcia (2011) ont contribué à cette littérature empirique par leur analyse sur les différences de la confiance publique à propos des états. Dans cette perspective, on

a essayé d'analyser les actions d'informalité et les fraudes fiscales dans ces conditions des taxations élevées des états en ajoutant une nouvelle variable incluant les dépenses fiscales méthodologiques au modèle d'Elgin et Garcia (2011). La nouvelle variable que nous avons ajoutée influence les revenus fiscaux nets étatiques par la voie de la confiance publique, les taux fiscaux et la base fiscale. La sécurité publique peut être considérée comme un facteur institutionnel des travaux observant l'économie informelle d'une perspective institutionnelle. Par exemple, un système juridique avec un faible niveau de confiance est un problème déclencheur pour l'informalité. Dans notre travail, le paramètre de la confiance publique est influent sur le contrôle de la base fiscale et des revenus financiers étatiques. En plus, les dépenses fiscales méthodologiques sont aussi considérées comme une fonction linéaire du paramètre de la confiance publique. Une sécurité publique plus élevée s'exprime un niveau d'effort plus élevé du point de vue de la réalisation du plan fiscal prévu par l'état. De la même manière, les taux fiscaux élevés s'expriment un besoin d'effort étatique plus élevé parce qu'ils encouragent les activités des fraudes fiscales. Pour cette raison, les taux fiscaux sont définis comme une fonction linéaire des dépenses fiscales méthodologiques comme la confiance publique. En dernier, la relation entre le niveau de production de l'économie formelle et les dépenses en question est supposée être positive. Une base fiscale plus large nécessite un contrôle étatique plus élevé et cette situation produit l'augmentation des dépenses étatiques. Dans le modèle, les niveaux de productivité des ouvriers sont importants du point de vue de leur positionnement dans l'économie formelle. Les ouvriers possédant une productivité au-dessus du niveau-seuil de productivité se positionnent dans l'économie formelle. Pour cette raison, l'état peut obtenir son revenu fiscal seulement de la fraction au-dessus de ce niveau-seuil. Dans ce cas, premièrement, le niveau optimal du capital et le niveau-seuil de productivité seront définis analytiquement et après, l'état définira les taux fiscaux en observant le niveau-seuil de productivité. Ce qui est visé est de calculer le niveau-seuil de productivité en liaison avec les taux fiscaux, la sécurité publique et les taux fiscaux méthodologiques. En conclusion, le choix optimal étatique sera analysé tandis que les choix optimaux des firmes sont considérés pour acquis. Pendant le travail de définir les choix optimaux étatiques, la méthode d'analyse numérique est utilisée. Dans cette analyse numérique, des valeurs moyennes sont obtenues pour les

dépenses fiscaux méthodologiques, les revenus fiscaux nets et l'économie informelle relative.

Par rapport aux résultats de l'analyse numérique, les dépenses administratives deviennent maximums quand les taux fiscaux atteignent 0.7. Après ce point-ci, les fraudes fiscales deviennent dominantes et le resserrement dans l'économie formelle devance l'augmentation d'impôt. Pour cette raison, à cause de la base fiscale rétrécie, les dépenses administratives diminuent aussi. Cet effet se présente indépendamment de l'effet de la confiance publique. De l'autre part, une confiance publique élevée fait naître des dépenses administratives plus élevées. Cette situation s'exprime l'augmentation de l'effort étatique. La relation entre la confiance publique et les dépenses administratives est linéaire et positive et elle peut être évidente seulement dans les taux fiscaux élevés. Quand la confiance publique est élevée et les taux fiscaux sont faibles, les revenus fiscaux nets sont positifs. La raison sous-jacente est la prévention des fraudes fiscales. L'Etat peut utiliser l'impôt faible et la confiance publique élevée comme un instrument politique séparément ou en forme d'un composant optimal. En dernier, quand l'augmentation ou la baisse dans l'économie informelle est examinée, il est supposé que la dimension relative de l'économie informelle serait formée par le taux fiscal défini par l'état. Cependant, la dimension de l'économie informelle est aussi influencée par le choix optimal étatique en plus des attitudes des firmes. Quand l'état augmente son niveau de contrôle, le niveau-seuil de productivité et les taux fiscaux considérés pour acquis diminuent et cette baisse signale un niveau de l'informalité plus petit. Quand on regarde aux résultats optimaux, on voit que dans la situation de la confiance publique faible, le taux fiscal optimal est zéro. Au fur et à mesure que la confiance publique augmente, l'état peut imposer un taux fiscal plus élevé. Dans ce travail, l'effet positif créé par la confiance publique devance l'effet négatif créé par les taux fiscaux élevés sur la base fiscale. Et on a montré que les taux fiscaux dépassant 30% ne sont pas optimaux. Jusqu'à ce point-ci, la confiance publique diminue l'économie informelle, même si les taux fiscaux augmentent.

La troisième et la dernière section du travail est dans la forme d'une discussion. Sous les sujets du bien-être et de l'efficacité dans la production, l'égalité après l'impôt, les types d'impôt et les points qui peuvent être liés au modèle en

termes des pertes de l'efficacité sont inclus à la discussion. En conclusion, la Turquie est un pays qui possède des problèmes structureaux à cause des politiques de travail et de population, de l'inégalité dans la répartition des revenus et de l'incapacité de la politique sociale appliquée. Et on ne doit pas attendre qu'une politique fiscale ou une politique de contrôle fiscal diminue l'économie informelle toute seule.

Le schème de développement de la thèse sera comme ceci ; le premier chapitre discutera les sujets de l'économie informelle, la taxation et la gestion fiscale pour la Turquie, le deuxième chapitre présentera le modèle fiscal optimal sous les dépenses administratives, le troisième chapitre sera présenté comme une discussion sur la productivité et l'optimalité des taux. Et dernièrement, les résultats seront évalués dans la conclusion.

Mots clés : Taxation optimale, Economie souterraine, Cout de taxe organizationnelle

ABSTRACT**OPTIMAL TAXATION AND THE INFORMAL SECTOR WITH
ADMINISTRATION COSTS**

Informal economy is one of the important economic problems for both developing and developed nations. In recent years in order to capture the informality problem economists and politicians prefer to work together and realize the serious problem of tax evasion and its negative effects on economy. This also indicates the importance of fighting against to informal economy. In general, the informal economy is also called as black, hidden, shadow, parallel, second or underground economy and is defined as a set of economic activities that occur outside of both public and the private sector establishments. The production in informal sector is legal but it is not under the control of government (Hart, 2008). In this context, governments have to apply the right policies to prevent informal economy and have to analysis the factors that contribute on informal sector. The factors that contribute on informal sectors are several and therefore it is not easy to observe the reel problem efficiently.

In this framework, in this study we prefer mainly to focus on fiscal side of the economy and try to analysis the relationship between taxes and informal economy. According to recent various empirical studies it is seen that the higher taxes do not bring higher informal sector (Johnson et al., 1997, 1998; Friedman et al., 2000; Torgler and Schneider, 2007; Elgin, 2011 and Elgin and Garcia, 2011). From this perspective we build an optimal taxation model to observe this relationship and we add a variable to Elgin and Garcia's (2011) model to observe the above relationship under the presence of administration costs of government.

The thesis is shaped around three main chapters. In the first chapter, the definition of informal economy, taxation/tax administration issues are examined for

Turkey, in second chapter of the study an optimal taxation model which captures the effects of tax administration costs is presented. The third and the final chapter of the study put forwards a discussion around welfare and the production efficiency which is concerned with the related literature with research.

In Chapter 1, we aim to evaluate the informal economy, taxation and tax administration in Turkey by discussing and using several related reports, data bases and the action plans of the government. Initially the definition of informal economy and the measurement approaches are discussed then the possible factors such as GDP per capita, income distribution, inflation and sectoral difference are evaluated. Then the issues related with taxation and tax administration are discussed. In tax administration side the number of taxpayers, the tax revenues and expenditures are evaluated by following the Revenue Administration's annual reports and data base. The final part of the Chapter 1 is devoted to the action plans of the government to fight against to informal economy. The action plan's five main goals are discussed and it is observed that the goals are closely related the model which is presented in Chapter 2. Indeed the latest action plan indicates that the administration is important as tax rate and even much more important for long-term revenue creation. On the other hand it is also costly for government to conduct such an action plan therefore the model that will be presented in Chapter 2 will be helpful to analyze the administration costs for the government.

It is stated that for the certain values of the tax rates which are the optimal ones, the trade-off between tax rates and the efficiency is not valid because the informal sector size is not affected by the increase in the tax rates in contrast to many studies in literature which examine the informal activities as a result of higher taxes (Frey and Pommerehne, 1984; Rauch, 1991; Loayza, 1996; Fortin et al., 1997; Schneider, 1994,1997; Tanzi, 1999; Ihrig and Moe, 2004; Busato and Chiarini, 2004; David and Henrekson, 2004; Amaral and Quintin, 2006 and Delipalla, 2009).

In our model, this administration cost variable affects the government net tax revenue through the commitment level of the government, taxes and the tax base. This commitment level can be thought as an institutional factor and in institutional framework it is known that the studies has extended the previous empirical models of

the informal economy by showing that tax morale, commitment level and a broad variety of governance/institutional factors matter quite significantly in the determination of the size of the informal economy. For instance a failure of a country's legal system undermines the official economy driving individuals and businesses to the informal economy. In our study this commitment level represents the power of the government's tax revenue collection and its control on tax base. This means the public trust is considerable variable in terms of tax evasion occurrence and the growth of the informal sector size. Therefore we examine the trade-off between taxes and informal sector size as occurrence of production inefficiency due to the tax administration costs and lower commitment level of the government.

Elgin and Garcia (2011) contribute to the recent literature by supporting the recent empirical findings by its theoretical foundations which depends mainly on the differences between commitment levels of the governments. On the other hand our setup improves their theoretical framework by redefining the government's problem with a new variable which takes into account the effects of tax administration costs.

In Chapter 2 we assume that total administration costs are a positive function of government commitment, the tax rate and the output in the formal sector. The tax administration costs depend positively on commitment because higher commitment implies higher government effort in order to achieve the announced tax plan. Similarly, higher tax rate is likely to increase the tax evasion behavior therefore in order to avoid tax evasion government has to make a stronger effort. Tax administration costs depend positively on the formal sector output because it constitutes the tax base. Higher tax base implies higher government effort to collect taxes. Since the informal sector is invisible to the government sector the tax base excludes informal sector output. The productivity level above which households choose the formal sector determines the formal sector size. Therefore government's tax revenues will depend on the formal sector size and threshold productivity level.

Initially the solution of the setup is based on the analytical solution of determining the optimal level of capital and finding the level of threshold productivity value. First, households with productivity values for their, observe the

tax rate announced by the government who wishes to charge on formal sector's output. Given the credibility of the announcement, households choose between the formal and the informal sectors. Those with a productivity level below the threshold will choose to operate in the informal sector while households with a productivity level above the threshold will prefer the formal sector. Then government observes the threshold productivity, calculates the formal sector size and decides the tax rate by solving equation. The threshold productivity value is the one that leave households indifferent between operating in the formal or the informal sector. According to this definition, this threshold level can be computed by equating the profits in the two sectors.

Our last purpose in model solution is calculating the threshold productivity value depending on the tax rates, commitment level and the tax administration costs, by using the backward solution method. This method implies that government first calculates the threshold level and then chooses a tax rate to maximize its total net tax revenues. A sub-game perfect equilibrium is results from the maximization of net tax revenues by the government in order to choose the optimal tax rate taking into account the optimal response of the household given by the optimal output and the capital level. For the numerical evaluation, we first analyze the firm's reaction when government choice is given as implied by the backward solution method required by the sequential structure of the game. Then we analyze the optimal choice of the government given the optimal reaction of the firms. In government' problem we prefer to use numerical analysis and we use Matlab codes which perform twenty-five repetitions for thousand households for all simulations and obtains the average values of tax administration costs, tax revenues and the relative size of the informal economy.

Chapter 3 presents a brief discussion related with efficiency and optimality of taxes. The subject of welfare efficiency and production efficiency are discussed in the framework of optimal taxation and then effect of taxes on production efficiency is evaluated through the informal economy. The final part of the Chapter 3 includes the tax effects on production efficiency however this time costly taxation issues are discussed especially the conditions; taxation under the presence of administration costs.

In conclusion part the results are evaluated and it is found that tax rates that exceed 30% are not optimal for the government. Up to this point the higher commitment level of the government reduces the relative size although an increase in the tax rate increases the relative size. In the considered interval the effect of on the relative size dominates the effect of tax rate. Therefore it is optimal for the government to increase the tax rate in order to increase the net tax revenue without having to fear a fall in the net tax revenues due to a tax evasion. Moreover there is a positive relationship between government's optimal tax rate and its net tax revenues. A higher tax rate implies higher tax revenues because the optimal tax rate does not imply an increase in the relative size of the informal sector due to tax evasion. Put differently, since the tax base remains relatively constant any increase in the tax rate increases the net tax revenues. Note that this relationship is not valid for implausibly high tax rates such as over 30%.

Finally this thesis discuss all these problems and their results in such scheme; Chapter 1 discusses the informal sector, taxation and tax administration subjects for Turkey, Chapter 2 discusses the model and its results and Chapter 3 contains a discussion about efficiency and optimality of taxes and all of the findings are summarized in Conclusion part.

Keywords: Optimal taxation, Informal economy, Tax administration costs

ÖZET**YÖNETİMSEL VERGİ MALİYETLERİ ALTINDA OPTİMAL
VERGİLENDİRME VE KAYIT DIŐI EKONOMİ**

Kayıt dıŐı ekonomi hem geliŐmiŐ hem de geliŐme yolunda olan ũlkeler iin önemli bir ekonomik problemdir. Uzmanlar ve iktisatılar uzun zamandır vergi kaakılıđı ve yasal/yasal olmayan bir kayıt dıŐı ekonominin varlıđı ile yũzleŐmiŐ ve tũm bu sorunlarla mũcadele hem ekonomik hem de politik sũrete önem taŐımaya baŐlamıŐtır.

Kısaca tanımlamak gerekirse kayıt dıŐı ekonomi gũlge, paralel, ikincil ve yer altı ekonomileri ūeklinde adlandırılmıŐ bir dizi ekonomik aktivitenin kamu ve özel sektŕr dıŐında ŕrgũtlenmesidir. Kayıt dıŐı ekonomi iindeki ũretim devlet kontrolũ ve dũzenlemeleri dıŐında kalmaktadır ve bu nedenle devletler vergi gelirleri kaybı yaŐamaktadır. Bu bađlamda devletler kayıt dıŐılıđın ŕnũne gemek adına eŐitli ŕnlemler alınmakta ve arkasında yatan nedenleri araŐtırmaktadır ve tez alıŐmasında da gŕrũleceđi ũzere kayıt dıŐı ekonomi oluŐumuna neden olan faktŕrler eŐitlilik arz etmektedir.

Bu alıŐmada, biz kayıt dıŐı ekonomi oluŐumuna neden olacak faktŕrler aısından daha ok mali sektŕre ait olabilecek sorunlar ũzerinde yođunlaŐmayı tercih ettik ve vergiler ile kayıt dıŐı ekonomi arasındaki iliŐkiyi analiz etmeye alıŐtık. Vergiler ve kayıt dıŐı ekonomi arasındaki iliŐkiye baktıđımızda son yıllarda yapılan ampirik alıŐmalarda yũksek vergi oranlarının kayıt dıŐılık ile iliŐkilendirilemeyeceđini gŕrdũk (Johnson ve diđ., 1997, 1998; Friedman ve diđ., 2000; Torgler ve Schneider, 2007; Elgin, 2011 ve Elgin ve Garcia, 2011). Ortaya ıkan mevcut yeni iliŐkiyi analiz edebilmek iin teorik optimal bir vergi modeli oluŐturduk ve Elgin ve Garcia'nın (2011) sŕz konusu iliŐkiyi analiz etmek iin oluŐturdukları modele yŕnetimsel vergi maliyetlerini temsil eden bir deđiŐken

ekledik ve bu maliyetlerin varlığı altında; vergiler, vergi gelirleri ve kayıt dışı ekonomiyi nümerik analiz yönetimi ile inceledik.

Bu amaç doğrultusunda tez çalışması üç bölüm etrafında şekillenmiştir. İlk bölümde kayıt dışı ekonomi tanımı, vergilendirme/vergi yönetimi ve denetimi konuları Türkiye için incelenmiş ikinci bölümde ise yönetsel vergi maliyetleri altında optimal vergi modeli tanıtılarak söz konusu maliyetlerin kayıt dışı ekonomi üzerindeki etkisi analiz edilmiştir. Üçüncü ve son bölüm ise refah ve üretim etkinliği ana başlıkları altında bir tartışma şeklinde gelişmektedir.

İlk bölümde amaçlanan Türkiye üzerine mevcut veriler ve mevcut raporlar çerçevesinde kayıt dışı ekonomi ve vergi yönetimi konuları ile ilgili ikinci bölümde tanıtılacak olan optimal vergilendirme modeli ile ilgili kalitatif ve tanımlayıcı bir takım sonuçlar elde etmektir. Bu doğrultuda ilk olarak kayıt dışı ekonomi kavramı tartışılmış ve kısaca kayıt dışı ekonomi kapsamı altına girebilecek faaliyetler ve kayıt dışılığı ölçme yöntemlerine yer verilmiştir. Akabinde Türkiye için kayıt dışı ekonomi ile ilgisi olduğu düşünülen çeşitli makroekonomik göstergeler tartışılmıştır ve görülmüştür ki Türkiye’de kayıt dışı ekonomi oldukça büyük bir sorun teşkil etmektedir ve mevcut veriler altında kayıt dışı ekonominin GSYİH içindeki payının 2013 yılı için %26,5 olduğu görülmüştür. Kayıt dışı ekonomi bizim modelimizde vergi ödemeyen ve devlet kontrolü dışında kalan kesim olarak ifade edilmektedir. Bu oran resmi ekonomi kapsamı dışında, vergi ödemeyen ve sigorta prim ödemeleri gerçekleştirilemeyen kesimi temsil etmektedir. Öte yandan Türkiye ekonomisi için %26,5’lik oranın gerçeği yansıtmadığı ve kayıt dışı ekonominin daha büyük bir payı ifade ettiği bilinmektedir. Yasa dışı faaliyetler de bu kapsama dâhil edildiğinde oranın daha da büyümesi beklenmektedir. Türkiye’de kayıt dışılığın örgütlenmesi reel sektörler itibar ile incelendiğinde enformelliğin tarımsal sektör ağırlıklı olduğu görülmektedir ve tarım sektörüne yönelik uygulanan herhangi bir politikanın kayıt dışı ekonomiyi doğrudan etkileyebileceği düşünülebilir. Tarım kesiminde yaşanan çözümler tarımsal işgücünü kırsal kesimden kentsel kesime kaymasına neden olurken söz konusu tarımsal istihdamın hizmetler sektöründe daha esnek bir şekilde örgütlenmesine neden olmuştur. Ayrıca düşük eğitim ve düşük gelir düzeyinde olan kesimin formel iş imkanlarına erişimde sorunlar yaşadığı yüksek işsizlik oranları, eşit

olmayan gelir dağılımı ve nüfusun hızla büyümesi gibi nedenlerin de kayıt dışı ekonomiye katkı yaptığı söylenebilir.

Çalışmanın mali faktörlerin incelendiği kayıt dışı ekonomi ve vergi yönetimi bölümünde ise vergi türleri açısından dolaylı vergi paylarının Türkiye’de yüksek olduğu gözlemlenmiş ve vergi sistemi içerisinde dolaylı vergi paylarının artmasının kayıt dışılığı arttırıcı bir etkiye sahip olduğu görülmüştür. Vergi yönetimi bölümünde de vergilendirme ile ilgili mükellef sayıları, elde edilen vergi gelirleri ve yapılan vergi harcamaları ve vergi yönetimi ile ilgili mevcut Gelir İdaresi Başkanlığı tarafından sunulan veriler ışığında betimsel ilişkiler elde edilmiştir. Kurduğumuz modelde yönetimsel vergi maliyetleri olarak ele aldığımız yeni değişkenin Türkiye açısından kapsamı vergi toplarken katlanılan harcamalar altında vergi yönetimi kısmında gözlemlenebilir. 2008’den sonra vergi denetimi, tutulan rapor sayıları ve çalıştırılan denetmen sayısında gözle görülür belirgin artışlar yaşanmıştır ve hazırlanan kayıt dışı ekonomi ile ilgili mücadele programları altında yönetimsel vergi maliyetlerine katlanma ihtiyacının önemi vurgulanmıştır. Tek başına denetimden yoksun bir vergi politikasının başarısı son yıllarda sorgulanmış ve yüksek vergi oranlarının da kayıt dışılığı teşvik ettiği düşünülerek vergi kayıpları yaşanmaması açısından vergi yönetiminin önemi kavranmıştır.

Çalışmanın ikinci bölümünde ise daha önce bahsedildiği üzere optimal vergi modeli tanıtılmış ve optimal vergi aralığında vergi oranları ve kayıt dışılık arasındaki mübadele ilişkisi analiz edilmiştir. Literatürde söz konusu ilişki ile ilgili olarak yüksek vergi oranlarının kayıt dışılığı arttırıcı etkiye sahip olduğunu ileri süren çalışmalar olduğu gibi (Frey ve Pommerehne, 1984; Rauch, 1991; Loayza, 1996; Fortin ve diğ., 1997; Schneider, 1994,1997; Tanzi, 1999; Ihrig ve Moe, 2004; Busato ve Chiarini, 2004; David ve Henrekson, 2004; Amaral ve Quintin, 2006 ve Delipalla, 2009) bu ilişkinin desteklenmediği son yıllarda yapılan çeşitli ampirik çalışmalar da mevcuttur. Elgin ve Garcia (2011) bahsi geçen ampirik literatüre devletlerle ilişkili kamusal güvendeki farklılıkları analiz ederek katkıda bulunmuştur. Biz de bu bağlamda Elgin ve Garcia’nın (2011) modeline yönetimsel vergi maliyetlerini içeren yeni bir değişken ekleyerek devletin söz konusu maliyetli vergilendirme durumlarında vergi kaçırma ve kayıt dışılık faaliyetlerini analiz etmeye çalıştık. Eklediğimiz yeni değişken devletin net vergi gelirlerini kamusal güven, vergi

oranları ve vergi tabanı aracılığı ile etkilemektedir. Kamusal güvenlik; kayıt dışı ekonomiyi kurumsal perspektif üzerinden inceleyen çalışmalardaki kurumsal bir faktör gibi düşünülebilir. Örneğin güven seviyesi düşük bir yasal sistem kayıt dışılığı tetikleyici bir sorun teşkil eder. Bizim çalışmamızda da kamusal güven parametresi devletin vergi gelirleri ve vergi tabanının kontrolü üzerinde etkilidir ayrıca yönetsel vergi maliyetleri de kamusal güven parametresinin doğrusal bir fonksiyonu olarak düşünülmüştür. Daha yüksek bir kamusal güvenlik devletin öngördüğü vergi planını gerçekleştirmesi açısından daha yüksek bir efor seviyesini ifade etmektedir. Aynı şekilde yüksek vergi oranları da vergi kaçırma faaliyetlerini teşvik etmesi açısından devletin daha yüksek efor sarf etmesi gerektiğini ifade etmektedir. Bu nedenle vergi oranları da kamusal güven gibi yönetsel vergi maliyetlerinin doğrusal bir fonksiyonu olarak tanımlanmıştır. Son olarak kayıtlı ekonomi üretim seviyesi ile söz konusu maliyetler arasındaki ilişkinin pozitif olduğu varsayılmıştır. Daha büyük bir vergi tabanı daha yüksek bir devlet kontrolü gerektirmektedir ve bu da devletin katlandığı maliyetlerin artmasına neden olmaktadır. Modelde çalışanların üretkenlik düzeyleri de kayıtlı ekonomide yer almaları açısından önem taşımaktadır. Eşik üretkenlik düzeyi üzerinde bir üretkenliğe sahip olan çalışanlar kayıtlı ekonomide yer alırlar. Bu nedenle devlet vergi gelirini sadece bu eşik düzey üzerindeki kesimden elde edebilmektedir. Bu bağlamda ilk olarak analitik olarak optimal sermaye düzeyi ve eşik üretkenlik seviyesi belirlenecek ardından devlet eşik üretkenlik seviyesini gözlemleyerek vergi oranlarını belirleyecektir. Burada amaçlanan eşik üretkenlik düzeyini vergi oranları, kamusal güvenlik ve yönetsel vergi oranlarına bağlı olarak hesaplamaktır. Sonuç olarak firmaların optimal tercihleri verili iken devletin optimal tercihi analiz edilecektir. Devletin optimal tercihlerini belirlemek için çalışmada nümerik analiz metodu kullanılmıştır. Yapılan nümerik analizde yönetsel vergi maliyetleri, net vergi gelirleri ve görelî kayıt dışı ekonomi için ortalama değerler elde edilmiştir.

Nümerik analiz sonuçlarına göre idari maliyetler vergi oranları 0,7'ye ulaştığında maksimum olmaktadır. Bu noktadan sonra vergi kaçırma baskın olmakta ve kayıtlı ekonomideki daralma vergi artırımının önüne geçmektedir. Bu nedenle azalan vergi tabanı nedeniyle idari maliyetler de azalmaktadır. Tüm bu etki kamusal güvenin etkisinden bağımsız olarak ortaya çıkmaktadır. Öte yandan daha yüksek bir kamusal güven daha yüksek idari maliyetler doğurmaktadır. Bu durum da devletin

harcadığı efordaki artışı ifade etmektedir. Kamusal güven ve idari maliyetler arasındaki ilişki doğrusal ve pozitifdir ve ancak yüksek vergi oranlarında belirgin olabilmektedir. Yüksek kamusal güven ve düşük vergi oranları mevcut iken net vergi gelirleri pozitifdir. Bunun arkasında yatan sebep vergi kaçırmanın önüne geçilmesidir. Devlet düşük vergi ve yüksek kamusal güveni gerek ayrı ayrı gerekse optimal bileşen şeklinde bir politika aracı olarak kullanabilir. Son olarak kayıt dışı ekonomideki azalış ya da artış incelendiğinde görece olarak kayıt dışı ekonominin alacağı boyutun devletin belirlediği herhangi bir vergi oranına göre şekilleneceği tahmin edilmektedir ancak denge kayıt dışı ekonomi boyutu firmaların davranışlarının yanı sıra devletin optimal tercihi tarafından da etkilenmektedir. Devlet kontrol düzeyini arttırdığında, eşik üretkenlik düzeyi, verili vergi oranları altında azalmaktadır ve bu düşüş daha küçük bir kayıt dışılık düzeyine işaret etmektedir. Optimal sonuçlara bakıldığında da düşük kamusal güvende optimal vergi oranının sıfır olduğu görülmektedir. Kamusal güven arttıkça devletin daha yüksek bir vergi oranı koyabilir. Bu çalışmada kamusal güvenin yarattığı olumlu etki yüksek vergi oranlarının vergi tabanı üzerinden yol açtığı olumsuz etkinin önüne geçmektedir ve %30'u aşan vergi oranlarının optimal olmadığı ortaya konmuştur. Bu noktaya kadar yüksek kamusal güven vergi oranları artsa bile görece olarak kayıt dışı ekonomiyi azaltmaktadır.

Çalışmanın üçüncü ve son bölümü ise kavramsal bir tartışma şeklindedir. Refah ve üretimde etkinlik konuları altında vergi sonrası eşitlik, vergi türleri ve etkinlik kayıpları açısından modellerle ilişkilendirilecek noktalar tartışmaya dahil edilmiştir. Sonuç olarak Türkiye gerek emek, nüfus politikaları gerek gelir dağılımı bozukluğu ve uygulanan sosyal politika yetersizliği sebebiyle yapısal sorunlar barındıran bir ülkedir ve tek başına bir vergi ve vergi denetimi politikasının kayıtdışı ekonomiyi azaltması beklenmemelidir.

Tezin gelişim şeması şu şekilde olacaktır; birinci bölüm kayıt dışı ekonomi, vergilendirme ve vergi yönetimi konularını Türkiye için tartışacak, ikinci bölüm idari maliyetler altında optimal vergi modelini tanıttacak, üçüncü bölüm ise verimlilik ve vergilerin optimalitesi üzerine bir tartışma şeklinde sunulacaktır. Son olarak sonuç bölümünde bulgular değerlendirilecektir.

Anahtar Kelimeler: Optimal vergilendirme, Kayıt dışı ekonomi, Yönetimsel vergi maliyetleri

INTRODUCTION

In this thesis the main purpose is to analyze the relationship between tax rates and informal sector size under the tax administration costs. The interesting result about this relationship in recent empirical studies is the higher taxes do not bring higher informality (Johnson et al., 1997, 1998; Friedman et al., 2000; Torgler and Schneider, 2007; Elgin, 2011 and Elgin and Garcia, 2011). It is stated that for the certain values of the tax rates which are the optimal ones, the trade-off between tax rates and the efficiency is not valid because the informal sector size is not affected by the increase in the tax rates in contrast to many studies in literature which examine the informal activities as a result of higher taxes (Frey and Pommerehne, 1984; Rauch, 1991; Loayza, 1996; Fortin et al., 1997; Schneider, 1994,1997; Tanzi, 1999; Ihrig and Moe, 2004; Busato and Chiarini, 2004; David and Henrekson, 2004; Amaral and Quintin, 2006 and Delipalla, 2009).

In this context, we have been concerned about this recent result in literature and present a theoretic optimal taxation model. In order to capture this relationship we add an administration cost variable to the benchmark model which belongs to Elgin and Garcia (2011) and observe these costs' effects on informal sector size and it is known that the production in informal sector is legal but does not comply with government regulations. These administrative costs are generally costs that incurred by the tax authority in establishing and operating systems to manage all aspects of taxation. Intuitively these costs are important in economic analysis because in optimal taxation literature, the assumption that is costless individuals and firms to pay their taxes and governments to collect taxes is not a realistic. Therefore we do not ignore these costs during the present tax rates' effect on informal sector. Moreover these costs depend on a wide range of factors such as including the complexity of the tax, characteristics of the tax base, structure of tax rates, frequency of reform, and organization and efficiency of the tax authority (Shaw et al., 2008).

Elgin and Garcia (2011) contribute to the recent literature by supporting the recent empirical findings by its theoretical foundations which depends mainly on the differences between commitment levels of the governments. On the other hand our setup improves their theoretical framework by redefining the government's problem with a new variable which takes into account the effects of tax administration costs.

We assume that total administration costs are a positive function of government commitment, the tax rate and the output in the formal sector. The tax administration costs depend positively on commitment because higher commitment implies higher government effort in order to achieve the announced tax plan. Similarly, higher tax rate is likely to increase the tax evasion behavior therefore in order to avoid tax evasion government has to make a stronger effort. Tax administration costs depend positively on the formal sector output because it constitutes the tax base. Higher tax base implies higher government effort to collect taxes. Since the informal sector is invisible to the government sector, the tax base excludes informal sector output. The productivity level above which households choose the formal sector determines the formal sector size. Therefore government's tax revenues will depend on the formal sector size and threshold productivity level.

In our model, this administration cost variable affects the government net tax revenue through the commitment level of the government, tax rates and the tax base and the commitment level represents the power of the government's tax revenue collection and its control on tax base. This means the commitment level represents the considerable variable in terms of tax evasion occurrence and the growth of the informal sector size. Therefore we examine the trade-off between taxes and informal sector size as occurrence of production inefficiency due to the tax administration costs and lower commitment level of the government.

The rest of the master's of art dissertation is organized as follows: Chapter 1 discusses the informal sector, taxation and tax administration subjects for Turkey, Chapter 2 presents the optimal taxation model under the presence of tax administration costs to evaluate their effects on informal economy and Chapter 3 provides a brief discussion about efficiency and optimality of taxes. Finally all results will be presented in conclusion part.

CHAPTER 1 THE INFORMAL SECTOR, TAX RATES AND TAX ADMINISTRATION COSTS IN TURKEY

In this chapter the concept of informal economy, taxation and tax administration will be evaluated for Turkey. In order to understand the tax administration costs' effects on informal sector which will be examined by an optimal taxation model in following chapter, it is important to examine the various related topics with informal sector and tax administration in Turkey.

1.1 The Definition of the Informal Sector

In the literature, the informal economy is also called as black, hidden, shadow, parallel, second or underground economy and is defined as a set of economic activities that occur outside of both public and the private sector establishments. The production in informal sector is legal but it is not under the control of government (Hart, 2008).

The two studies, Kaldor (1956) and Cagan (1958), are the examples of early beginnings of research into informal economic activity. Then the quantitative aspects of the informal sector were analyzed in various studies (Tanzi, 1980; Isachsen and Strøm, 1981; Simon and Witte, 1982). Tanzi (1999) and Thomas (1999) mainly focused on the meaning of the concept of a 'black' economy, and about the methods used to estimate its size.

All these studies indicate that the informal sector is not a completely new subject for economists. Specialists in public finance have for a long time been concerned with tax evasion and the existence of the legal and illegal informal economy. Furthermore in the last few years, the concept of the informal economy has received ever increasing attention among the public and politicians in industrial

countries. One of the recent studies, Chen (2007) describes the move from the ‘old’ concept of the informal sector to a more comprehensive view of the informal economy which is mainly determined and affected by employment arrangements. The ‘new’ view of informality which focuses on the worker and informal employment, that is employment without any sort of protection, includes self-employment in unregistered firms and wage employment in unprotected jobs.

Table 1.1 can be observed for better understanding of classification between various informal economic activities which some of them are legal and some are not. According to Buehn and Schneider (2013) the informal economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions, therefore all economic activities that would generally be taxable were they reported to the tax authorities.

	Monetary Transactions		Nonmonetary Transactions	
Illegal Activities	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling and fraud		Barter: drugs, stolen goods, smuggling, etc. produce or growing drugs for own use. Theft for own use.	
Legal Activities	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods.	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

Table 1.1: A Taxonomy of Underground Economic Activities

Source: Buehn and Schneider (2013)

Following Table 1.1 tax avoidance and tax evasion seem to be part of the legal activities. Tax evasion deceives the government of legally due tax revenues, thereby reducing the government’s ability to provide public services, while increasing the nation’s debt burden (Cebula and Feige, 2011). It indicates to a situation where a person try to reduce his tax liability by deliberately suppressing the income or by inflating the expenditure showing the income lower than the actual income and

conducting to various types of deliberate manipulations. Moreover the line of separation between tax planning and tax avoidance is very thin and blurred and any planning which, through done strictly according to legal requirements defeats the basic intention of the legislature behind the statute could be termed as instance of tax avoidance (Savita and Gautam, 2013).

Since informal economy severely undermines a government's fiscal stance, reducing the informal economy size and fighting tax evasion are among the roadmaps of any government. This is one of the main reasons of why there is an increasing attention on the economic analysis of the informal economy in recent years (Elgin and Schneider, 2013).

Moreover estimating the size of the informal economy is a challenge since the purpose of operating in it is often to avoid detection and countries may lack the capacity to monitor informal activity. While there are no direct measures of the size and composition of the underground economy, a number of indirect methods have been proposed, although each of these has drawbacks. The main methods to estimate the size of the informal economy are (Schneider, 2004; Schneider et al., 2010 and Singh et al., 2012) listed as below:

- Currency demand approach estimates the size of the underground economy from the excess demand for cash since most transactions in the underground economy are conducted in cash.
- Electricity demand approach assumes that electricity usage is a good physical indicator of economic activity, and estimates the growth of the underground economy based on the difference between growth rate of electricity consumption and the official GDP growth.
- Labor force approach estimates the growth of the underground economy based on the decline in labor participation, assuming a constant labor participation rate.

- Multiple indicators multiple causes model (MIMIC model) is mainly based on the use of a specific structural equation model and estimates the size of the informal economy based on multiple observed variables that are presumed to cause it.

As a result despite the development of various methods, still persists in the literature, is the lack of consensus on the measurement of the informal economy, inhibiting construction of significantly large datasets that would make informality subject to robust (applied) policy analysis (Elgin and Schneider, 2013).

1.2 The Possible Causes of High Informal Sector

Indeed that there are many factors that can affect informal sector and classified such as fiscal, economic, legal, political and social factors. Table 1.2 summarizes all these factors; Schneider (2012) has determined various factors' weight in such groups on informal economy from the average values of 12 studies and the average values of empirical results of 22 studies.

Factors influencing the informal economy	Influence on the informal economy (in %)	
	(a)	(b)
(1) Increase of the Tax and Social Security Contribution Burdens	35-38	45-52
(2) Quality of State Institutions	10-12	12-17
(3) Transfers	5-7	7-9
(4) Specific Labor Market Regulations	7-9	7-9
(5) Public Sector Services	5-7	7-9
(6) Tax Morale	22-25	-
Influence of all Factors	84-98	78-96
(a) Average values of 12 studies		
(b) Average values of empirical results of 22 studies		

Table 1.2: Main Causes of the Increase of the Shadow Economy

Source: Schneider (2012)

According to Table 1.2 it is clear that on average the factors that concerned with taxation seem to have more significant role on informal sector. Since taxes

affect labor-leisure choices, and also stimulate labor supply in the informal economy, the distortion of the overall tax burden is a major concern for economists.

Schneider (2012) indicates that the bigger the difference between the total cost of labor in the official economy and the after-tax earnings (from work), the greater is the incentive to avoid this difference and to work in the informal economy. Since this difference depends broadly on the social security burden/payments and the overall tax burden, they latter are key features of the existence and the increase of the informal economy.

For Turkey the most similar recent study was conducted by Elgin and Schneider (2013). They compare the level and driving forces of informal economies in 38 OECD countries using two different methodologies. One of these is the multiple-indicators multiple-causes (MIMIC) approach based on an estimation of a structural equation model and the other one is based on a two-sector dynamic general equilibrium (DGE) model developed by Elgin and Öztunali (2012). According to their results the average driving forces of the informal economy of the 38 OECD countries obtained using the MIMIC model show that personal income tax (13.8 %), indirect taxes (14.1 %), tax morale (14.5 %), unemployment (14.7 %), self-employment (14.5 %), growth of GDP (14.3 %) and business freedom index (14.2 %) contribute more or less evenly to informal economies. On the other hand according to the estimates constructed using the DGE model growth of GDP per-capita has by far the largest effect (24.7%) followed by indirect taxes (18.5 %), unemployment (18.3 %), tax morale (17.1 %), personal income tax (11.2 %), self-employment (5.8 %), and business freedom (4.3 %).

In below Figure 1.1 the results from two different approaches can be observed for Turkey.

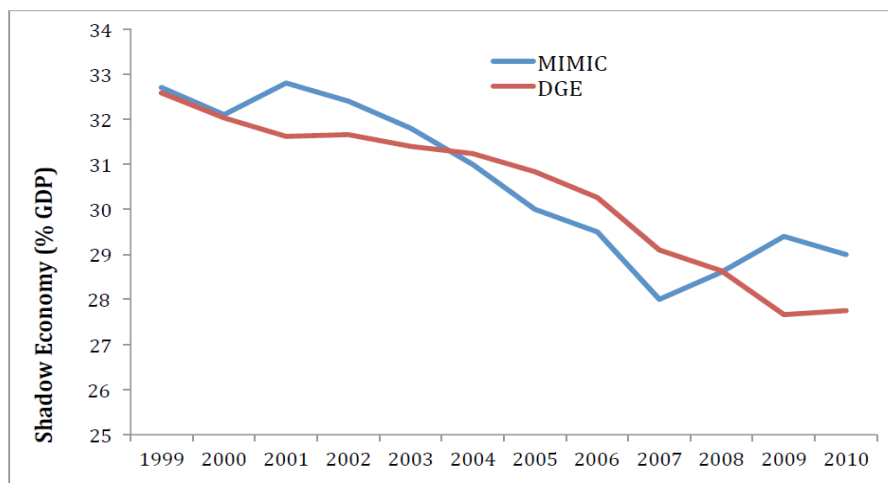


Figure 1.1: Shadow Economy (%GDP)

Source: Elgin and Schneider (2013)

In order to capture these results Elgin and Schneider (2013) preferred to examine effects of seven variables on informal economy size; personal income tax, indirect taxes (both as % of GDP), tax morale, unemployment rate, self-employment ratio, growth of real GDP per capita and business freedom index. In macroeconomic framework all of these variables can be taught as potential causes of informal economy. In addition the high inflation, unequal income distribution, small companies' lower competitiveness and sectoral decomposition are the other various important macroeconomic determinants that may have significant role on informal sector size growth. Moreover Elgin (2011) provides a measurement of informal sector share by using DYMIMIC (dynamic multiple indicators and multiple causes). This time the multiple causes are the unemployment rate, GDP per capita, inflation rate, reel minimum wage, the foreign trade volume and the ratio of government expenditures to GDP, the share of direct/indirect taxes in GDP and inverse seignorage. In taxation literature inverse seignorage is often used instead of the power of tax enforcement (Ihrig and Moe, 2004). It is expected that unemployment rate, the reel minimum wage and the share of direct/indirect taxes in GDP to have been positive correlation with informal sector. However the other causes have been negative correlation with informal economy.

In sectoral composition, in real terms the agriculture sector plays significant role on informal sector growth in Turkey and in private sector terms the size of the firms play important role on formal/informal sector' border. The small firms are thought to have lower competitive power than the bigger ones therefore they have difficulties to access formal credit markets or in doing business so prefer to be a part of the informal sector (Şengül, 1997; İkiz, 2000). In below section of the study all of these macroeconomic determinants will be examined for Turkey.

1.3 Informal Sector Size and the Related Macro Indicators in Turkey

There are different studies in literature that measure relative size of the informal economy in Turkey which can be observed as below:

Author	Year	Method	Informal Economy/GDP (%)
İlgin	2001	Basic Monetary Ratio	% 66,2
	1993	Basic Monetary Ratio	% 55,3
	1992	Econometric Ratio	% 47,2
Altuğ	1992	The Informal Employment Approach	% 35
Derdiyok	1989	Tax Approach	% 46,9
Temel, Şimşek, Yazıcı	1992	Econometric Approach	% 8,1
	1992	Transaction Volume	% 1,9
	1991	Tax Approach (with different assumptions)	% 29,9-16,4
Çetintaş, Vergil	1992	Econometric Monetary Forecasting	% 23
	2000	Econometric Monetary Forecasting	% 24,7
Schneider	2001	Mixed Approach	% 33,2
Kasnakoğlu	1997	Currency Ratio	% 30-61
		Econometric	% 9-13
		Transaction Volume	% 31
Özsoylu	1990	Currency Ratio	% 11,7
Tax Inspectors Board	2004	Input-Output Approach	% 30

Table 1.3: The Estimations on Informal Sector Size in Turkey

Source: Sarıca (2006)

The several different estimations' results can be seen from Table 1.3. The measurement problems due to time dimension and the inadequate data can create such different results.

The share of informal economy in GDP can be observed for the years between 2002 and 2013 and in Figure 1.2 the informal economy seems to be in a decreasing trend since 2002 except crisis period 2009. From Figure 1.4 it is shown that GDP per capita was increasing between 2005 and 2008 hence the informal sector size might also decrease between this interval.

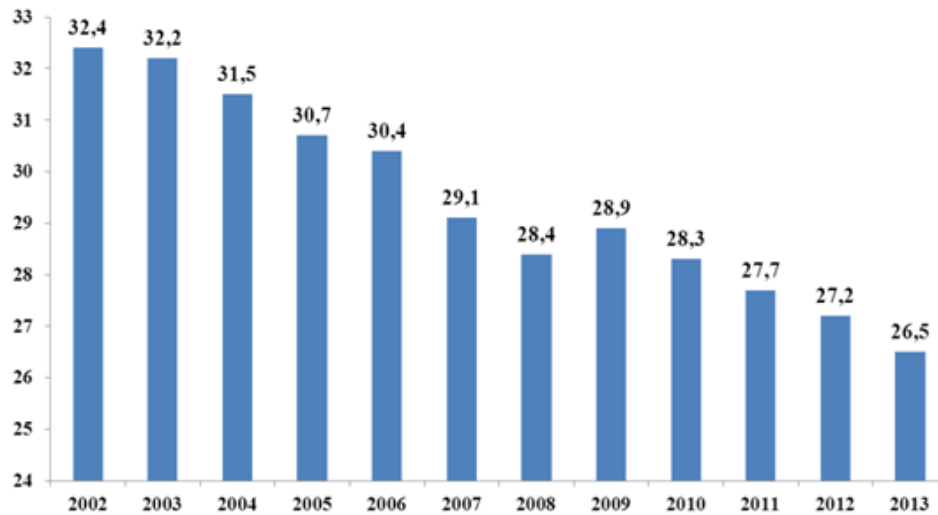


Figure 1.2: The Share of Informal Sector in GDP

Source: www.kayitliekonomiyegecis.gov.tr

In another way to measure to informal sector look at informal employment. According to this measure provided by Turkish Statistical Institute the share of informal employment has decreased from 50,6% to 37,8% between 2000 and 2013 as can be seen in Table 1.4.

	Informal Employment	Total Employment	The Share of Informal Employment
2000	10.925	21.581	50,6
2001	11.382	21.524	52,9
2002	11.133	21.354	52,1
2003	10.943	21.147	51,7
2004	9.843	19.632	50,1
2005	9.666	20.067	48,2
2006	9.593	20.423	47,0
2007	9.423	20.738	45,4
2008	9.220	21.194	43,5
2009	9.328	21.277	43,8
2010	9.772	22.594	43,3
2011	10.139	24.110	42,1
2012	9.686	24.821	39,0
2013-August	9.803	25.960	37,8

Table 1.4: Informal Employment in Years (1000 people)

Source: TurkStat

Figure 1.3 illustrates the growth rate of informal employment. According to Figure 1.3 the growth rate of informal employment seems to be negative between 2002 and 2008. The fall in the share of informal employment observed in 2010 can be explained by the higher growth of the total employment. However the negative growth of the informal sector since 2011 cannot be explained by the growth of in total employment alone. Therefore it will be useful to focus and try to understand the other factors' effects such as government tax enforcement and tax administration capacity.

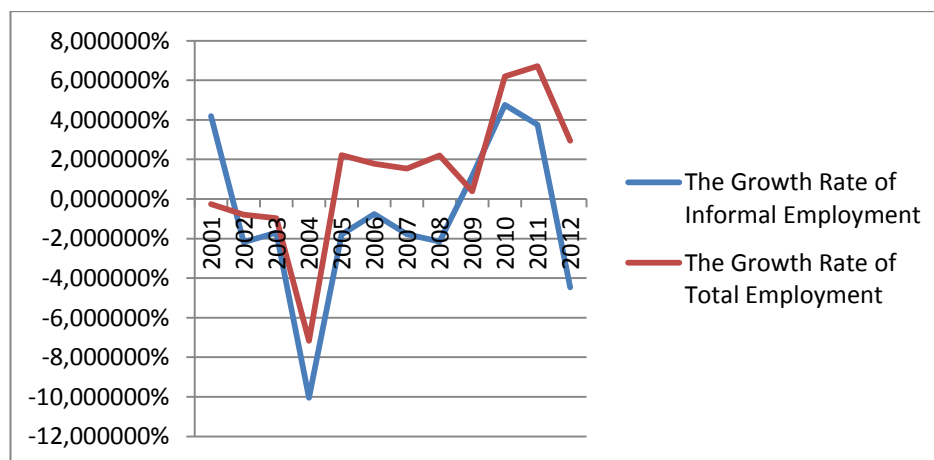


Figure 1.3: The Growth Rate of Informal Employment and Total Employment

Source: TurkStat

1.3.1 GDP Per Capita

As mentioned above several studies associate a low GDP per capita with a high informal sector. Figure 1.4 below gives the evolution of the GDP per capita between 2002 and 2012. It is observed that GDP per capita increased from 2002 to 2008 and it is in an increasing trend except for the economic recession year 2009.

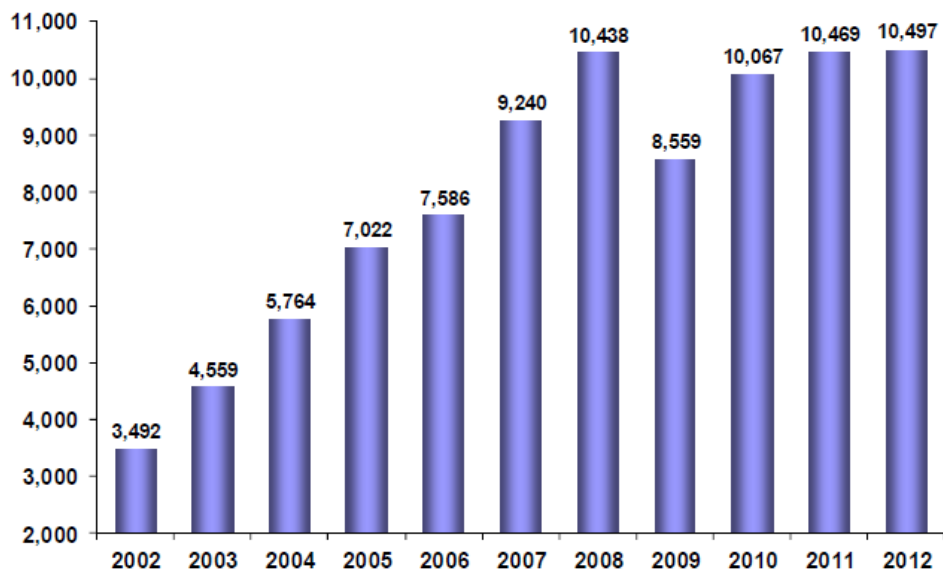


Figure 1.4: The GDP per capita (in dollars)

Source: TurkStat

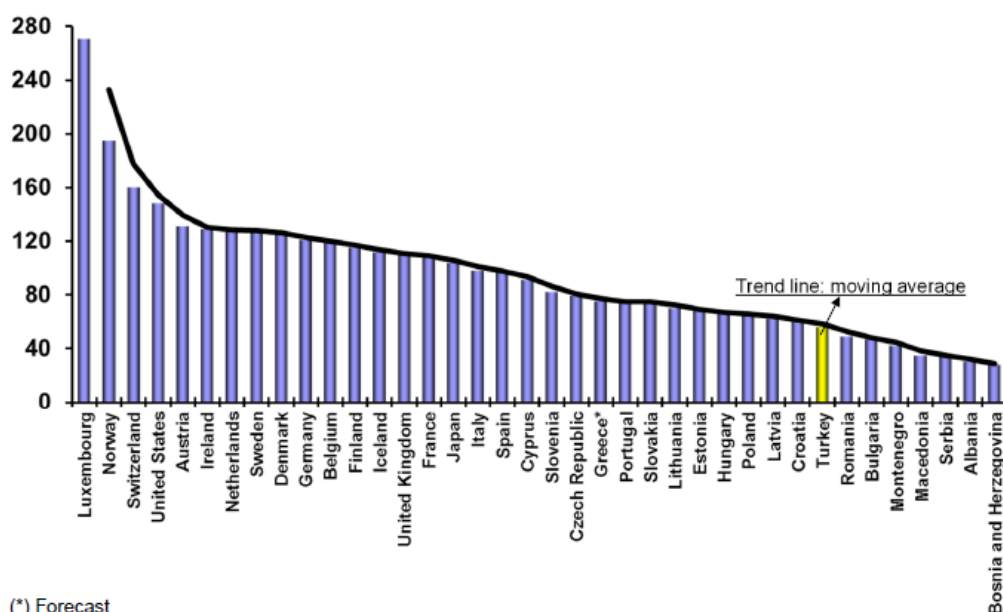
In order to capture the relationship between GDP per capita and the informal economy Table 1.5 can be observed and it seems that between the period of 2002 and 2008, share of informal economy is in decreasing trend. This declining trend may be associated with increasing trend in GDP per capita during the same period. The negative effect of economic recession is also observed on share of informal economy for the year of 2009.

Year	GDP per capita	The Share of Informal Economy
2002	3.492	32,4
2003	4.559	32,2
2004	5.764	31,5
2005	7.022	30,7
2006	7.586	30,4
2007	9.240	29,1
2008	10.438	28,4
2009	8.559	28,9
2010	10.067	28,3
2011	10.469	27,7
2012	10.497	27,2

Table 1.5: GDP per capita (in dollars) and the Share of Informal Economy in GDP

Source: The Combination of Figure 1.4 and Figure 1.2

Beside this increasing trend, the comparison of several countries' GDP per capita can be observed on Figure 1.5. Figure 1.5 states that the GDP per capita is lower in Turkey compared to many other countries. This result supports the idea of lower GDP per capita may bring higher informal sector in Turkey. Although the increasing trend of GDP per capita in Turkey, its magnitude is still low.



(*) Forecast

Figure 1.5: Per capita GDP, 2012-Purchasing Power Parity AB-27=100

Source: TurkStat

The share of informal economy in above mentioned country groups can be observed on Figure 1.6.

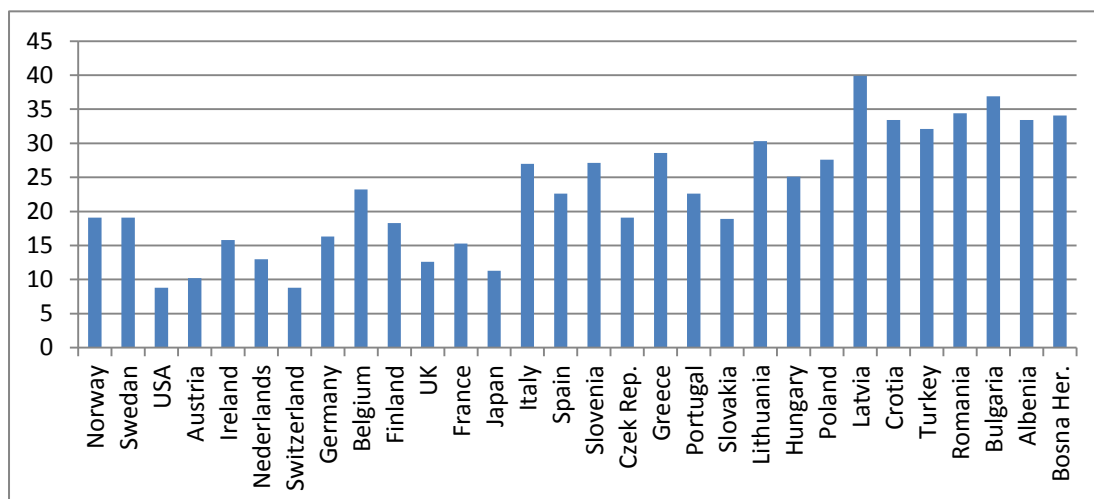


Figure 1.6: Share of Informal Economy (% of GDP) in Various Countries

Source: http://www.nationmaster.com/graph/eco_inf_eco-economy-informal

1.3.2 Unequal Income Distribution

In order to measure income inequality, the Figure 1.7 below gives the Gini coefficient which varies between 0 and 1. If the income is distributed fairly in a society, then the Gini coefficient is equal to 0. If the income is received by only one person, then the Gini coefficient is equal to 1.

According to Figure 1.7 we expect a declining trend in informal economy between the years of 2002 and 2005 due to the recovery in income distribution and we expect to increase informal sector size in 2006 and 2009. The unequal income distribution may limit to achieve technology, the possibilities related with education or obtaining various licenses to stay in formal sector. However the expected positive relationship between unequal income distribution and informal sector size is not supported by Figure 1.2 and Figure 1.7 for the year of 2006.

This incompatible result states that by only evaluating Gini coefficient may not provide clear information about the size of informal sector. In order to capture the exact relationship between inequality and informal economy, it is more useful to examine the studies which are based on the econometric models. For instance in the study of Mishra and Ray (2010), inequality affects the informal economy through three channels. First one is wealth constraint; which is a kind of problem for firms

during undertaking the fixed costs in the market. The second one is related with entry conditions; some firms that productive but have no enough money may prefer to be in informal sector. The last one is about the demand side; if the demand level to their production is high then those firms' profits will be also high therefore size of the informal sector may increase. Moreover Winkelried (2005) also focuses on the behavior of aggregate demand and states that the redistribution towards middle class can decrease the size of the informal sector.

On the other hand data provided by Turkstat indicates important income inequality. In order to measure income inequality Turkstat uses the following method: First households are listed from the lowest amount to the most amounts by disposable household income and all individuals in the households is listed by equivalent disposable income in the same way. Then household/individuals quintile groups is formed by dividing the number of the households in five equal parts and deciles is formed by dividing the number of the households in ten equal parts and 5% groups is formed by dividing the households in twenty equal parts. As such the P80/P20 is the criteria to measure individual income distribution and it is the ratio of total equivalised income received by the 20% of persons with the highest income (top quintile) to that received by the 20% of persons with the lowest income (lowest quintile).

According to the latest Income and Living Conditions Survey (2013) in Turkey which was conducted by TurkStat, the richest 20% of the population receives 46.6% of the national income while the poorest 20% receive 5,9% of the national income. This implies that P80/P20 indicator is equal to 7,2 which means that the richest 20% is seven times richer than the poorest 20%. This high value of income inequality suggests that income distribution may be a cause of informal sector in Turkey even though the evolution of the Gini coefficient does not seem compatible with the evolution of the share of informal sector given in Figure 1.2.

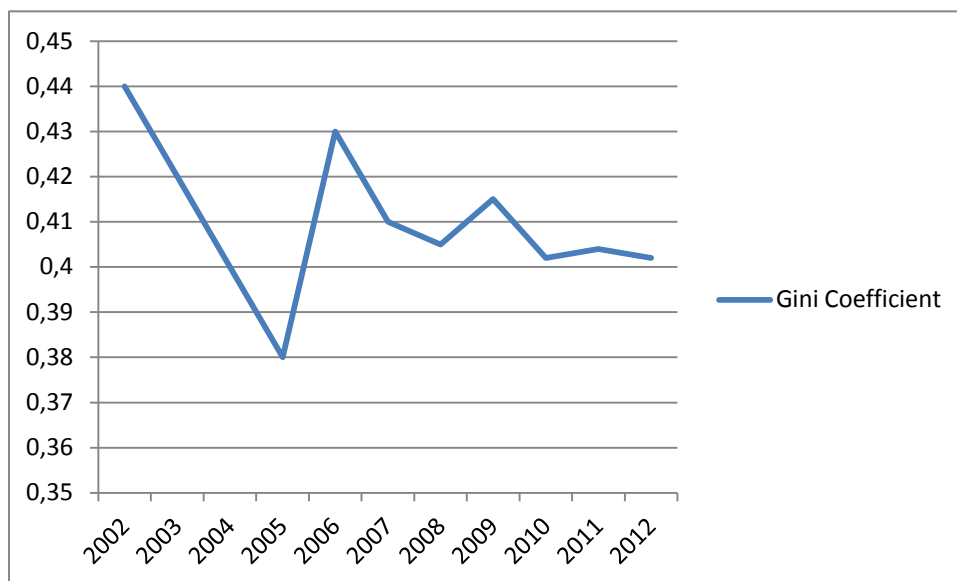


Figure 1.7: Gini Coefficient

Source: TurkStat

1.3.3 Inflation

The relationship between informal employment and annual CPI can be observed in Figure 1.8. According to Figure 1.8 it seems that inflation and the share of the informal sector are not closely related. This means although the high inflation distorts the tax system, this does not affect the behavior of tax evasion. This argument is supported by the volatility observed in CPI evolution shown in Figure 1.9 where as the evolution of the share of informal sector exhibit much less volatility.

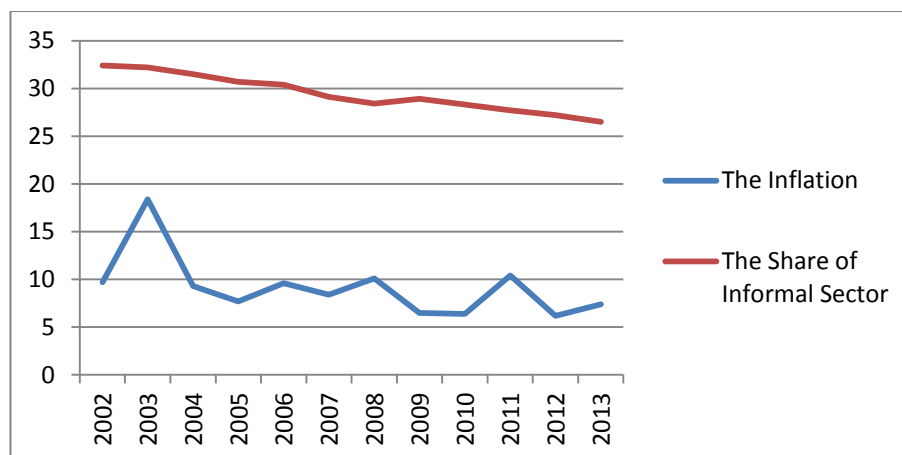


Figure 1.8: Annual CPI and the Share of Informal Sector

Source: TurkStat, CBRT

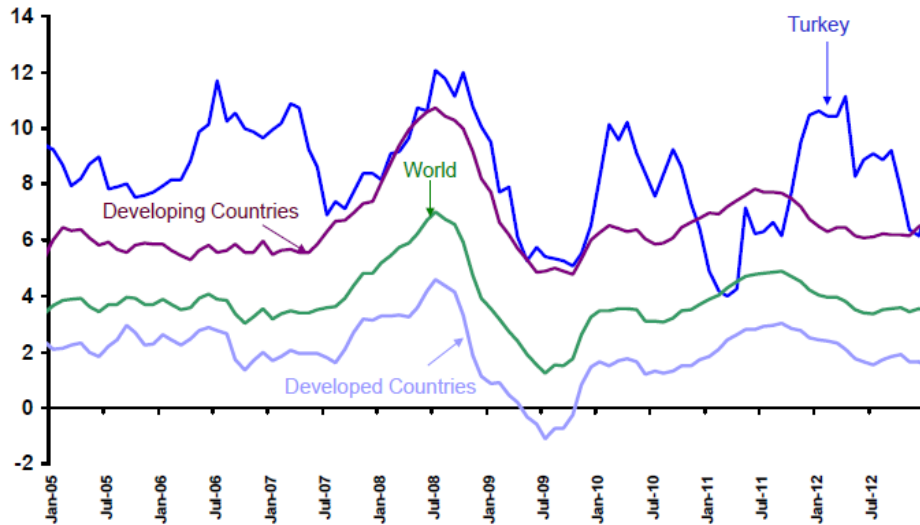


Figure 1.9: Annual CPIs

Source: CBRT

1.3.4 Sectoral Differences

In order to reduce informality, the share of the sectors in economy should be evaluated in detail. Because in Turkey, it is known that the workers in agriculture sector are mainly the part of the informal sector. And for that reason any policy that may affect this sector will be related also with informal economy. During the recent years although the agriculture sector share in economy has decreased, because of the lack of productivity in workers, who were employed in that sector also could not find formal jobs in the market.

According to Figure 1.10, among all economic sectors the highest growth rate belongs to the services. From 2002 to 2013 the services' share has increased 7.3% points and it is stated that this increase is also related with the decrease in agriculture sector. There has been 10.3% points decrease in agriculture sector and this is a direct result of the immigration from rural to urban side of the country. In urban side, the low-productive and low-educated agricultural workers are mainly the part of the informal and unsecured job markets.

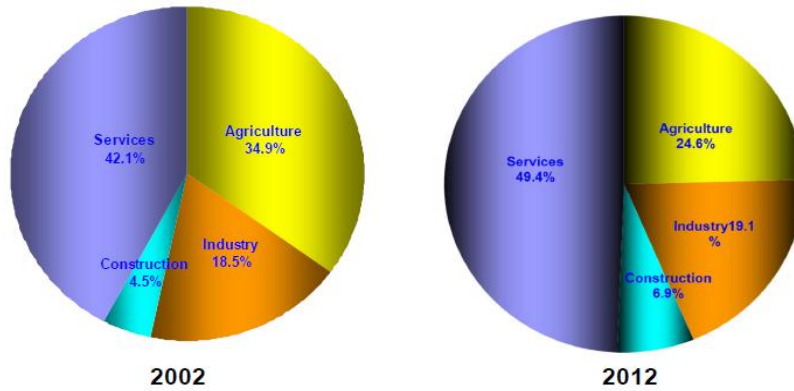


Figure 1.10: Distribution of Employment by Economic Activity (%)

Source: TurkStat

Figure 1.11 shows that informal workers are dominant in the agriculture sector which contributes significantly to the informal sector size in Turkey.

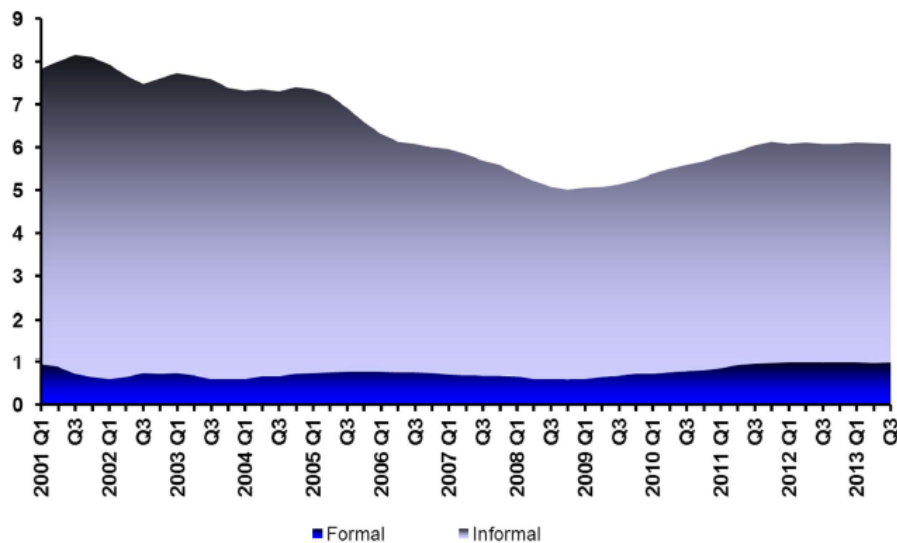


Figure 1.11: Workers in Agriculture (Million, 4-Quarter Moving Average)

Source: TurkStat

Moreover observing labor market structures can present important results about informality. From Figure 1.12, the unemployment rate can be observed. According to the Household Labor Force Indicators for August 2013; the unemployment rate increased by 1,0% points to 9,8% compared to the previous year's same month and there is a significant decrease in unemployment from 2009 to

2011 and these low unemployment rates might increase the tax base by increasing the number of the taxpayers in economy.

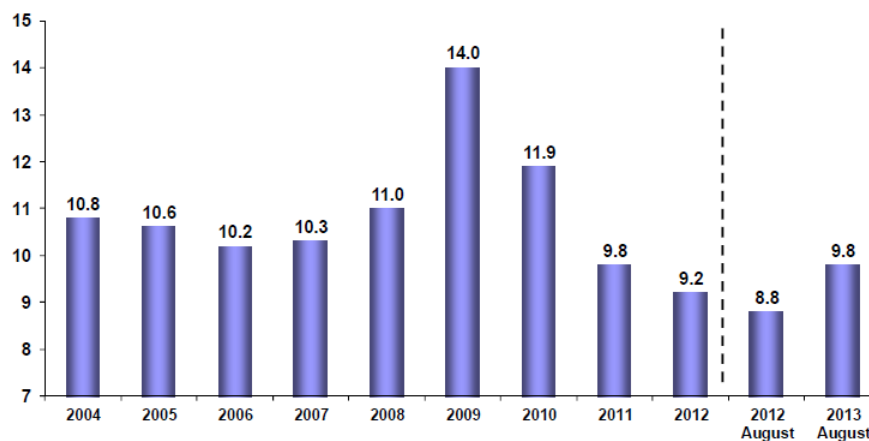


Figure 1.12: Unemployment Rate (%)

Source: TurkStat

The one of the interesting point related with labor market conditions in Turkey is also observed on Figure 1.13. The share of worker without an employment contract is 44% in Turkey and it is the leading country and Ireland and Greece also follows it with 39%. The lower ratios are belonged to Sweden and Finland.

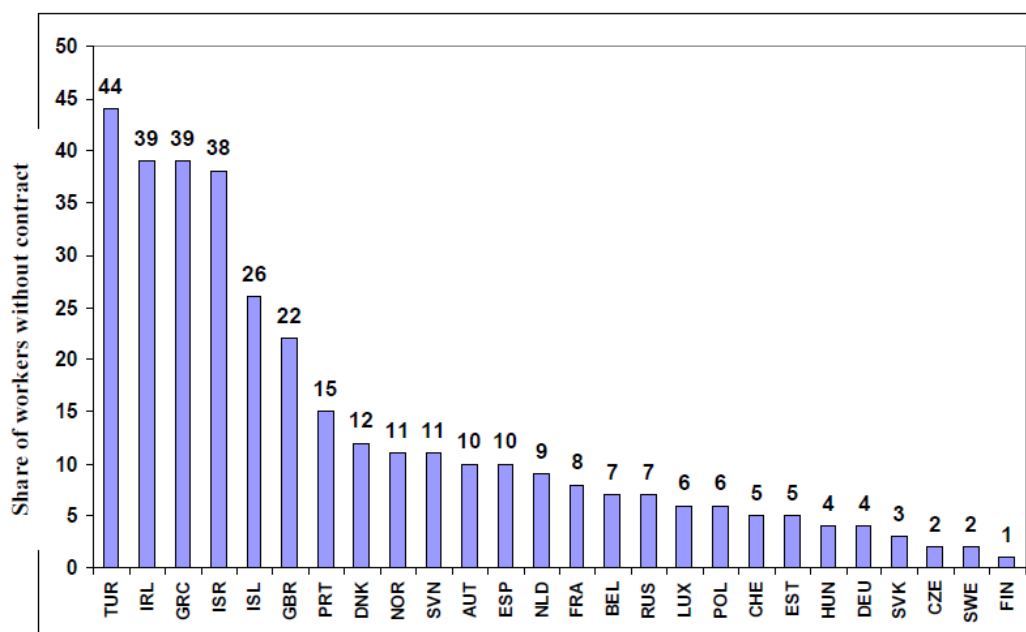


Figure 1.13: Share of Worker without an Employment Contract, 2006

Source: Schnedier (2012)

Moreover in of the OECD (2008) study presents some alternative measurements on informal economy which focus on informal jobs, own account works, unpaid family workers, multiple job holders and undeclared income. The study is based on seven OECD countries and one of the countries is Turkey. The Turkey's situation can be observed as below:

Country	Employees in informal jobs		Own account workers % of non-farm employment	Unpaid family workers % of non-farm employment	Multiple jobs holders % of total employment	Undeclared income	
	Employees not registered for mandatory social security	Employees without work contract				% of workforce typically not reported for tax purposes	% of employees receiving wages cash-in-hand
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Czech Republic	--	1,8	11,4	0,7	2,1	10,1	3,0
Hungary	19,4	2,6	6,4	0,3	1,8	8,6	8,0
Korea	25,8	--	17,1	4,7	1,7	7,0	--
Mexico	31,5	26,9	20,6	5,1	3,3	30,9	--
Poland	--	4,9	7,0	0,7	7,5	10,6	11,0
Slovak Republic	--	2,2	9,2	0,1	1,2	5,6	7,0
Turkey	21,7	--	16,6	3,3	3,1	24,6	--

Table 1.6: Alternative Measurement of Informal Employment and Undeclared Work, 2006

Source: OECD (2008), pp.86

According to these alternative measurements it is clear that informal employment is a serious problem for Turkey. The OECD (2008, pp.88) report indicates that in Turkey over 40% of the workforce is either working in informal salaried jobs or as own-account or unpaid family workers and informal workers tend to have relatively low levels of labor market bargaining power such as they are young and older workers, women and those with relatively low levels of education. Moreover since fully-informal employment is concentrated mainly in small businesses, partial informality, in the form of under-declaration of earnings, is common even in larger businesses.

1.4 Informal Sector Size and Tax Administration in Turkey

The fiscal side of the government is directly related with the size of the informal sector and the most important role belongs to the government tax policy. However the effect of higher taxes will have been always the controversial issue. Because of the government's high tax charges, households can prefer to be in informal sector and as a result of increase in informal sector government can give tax breaks and exemptions and this cycle may distort the confidence of households about government and its tax policies and economic activities.

1.4.1 Main Indicators

The budget deficit problem was always a kind of important economic problem for Turkey. In order to cope with this problem, two main goals were tried by government during the long periods.

First one is decreasing the government expenditures and the second one is increasing the revenues. Since 2002, the expenditures have been already being decreased by the government and the privatization applications were the main choice of revenue creation rather than the taxation. After achieving big growth rates, tax rates started to increase due to the tax base increase. However from then on, the government became more interested with increasing the level of tax that can be collected from the same income again by using tax rate as a tool. This goal may affect the tax evasion and informal economy can get bigger. The government budget deficit between 2002 and 2012 can be seen as below:

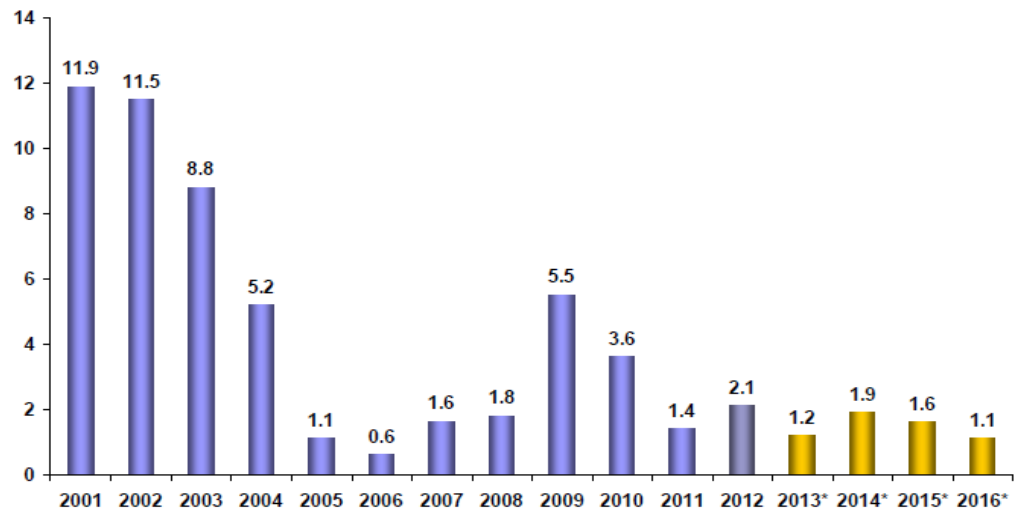


Figure 1.14: Central Government Budget Deficit (% of GDP)

Source: Ministry of Finance, 2014-2016 MTP

(*) 2014-2016: Medium Term Program Targets

Then with increase of informal economy, tax revenues of government decrease therefore the quality and quantity of public goods and services may reduce. If economic activities are not reported and recorded, then a country's measured GDP will be less than its actual GDP, with obvious consequences for macroeconomic policies (Georgiou, 2007). For instance in order to compensate tax revenue decrease, governments may increase tax rates on formal sector and this action again may increase size of the informal sector (Buehn and Schneider, 2012). Lyssiotou et al., (2004) also indicate tax base erosion by informal activities then undermining financing of public goods/services and social protection.

Moreover tax types' structures can play important role on informal economy. For instance the value-added-taxes which are indirect ones are accepted as one of the important factors for occurrence of informal economy. From TUSİAD's (2012) Report, the direct and indirect tax shares in GDP for Turkey are presented by Figure 1.15.

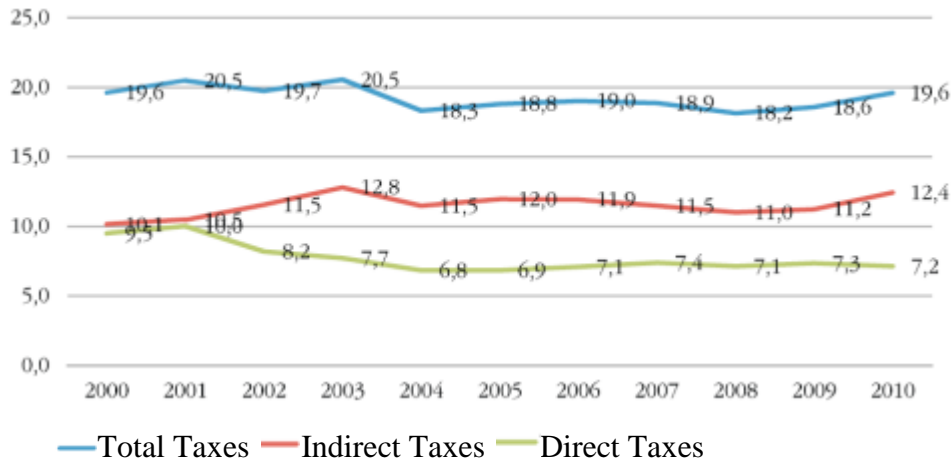


Figure 1.15: Total Taxes, Indirect and Direct Taxes (% of GDP)

Source: OECD

According to TUSİAD's 2012 Report (pp. 49-50) the share of direct taxes is greater than the indirect taxes in OECD countries. The Figure 1.16 shows direct and indirect taxes share in total tax revenues. Since 2003, special consumption tax has been applied in Turkey therefore this new type of tax applications might increase the share of indirect taxes in total tax revenues. Moreover in indirect tax group, the special consumption taxes are more dominant than the value-added taxes therefore the effect of generality that can be created by value-added taxes are not so considerable.

The report also indicates that the value-added tax rates are lower in Turkey than many other OECD countries. This means that efficiency is affected more negatively from preferring special consumption taxes because households' welfare decrease by higher prices of fuel oil, mobile communication, means of transportation or tobacco.

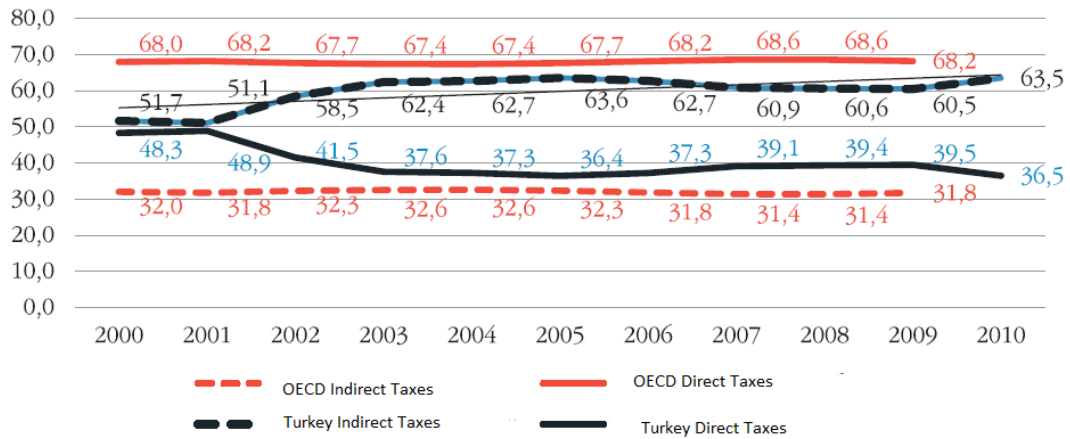


Figure 1.16: The Share of Indirect and Direct Taxes in Total Tax Revenues by Excluding Social Security Payments
Source: OECD

It can be stated that government’s tax policy will have important consequences on production efficiency and welfare of the consumers. The determining applicable tax policy and tax administration should be primarily focused on by governments. It is known that the tax burden share in GDP per capita in Turkey is lower than the other OECD countries. This result might occur due to difference in income levels therefore something should be done other than only using taxes as a tool for revenue creation. For instance the revenues from direct taxes should be collected from whole tax base and administration side of the government can play key role to achieve that goal. Revenue Administration in Turkey works for better tax administration and various indicators related to tax administration can be achieved from their annual reports and related figures can also be observed below:

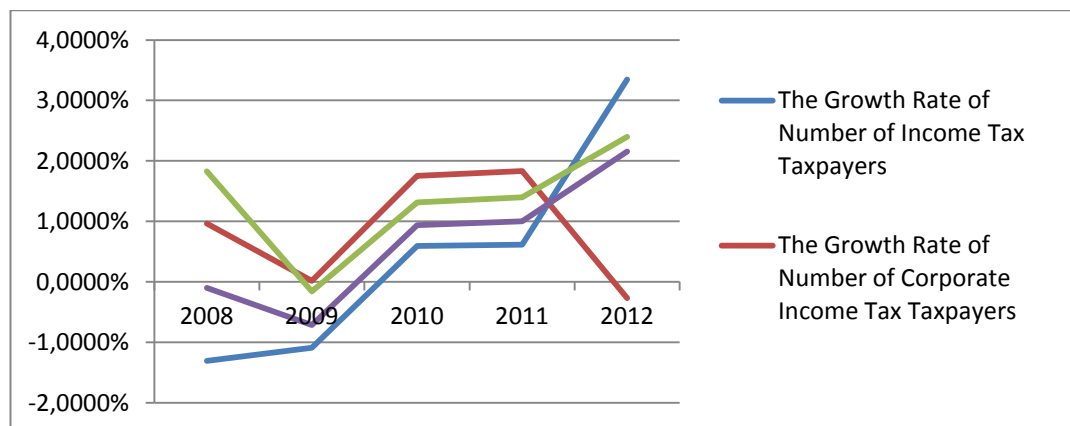


Figure 1.17: The Growth Rate of Number of Taxpayers

Furthermore the tax administration costs are related with the tax base and the tax base is related with the number and income of the tax payers as well as the available tax rate. Therefore, the number and income of the tax payers will have an effect on tax administration costs. Figure 1.17 shows growth rate of number of taxpayers in different tax types.

According to Figure 1.17 since 2011 there has been a declining trend in growth rate of the corporate income tax taxpayers however the growth rate of number of taxpayers in the other tax categories has been in an increasing trend. In 2009, because of the economic recession, the domestic demand was affected negatively therefore the capacity of to pay tax also decreased. After 2009, the positive effects of action plan of the government can be observed on taxpayers' numbers except the corporate income tax taxpayers.

The 2008 Economic Crisis's effects can also be observed on Figure 1.18. The tax revenues decreased in 2009 however the expenditures increased because of the expansionary policies. Then in 2010, the tax revenues started to increase again due to the recovery in economic conditions therefore the expenditures were decreased by the government.

The two effects can be observed together as below:

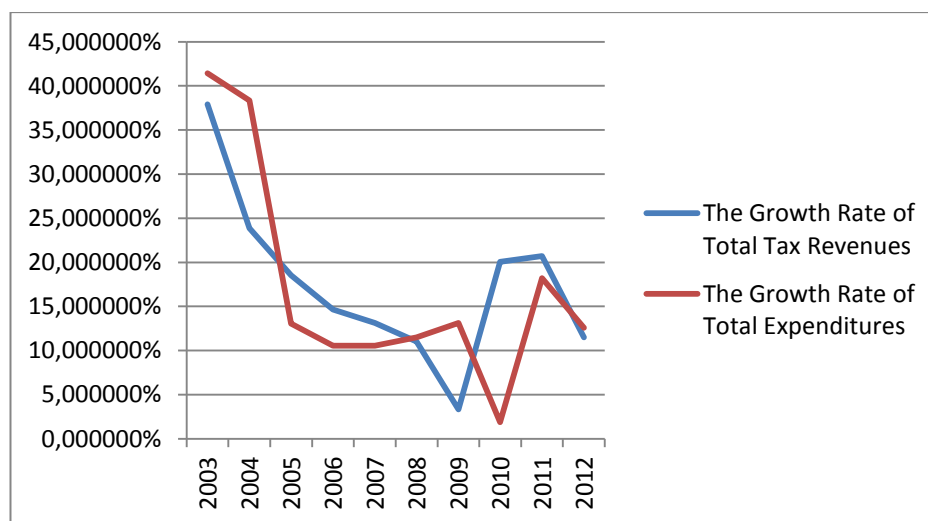


Figure 1.18: The Growth Rate of Tax Revenues and Expenditures

Moreover the tax revenues as a percentage of GDP can be observed on Figure 1.19. This ratio is called as tax burden by Revenue Administration and according to the latest available annual report which is belonged to 2012; the tax burden seems to be in increasing trend except the years 2006 and 2008. In 2009 the growth rate of the tax revenues are on its lowest value which is about 3% however in 2007 the growth rate of the revenues are 13%. This situation indicates that the low value of the tax burden in 2009 may come from the low values of tax revenues due to the economic recession however for the year 2006 the decrease in tax burden comes from the growth rate of GDP.

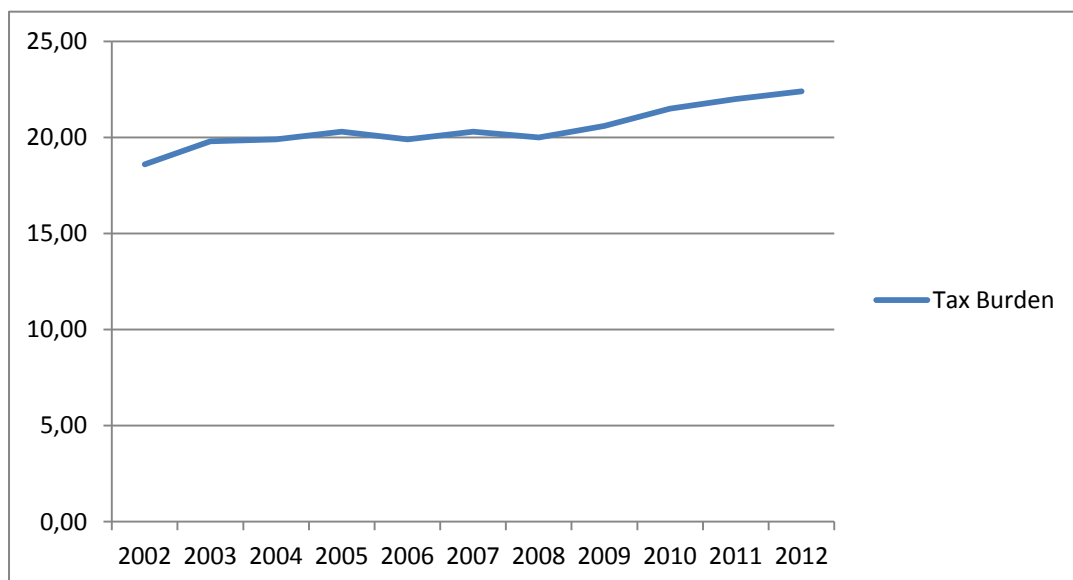


Figure 1.19: Tax Burden (Tax revenues as percentage of GDP)

Indeed since 2008, Revenue Administration was authorized as the key institution for the tax administration and beside tax rate tool, tax administration became important. In this term, the expenditures that government has to take should be focused because tax administration is conducted by undertaking extra costs. Tax administration is a costly and a difficult process therefore government has preferred to move according to the certain action plans.

1.4.2 Action Plans

In our study we also focus on administration side of the government and we think that lack of the government inspection on taxpayers such as lack of number of

audits and administration systems such as related with computerized technology or systems have effects on formal or informal sectors.

In recent empirical literature, higher taxes are considered to have positive effects on formal sector size in contrast to the general opinion. The activity in the informal economy is largely untaxed, and hence does not contribute to tax revenues. Countries with lower enforcement of the formal sector registration requirements may also have poor implementation of tax laws regarding formal firms. Conversely low revenues mean the government lacks the resources necessary to build capacity to enforce rules, and the capacity to offer some of the benefits of being formal.

In this context two action plans to fight against to informal economy were applied in Turkey. First one was conducted between 2008 and 2010 and the second one was in 2011 and 2012. Although the actions related to fighting the criminal economy/black market were not listed in the "Action Plan of Strategy for Fight Against the Informal Economy (2008-2010)", In the Action Plan (2011-2013), 47 actions concerning this issue were prepared and presented. The action plan has the following five main objectives: Increasing voluntary compliance, strengthening audit capacity, increasing the deterrence of the sanctions, sharing the database and the raising public awareness.

The Goal 1 is directly related with the taxpayer's compliance to the tax. In order to increase this compliance level government performs specific transactions under "The Taxpayer Risk Management Project" and the cost of tax compliance will be calculated and reported for each year, and every effort will be made to decrease this cost. In addition any kind of tax-related declaration, notification or form used by taxpayers will be reviewed and clarified and finally the customs procedures will be carried out with electronic signatures. These objectives' achievements are expected to prevent the tax evasion and informality.

Under Goal 2, the audit capacity is improved. This goal is related with the government administration on taxation. For instance the use of electronic invoices and accounts will be promoted starting from the sectors of fuel oil, mineral oil,

tobacco and alcohol and technical and legal infrastructure will be created for registering online trade. The "Electronic Business Audit Book" and the "Electronic Business Registration Center" including the information that serves as the basis for business and sector analysis, will be formed for the sole use of audit officers. Moreover the Social Security Institution will increase the number of audit officers to 1500 within the period of the Action Plan. Through cooperation between the Social Security Institution and the Revenue Administration, efficiency will be provided by combining the audit forms and business assessment records. Audits will be carried out electronically. Note that the Revenue Administration has significant role on to achieve these objectives.

In order to evaluate the government's policy on strengthening the audit capacity Figure 1.20 can be observed, It seems that there is a significant increase in number of audits after 2007. According to Revenue Administration's annual reports and data base although there were just 6.320 audits in 2007, this number became 48.352 in 2008.

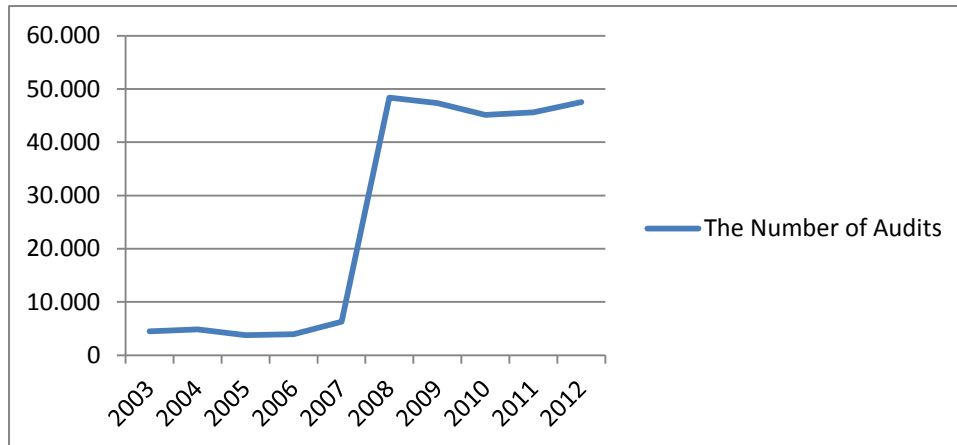


Figure 1.20: The Number of Audits

In addition Figure 1.21 shows the expenditure/detected worker ratio. The greatest value of the detected workers belongs to 2007 and from that year the detected workers' number starts to decrease until 2011. Moreover the ratio's maximum value belongs to 2010 which is about 372,947 TRY and this value shows the total expenditure amount of Revenue Administration per detected employees.

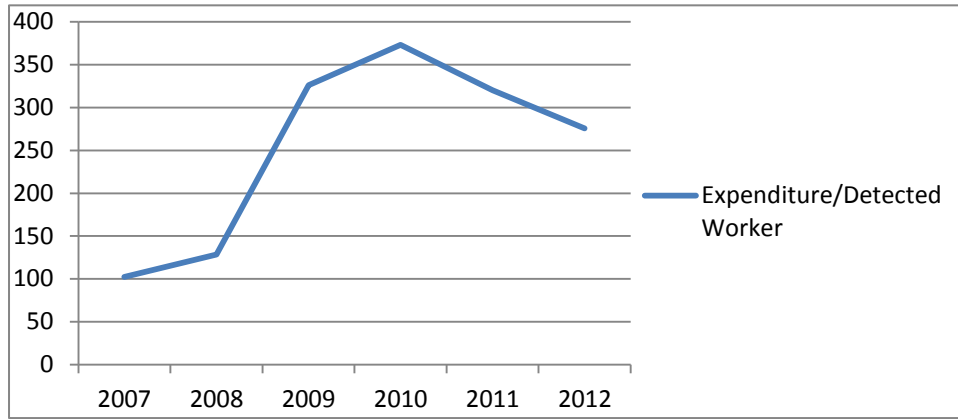


Figure 1.21: The Total Expenditures Divided by Detected Workers

From Figure 1.20 it seems that the number of audits is stable between 2008 and 2011 however the growth rate of total expenditures of Revenue Administration are volatile and it is decreasing since 2010. On the other hand the number of detected workers is increasing for the same period between 2010 and 2012. It can be stated that Revenue Administration needs to spend more on administration capacity in order to detect the informal workers. Although the number of audits has been increased from the beginning of the year 2008 this is not sufficient for capture the problem of informal sector and government needs to realize the importance of administration of the tax system in a multi-directional base and improve its administration tools.

From Figure 1.22 the amount of expenditure to collect 100 TRY tax can be observed. This ratio is accepted as tax collection costs of government. This ratio starts to decrease after 2008 and in a stable trend during 2009-2011. The Figure 1.22 also supports the suggestion above it can be observed that expenditure amount is not adequate for effective tax administration as well as tax collection.

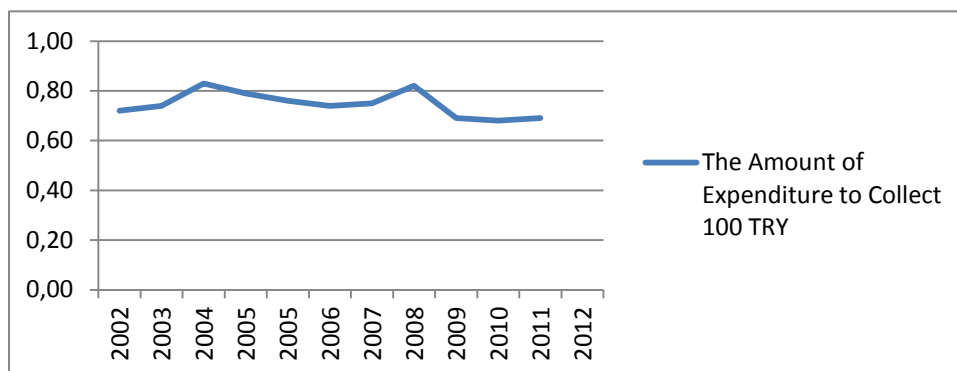


Figure 1.22: The Amount of Expenditure to Collect 100 TRY

Under Goal 3, the deterrence of the sanctions will be increased. For that reason the required regulations will be determined upon reviewing the legislation on sanctions and these regulations will put into effect within the determined time period. The required regulations and their deterrence will help both taxpayers and the government.

The Goal 4 is related with the sharing of the database. In this regard a system will be developed for sending sales data from gas stations to the Revenue Administration online and another system will be developed to instantly convey and report data of the mass flow meters installed on the POS machines of companies that produce liquid sugar, to the Sugar Agency in an electronic environment, and to track the input regarding the liquid sugar used in the manufacturing industry. In addition a system will be developed for data sharing between related institutions, regarding the procedures carried out by notaries public as a result this goal shows that information gathered from all state institutions and organizations will be analyzed and shared between institutions.

The last one is Goal 5 and it is related with raising public awareness. Under this goal the tax consciousness training will be introduced to the 3rd, 4th and 5th grades of Elementary Schools across Turkey, and will be continued by including the 6th, 7th and 8th grades; additionally, “Tax Consciousness” and “Labor and Social Security” courses will be added to the National Education curriculum. Then the extent of the informal economy in our country will be evaluated and tracked for established time periods and promotional activities through the media will be carried out to raise public awareness, regarding the fight against the informal economy.

To summarize, the action plan seeks to improve the voluntary compliance, audit capacity, power of sanctions, sharing the data base and the public awareness. Therefore, a model which will be presented in Chapter 2 that aims to analyze the relation between informal sector and government tax behavior for Turkey has to take into several facts such as voluntary compliance, tax administration costs due to increasing audit capacity and government efforts to discourage informal sector.

All these goals which are above mentioned are related with the model that will be presented in Chapter 2 in several ways. The Goal 1 is about the improving the voluntary compliance in tax system and in model individuals also decide by their selves to be either the part of formal or informal sector. The Goal 2 is about the power of the audit capacity and this is related with the variable of tax administration costs in model. The administration costs of taxation will be analyzed for computing net tax revenue of the government therefore the expenditures for conducting this goal's objectives are important for our analysis. The third goal is about the sanctions mechanism and in model in Chapter 2, the commitment level of government will have effect on informal sector size. These means the Goal 3 can be associated with the commitment and public trust of the governments. If legal system is improved then the tax base can also be increased by decreasing the compliance costs of the taxpayers. On the other hand making improvements on legal side also brings some costs to governments at the same time. The Goal 4 can be associated with the information asymmetry between government and the taxpayers' ability to pay. The information asymmetry can distort production efficiency and contribute on informal sector. Finally the Goal 5 targets again to help decreasing the information asymmetry and contribute on production efficiency. All these relationships between action plan of the government and the model that will be presented in Chapter 2 indicate that the model will be helpful to explain the transformation of Turkish government's tax system since 2011. As a result in following chapter of the study we will show the effect of administration cost variable which includes the tax rate, public trust and the tax base and it is seen that all these factors have very important roles on government revenue maximization and informal economy.

CHAPTER 2 AN OPTIMAL TAXATION MODEL FOR ANALYZING THE TAX ADMINISTRATION COSTS EFFECTS ON RELATIVE SIZE OF THE INFORMAL SECTOR

In this chapter the study discusses the effects of tax administration costs on informal sector and we change the baseline model to incorporate the informal sector and administration costs in a same optimal taxation model. The remainder of the chapter is organized as follows; Section 1 describes the setup, Section 2 presents the solution and Section 3 presents the numeric analysis by conducting the various simulations. Finally the all results will be discussed and evaluated.

2.1 The Setup

We take Elgin and Garcia (2011) as a benchmark model and we add tax administration cost to their setup. We use this framework in order to assess the relationship between taxes and the informal sector. Elgin and Garcia (2011) contribute to the literature by supporting the recent empirical findings by its theoretical foundations which depends mainly on the differences between commitment levels of the governments. On the other hand our setup improves their theoretical framework by redefining the government's problem with a new variable which takes into account the effects of tax administration costs.

Our model consists of three types of economic agents: Households, firms and government. In addition there are two types of households: Those who work in the formal sector and those who work in the informal sector. Firms operate in an environment of perfect competition. The government is assumed to be interested only in maximizing its revenues.

2.1.1 Households

Households are assumed to be producers at the same time. There is a continuum of consumer-producer households denoted by i and indexed on the interval $[0,1]$. Household preferences are identical regardless of the sector chosen and are given by the following utility function

$$U(i)[\Pi(i)] = \mathbb{E}u[\Pi(i)], \quad i \in [0,1] \quad (1)$$

In the above equation, $U(\cdot)$ is a strictly increasing, concave, and twice continuously differentiable function, and $\Pi(i)$ represents household i 's profits. \mathbb{E} , is the expected value operator. The utility function is assumed to be linear for simplification purposes.

Labor supply is assumed to be exogenous. Specifically we assumed that each household is endowed with one unit of time which they devote entirely to labor.

2.1.2 Firms

Households who are at the same time producers will have access to different technologies according to whether they work in the formal or the informal sector.

2.1.2.1 The Formal Sector

It is assumed that households can provide labor but have no capital. Therefore they need external financing (loans etc.) in order to rent capital. Furthermore, the only way that households can access the credit market is by becoming a part of the formal sector. The rental rate of capital, which is the interest rate is denoted by r and is assumed to be exogenous.

The production function in the formal sector is assumed to be of Cobb-Douglas type with constant returns-to scale

$$Y_F(i) = z(i)[K(i)]^\alpha [N(i)]^{1-\alpha}, \quad \alpha \in (0,1) \quad (2)$$

In equation (2) $K(i)$ represents the capital level employed by the household i for production purposes. $N(i)$ represents the labor employed and α is the capital share (assumed to be identical across all producers). In addition, $z(i)$ represents a productivity level defined as below:

$$z(i) = \exp[\theta(i)] \quad (3)$$

In above equation the productivity level $z(i)$ is assumed to be a convex function of individual productivity $\theta(i)$. The individual productivity parameter $\theta(i)$ is assumed to be drawn from some known distribution f . The productivity level of a household will play an important role in the households' choice of sectors. Because households who are uneducated and mostly have to work only in labor-intensive sectors have lower productivity and cannot exceed the threshold level easily.

Therefore, there will be threshold level of productivity beyond which households will prefer to operate in the formal sector. This threshold level will depend on the expected profits that the household can achieve in the two sectors. The expected profits in the formal sector denoted by $\mathbb{E}\Pi_F(i)$ are given by the difference between total revenues, total costs and taxes as given below:

$$\mathbb{E}\Pi_F(i) = Y_F(i) - rK(i) - \mathbb{E}T(i), \quad 0 < r < 1 \quad (4)$$

In the above equation the price of the good produced by household i is normalized to one. It is also assumed that profits are the only remuneration for the household. It can be observed that the formal sector's expected profits also depend on the third component of equation, $\mathbb{E}T(i)$. This component shows the expected tax payments of households that have to be undertaken when they use formal production technology. Why the taxes enter with an expected value operator will become clear below when we discuss the government sector.

2.1.2.2 The Informal Sector

The informal sector is assumed to have labor-intensive technology and therefore does not use capital during the production process. The production function of the firms in the informal sector is given below:

$$Y_I(i) = \exp[\theta(i)] [N(i)] = z(i), \quad (5)$$

Firms that operate in the informal sector do not pay any taxes since they are invisible to the government by definition. Hence, the profit function is expressed as follows.

$$\Pi_I(i) = Y_I(i) \quad (6)$$

Note that the production level and the implied profits are simply equal to the value of $z(i)$ in the informal sector.

2.1.3 Household's Optimal Decisions

Since household utility depends on profits in both cases, utility maximization is equivalent to maximizing expected profits in each case. This amounts to choosing the capital level that maximizes the expected profits if operating in the formal sector and then to comparing the resulting profit to the one that would result if the household choose to operate in the informal sector. Therefore the households' problem can be represented as below by using the equations (1), (4) and (6).

$$\max_{K(i) \text{ s.t. } K(i) \geq 0} \{Eu[\Pi_F(i)], u[\Pi_I(i)]\} \quad (7)$$

The above problem can be solved in two stages. In the first stage any household decides the level of capital that maximizes the expected profit if he chooses to operate in the formal sector. In the second stage the household decides the productivity level which equates the expected profits in both sectors in order to

decide in which sector to work. The first stage can be represented as below: In equation (7), λ and τ represent respectively the commitment level and the tax rate. Their role will be explained in detail while discussing the government sector below. Comparison of both utilities as implied by equation (7) yields threshold level of $\theta(i)$. Furthermore expected profits in formal sector, $\mathbb{E}\Pi_F(i)$ is needed to be rearranged as given equation (8) by inserting formal sector output and expected tax payments into it.

$$\max_{K(i)} \mathbb{E}\Pi_F(i) = z(i) [K(i)]^\alpha - r[K(i)] - \mathbb{E}T(i) \quad (8)$$

The second stage will be presented after discussing the government sector.

2.1.4 The Government

The government seeks to maximize its tax revenues represented by TR. A tax plan for charging households is announced by the government and a percentage τ of their output is collected as a tax. The realization of the announced tax plan depends on the institutional quality and the degree of government commitment to collect taxes. The degree of commitment is represented by λ which can take any value between $[0,1]$. The degree of commitment can be considered as the probability to pay the announced taxes. Therefore with some probability λ , households believe that the government will commit to its announcement and apply the announced tax rate. If a household does not pay the taxes (tax evasion) government confiscates his output and expropriate as a punishment. Hence the expected taxes that a household faces can be expressed as below:

$$\mathbb{E}T(i) = [\lambda\tau + (1 - \lambda)] z(i)[K(i)]^\alpha, \quad 0 < \tau < 1, \quad 0 < \lambda < 1 \quad (9)$$

2.1.4.1 Government's Optimal Decision and Tax Administration Costs

We extend the setup in Elgin and Solis-Garcia (2011) by introducing tax administration costs into government's problem. The tax administration costs will be denoted by ACT .

Administrative costs are generally costs that incurred by the tax authority in establishing and operating systems to manage all aspects of taxation. Intuitively these costs are important in economic analysis because in optimal taxation literature, the assumption that is costless individuals and firms to pay their taxes and governments to collect taxes is not a realistic. Therefore we do not ignore these costs during the present tax rates' effect on informal sector.

And these costs depends on a wide range of factors such as including the complexity of the tax, characteristics of the tax base, structure of tax rates, frequency of reform, and organization and efficiency of the tax authority (Shaw et al., 2008). We assume that total administration costs are a positive function of government commitment, the tax rate and the output in the formal sector. ACT depends positively on λ because higher commitment implies higher government effort in order to achieve the announced tax plan. Similarly, higher tax rate is likely to increase the tax evasion behavior therefore in order to avoid tax evasion government has to make a stronger effort. Tax administration costs depend positively on the formal sector output because it constitutes the tax base. Higher tax base implies higher government effort to collect taxes. Since the informal sector is invisible to the government sector the tax base excludes informal sector output. In this case, total administration costs can be represented by the equation (10) as below:

$$ACT = \int_{\theta(v)}^1 [\lambda \tau Y_F(i)] f(i) di \quad Y_F(i) \in [\theta(v), 1] \quad (10)$$

The productivity level above which households choose the formal sector determines the formal sector size. Therefore government's tax revenues will depend on the formal sector size and threshold productivity level. Since tax burden falls only on the formal sector, the net tax revenues will be defined only between the interval of

$[\theta(v), 1]$. In this case, the tax rate which will maximize government's tax revenues net of administration costs will follow from the government's problem given below:

$$\max_{\tau} \int_{\theta(v)}^1 [TR - ACT(i)] f(i) di = \max_{\tau} \int_{\theta(v)}^1 [\tau z(i) [K(i)]^{\alpha} - ACT(i)] f(i) di, \quad (11)$$

Having presented the household and government problems we can proceed to the solution of the model.

2.2 Solving the Model

Initially the solution of the setup is based on the analytical solution of determining the optimal level of capital and finding the level of threshold productivity value. The optimal level of capital results from solving equation (8). The threshold level of productivity results from solving the second stage of equation (7).

Although the model is static it will be convenient to define a timing of events in order to facilitate comprehension. First, households with productivity values for their $\theta(i) \in f$ observe the tax rate τ announced by the government who wishes to charge on formal sector's output. Given the credibility of the announcement (λ), households choose between the formal and the informal sectors. Those with a productivity level below the threshold will choose to operate in the informal sector while households with a productivity level above the threshold will prefer the formal sector. Remember that the threshold productivity value is the one above which expected profits in the formal sector become higher than the profits in the informal sector as implied by equation (7). In the present setup the threshold level of productivity can be interpreted as the household's reaction function. Government observes the threshold productivity, calculates the formal sector size and decides the tax rate by solving equation (11).

Given the definition of tax revenues in equation (9), the expected profits in the formal sector can be expressed as follows:

$$\mathbb{E}\Pi_F(i) = z(i) [K(i)]^\alpha - r[K(i)] - [\lambda\tau + (1 - \lambda)] z(i)[K(i)]^\alpha \quad (12)$$

The capital level that maximizes above equation is given below:

$$K(i) = \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{1}{1-\alpha}} \quad (13)$$

Introducing equation (9) into equation (12) yields:

$$\begin{aligned} \mathbb{E}\Pi_F(i) = z(i) & \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} - r \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{1}{1-\alpha}} \\ & - [\lambda\tau + (1 - \lambda)]z(i) \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} \end{aligned} \quad (14)$$

Note that in the informal sector expected profits are simply equal to the productivity level $z(i)$. This implies that threshold level follows from equating the above equation to $z(i)$.

2.2.1 A Competitive Equilibrium

The competitive equilibrium of the above defined setup is asset of values for the tax rate τ , optimal capital $K(i)$, informal sector's output $Y_I(i)$ and the formal sector's output $Y_F(i)$ for all $i \in [0,1]$.

In equilibrium, the households with a productivity value that is equal or above the threshold productivity value $\theta(v)$ will prefer to stay in the formal sector. Taking administration costs and commitment level as given, a household i with a productivity parameter $\theta(i)$ takes part in the formal sector according to the condition of defined below equation (15):

$$\theta(i) \geq \theta(v) \quad (15)$$

For providing the proof of this condition, consider any household i with productivity parameter $\theta(i)$. The households who prefer to be a part of formal or

informal sector get profit according to their choices. These profit functions of two sectors are already defined in equations (4) and (6). The threshold productivity value is the one that leave households indifferent between operating in the formal or the informal sector. According to this definition, this threshold level can be computed by equating the profits in the two sectors: $\mathbb{E}\Pi_F(i) = \Pi_I(i)$. This condition implies that the expression given in equation (14) should be equal to $z(i)$ in order to find the threshold productivity value.

By inserting optimal capital, $K(i)$ into the expected profits function, $\mathbb{E}\Pi_F(i)$ in formal sector, this condition can be redefined in equation (16).

$$z(i) = z(i) \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} - r \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{1}{1-\alpha}} - [\lambda\tau + (1-\lambda)]z(i) \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} \quad (16)$$

Rearranging equation (16) to solve for $z(i)$ yields equation (17) below where

$$A := \alpha^{\alpha/1-\alpha} - \alpha^{1/1-\alpha}.$$

$$z(i) = A \left[\frac{\lambda(1-\tau)z(i)}{r^\alpha} \right]^{\frac{1}{1-\alpha}} \quad (17)$$

Taking log of equation (17) and rearranging yields the threshold productivity value given in equation (18). This threshold productivity value is also used as a proxy for the size of the informal sector.

$$\theta v(i) = \left(\frac{\alpha-1}{\alpha} \right) \left[\log(1-\tau) + \log A + \log \lambda - \left(\frac{\alpha-1}{\alpha} \right) \log r \right] \quad (18)$$

According to the reduced form of the equation (17) there is a negative relationship between tax rates and the formal sector size. If government increases the tax rates $z(i)$ increases this means the informal sector size increases. An increase in the commitment level will have the opposite effect on the size of the informal sector. On the other hand the interest rate's effect is same as the tax rate effect if there is an

increase in the interest rates, the size of the informal economy will increase because of the higher $z(i)$. We expect this result from the profit function of the formal sector. Because firms make their decision also considering the production costs such as interest rates.

2.2.2 Sub-game Perfect Equilibrium

Insofar the taxes are exogenously given and this provides the positive correlation between the tax rates and the size of the informal sector. Next intention of our setup will be calculating the threshold productivity value depending on the tax rates, commitment level and the tax administration costs, by using the backward solution method. This method implies that government first calculates the threshold level and then chooses a tax rate to maximize its total net tax revenues.

A subgame perfect equilibrium is results from the maximization of net tax revenues by the government in order to choose the optimal tax rate taking into account the optimal response of the household given by the optimal output and the capital level. Combining equation (10) and (11) yields the following maximization problem for the government.

$$\max_{\tau} \int_{\theta(v)}^1 \tau Y_F(i) - \lambda \tau Y_F(i) f(i) di \quad (19)$$

Inserting the production function given in equation (2) into equation (19) remembering that labor supply is normalized to one, allows equation (19) in terms of capital and productivity. Combining this equation with the optimal capital level given in equation (13) helps rewrite equation (19) as follows:

$$\begin{aligned} \max_{\tau} \int_{\theta(v)}^1 & \left[A \tau \left[\frac{\lambda(1-\tau)z(i)}{r^\alpha} \right]^{\frac{1}{1-\alpha}} \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} \right. \\ & \left. - \lambda \tau A \left[\frac{\lambda(1-\tau)z(i)}{r^\alpha} \right]^{\frac{1}{1-\alpha}} \left[\frac{\alpha\lambda(1-\tau)z(i)}{r} \right]^{\frac{\alpha}{1-\alpha}} f(i) \right] di \end{aligned} \quad (20)$$

Equation (20) cannot be solved analytically. Therefore we will use numerical solution method.

2.3 Numerical Analysis

For the numerical evaluation, we will first analyze the firm's reaction when government choice is given as implied by the backward solution method required by the sequential structure of the game. Then we will analyze the optimal choice of the government given the optimal reaction of the firms.

For this, we use a Matlab code which performs 25 repetitions for 1000 households for all simulations and obtains the average values of tax administration costs, tax revenues and the relative size of the informal economy.¹ The value of α is assumed 0.3 and the value of r is assumed 0.06. Furthermore $\theta(i)$ is assumed to have a standard normal distribution.

In a second step in order to assess the effect of tax rate and the commitment rate we repeat the exercise above by varying the values assigned to τ and λ . Specifically, first the tax rate will be allowed to move in the interval $[0, 0.99]$ while λ will be set to 0.3. Then, the tax rate will be fixed while λ will be allowed to move in the interval $[0.3, 1]$. Among all these values of τ and λ , we choose the ones that yield relevant results and represent graphically the corresponding values for ACT, TR and relative size of the informal sector.

2.3.1 Firm's Reaction When Government Choice Is Given

Firms choose to operate in the formal or the informal sector having observed the government decision on taxes. Therefore in what follows we will present firms' reaction for all possible actions of the government. Specifically total tax administration costs, net tax revenues and the relative size of the informal sector will depend on the choice of firms according to various values of the tax.

¹ We use as a basis the Matlab code used in Elgin and Garcia (2011).

2.3.1.1 Total Tax Administration Costs

From Figure 2.1, we observe that, keeping the level of commitment λ constant at 0.3, 0.4 and 0.5; ACT is increasing with the tax rates. ACT is maximized when the tax rates, τ is approximately 0.7. After this point, tax evasion increases so much that formal sector size falls more than the increase in tax rates. With less firms in the formal sector, the number of firms that government has to control is also lower. Hence ACT starts to fall as the tax rate approaches to 1. This result does not depend on the value of government commitment. However higher λ yields a higher value of ACT for a given tax rate since higher government commitment implies higher efforts to control tax evasion. This result is confirmed by Figure 2.2 below.

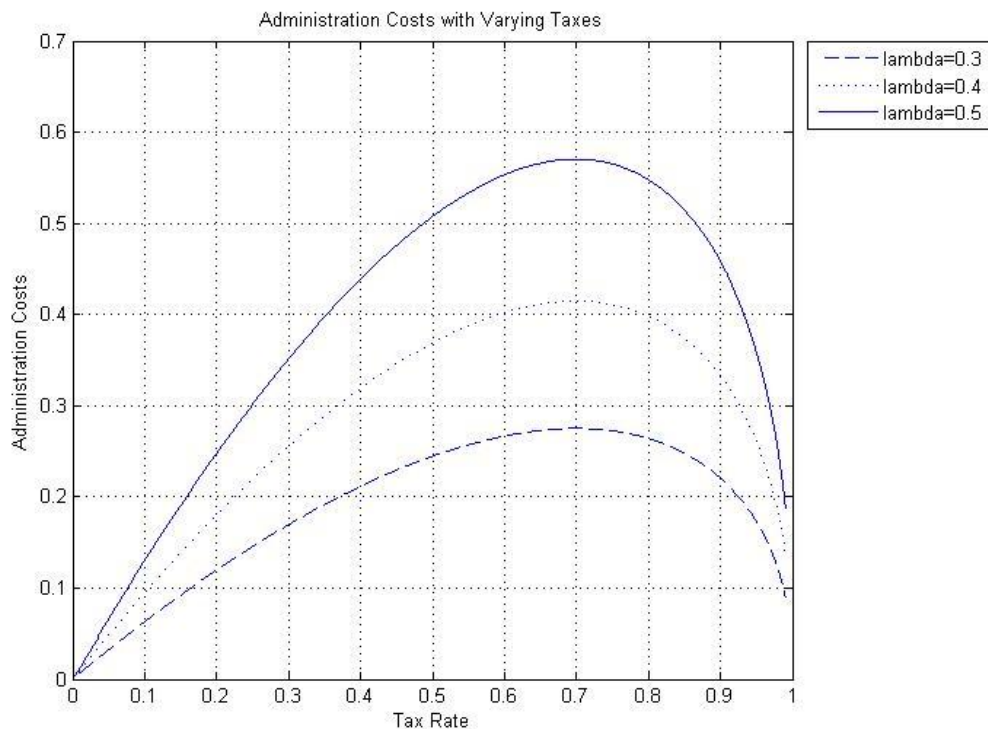


Figure 2.1: Administration Costs with Varying Taxes

Figure 2.2, shows the effect of the commitment level on ACT. In this case, a significant relationship between λ and ACT appears only for higher tax rates especially above the value of $\tau=0.5$. Therefore for specific values of tax rates beginning from 0.6 to 0.8 were chosen as fixed values. The positive and linear relationship is remarked between λ and ACT.

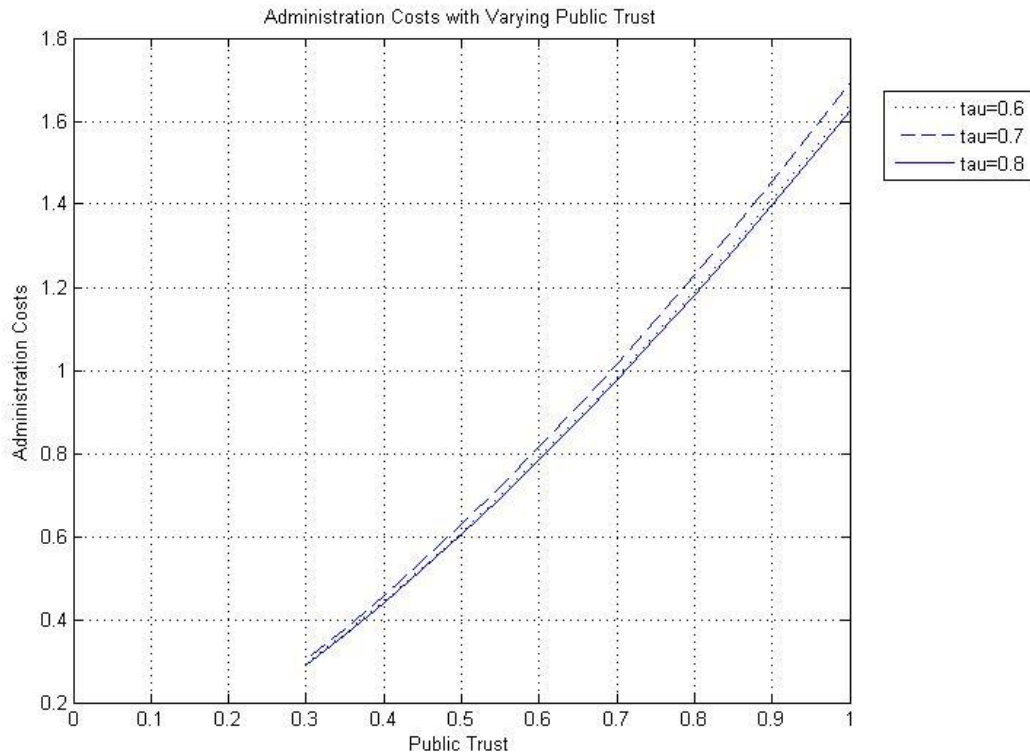


Figure 2.2: Administration Costs with Varying Public Trust

2.3.1.2 Net Tax Revenues

Net tax revenues are given by the difference between the total tax revenues and the total administration costs. The effect of taxes on both total tax revenues and administration costs depend on the value of the tax rate. Therefore the effect of the tax rate on the net tax revenues will also depend on the value of tax rates. Moreover public trust also affects net tax revenues through its effect on administration costs.

It can be seen from Figure 2.3 that net tax revenues are positive for low values of tax rates and high values of government commitment. The reason is that both low values of tax rates and high level of government commitment discourage tax evasion.

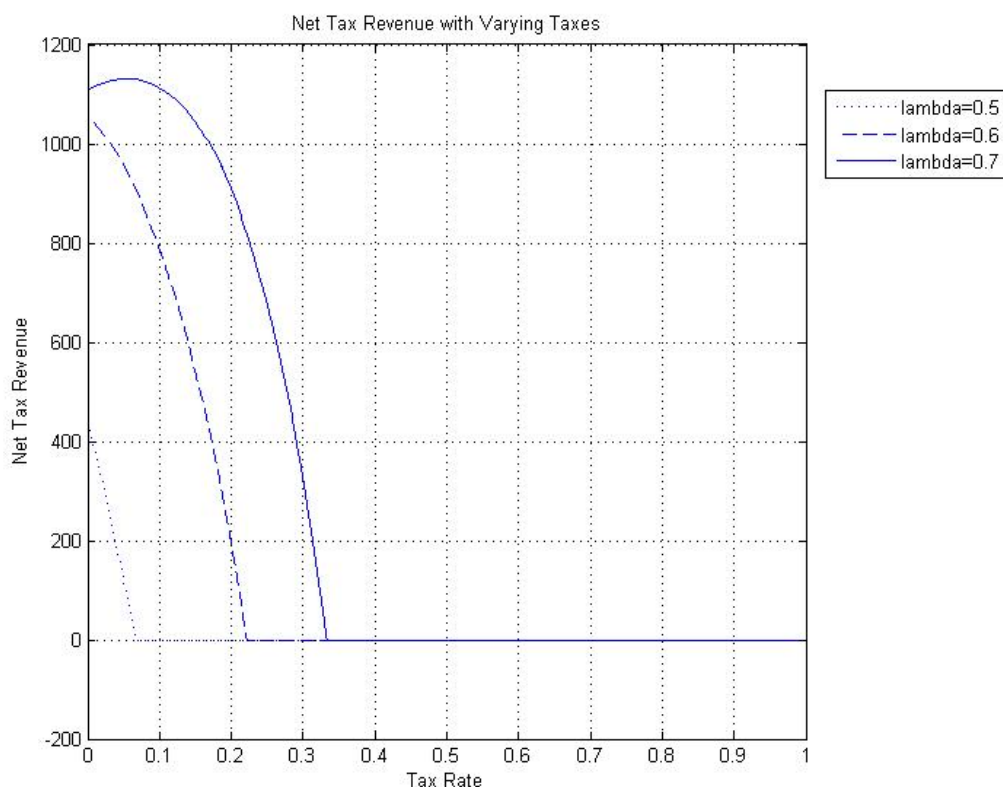


Figure 2.3: Net Tax Revenue with Varying Taxes

From Figure 2.4 shows that when public trust is low or tax rates are high net tax revenues become negative since formal sector size decrease in both cases due to tax evasion. However the negative values of the net tax revenue is close to 0 in all cases.

In Panel A, we observe that, keeping the level of commitment constant at 0.3, tax revenue shows an adverse Laffer effect. The net tax revenue is minimized when the tax rate is approximately at 0.7. For tax rates lower than 0.7 the effect of the tax rate on net tax revenues is dominated by its effect on ACT. Indeed, Figure 2.1 shows that ACT increases with the tax rates until $\tau = 0.7$. Therefore net tax revenues decrease as τ increases while in the second region ACT starts to fall and therefore the effect of tax rate on net tax revenues is dominated by its effect on total tax revenues. Thus in the second region, net tax revenues increase as the tax rates increase.

Public trust has no effect on total tax revenues but it affects net tax revenues through its effect on ACT. As we have seen Figure 2.2 higher public commitment implies higher administration costs. Therefore, as we can see in Panel B, net tax revenues are negative function of public trust.

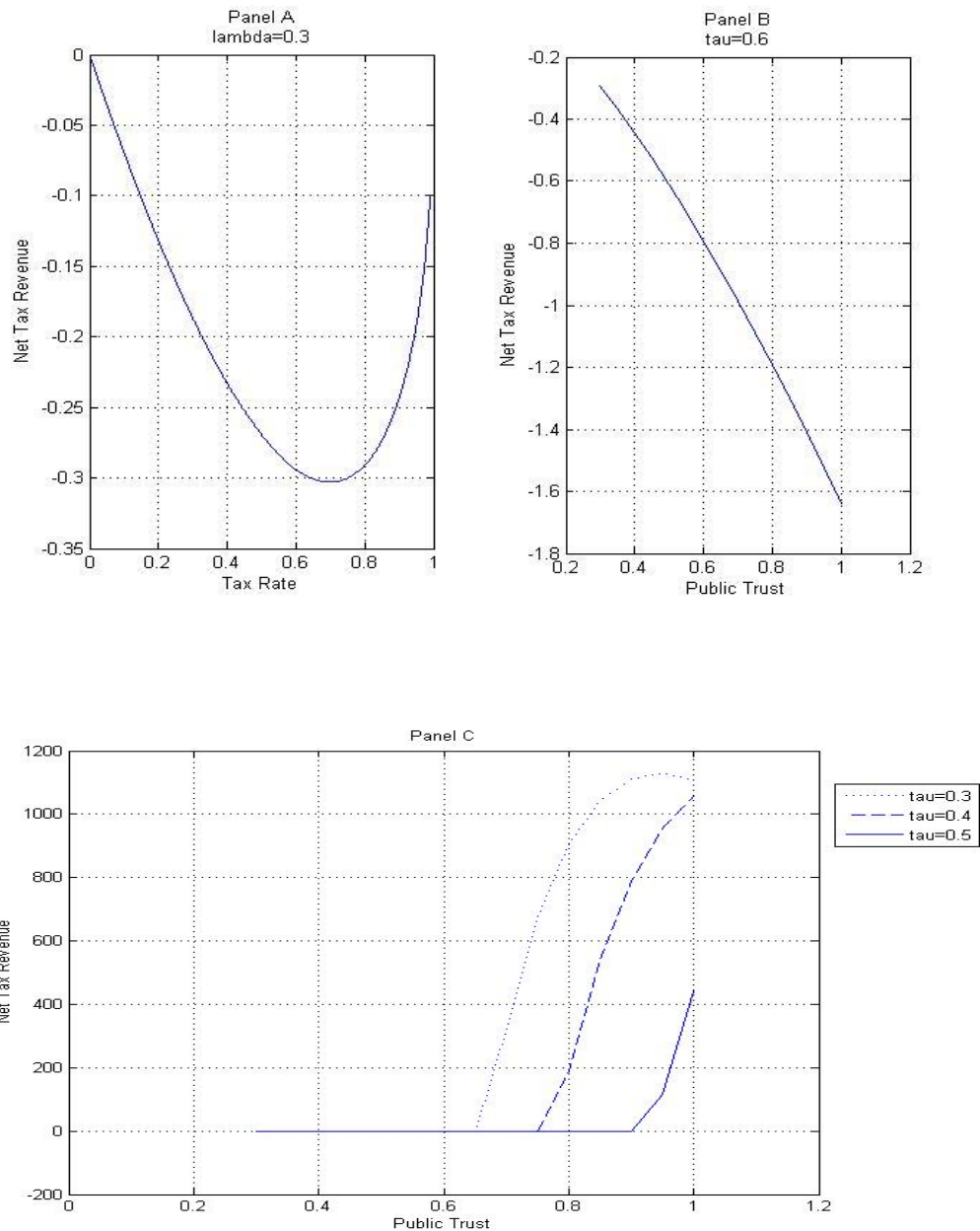


Figure 2.4: Net Tax Revenue with Varying Taxes and Varying Public Trust

Panel C shows that there is a critical value for public trust to generate positive values of the net tax revenue. Specifically net tax revenues become positive for $\lambda > 0.6$. Beyond this critical value any increase in government commitment accompanied by a fall in the tax rate increases the net tax revenues. To summarize, the analysis above suggests that government can use tax rates or public trust as separate tools in order to maximize net tax revenues. Specifically, government can increase the public commitment or decrease the tax rates or use an optimal combination of the two instruments.

2.3.1.3 Relative Size of the Informal Economy

The relative size of the informal sector is given by equation below:

$$RS = \frac{\int_0^{\theta v(i)} Y_I(i) f(i) di}{\int_{\theta v(i)}^1 Y_F(i) f(i) di} \quad Y_F(i) \in [\theta(v), 1], \quad Y_I(i) \in [0, \theta(v)] \quad (21)$$

As can be seen from the equation the relative size depends on the threshold value of the productivity parameter given by equation (18) which depends positively on the tax rate. If the tax rate increases the threshold value increases and the informal sector's size also increases. One should notice that the positive relationship between relative size and the tax rate can be altered depending on the tax choice of the government. The positive relationship mentioned here is a one way reaction of the relative size to any tax rate. However the equilibrium relative size which depends not only on firms' reaction but also on the government's tax choice will imply a negative relation between the relative size and the tax rate as we will analyze in detail later.

Figure 2.5 shows that the relative size starts to increase significantly when $\tau > 0.7$. This result is conform with Figure 2.1 where decline in total administration costs is observed due to the fall in the tax base following the tax evasion (higher informal sector relative size).

This delay problem is again due to the baseline model defining of the productivity parameter. It can be observed that while τ is increasing RS is also increasing and when λ is 0.6 and τ is 0; RS is approximately 0.5.

From Figure 2.5 we observe that as government commitment increases the effect of the tax rate on the relative size falls. This is due to the fact that higher public

trust reduces the threshold productivity as implied by equation (18). When government control increases, the threshold productivity falls for a given value of the tax rate. Since the informal sector size is equal to the number of firms that operate with a productivity level below the threshold, a fall in the threshold productivity implies lower relative size.

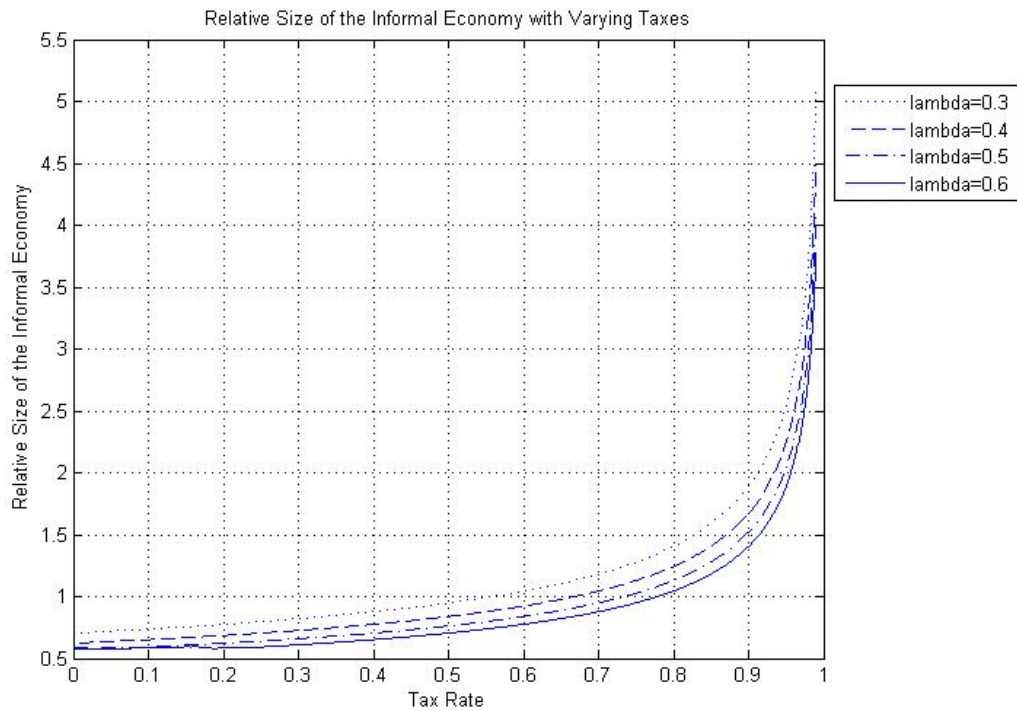


Figure 2.5: Relative Size of the Informal Economy with Varying Taxes

The analysis above shows that a lower relative size results from: a higher lambda, lower tax rate or a combination of both. The negative relationship between relative size and government control can also be seen in Figure 2.6.

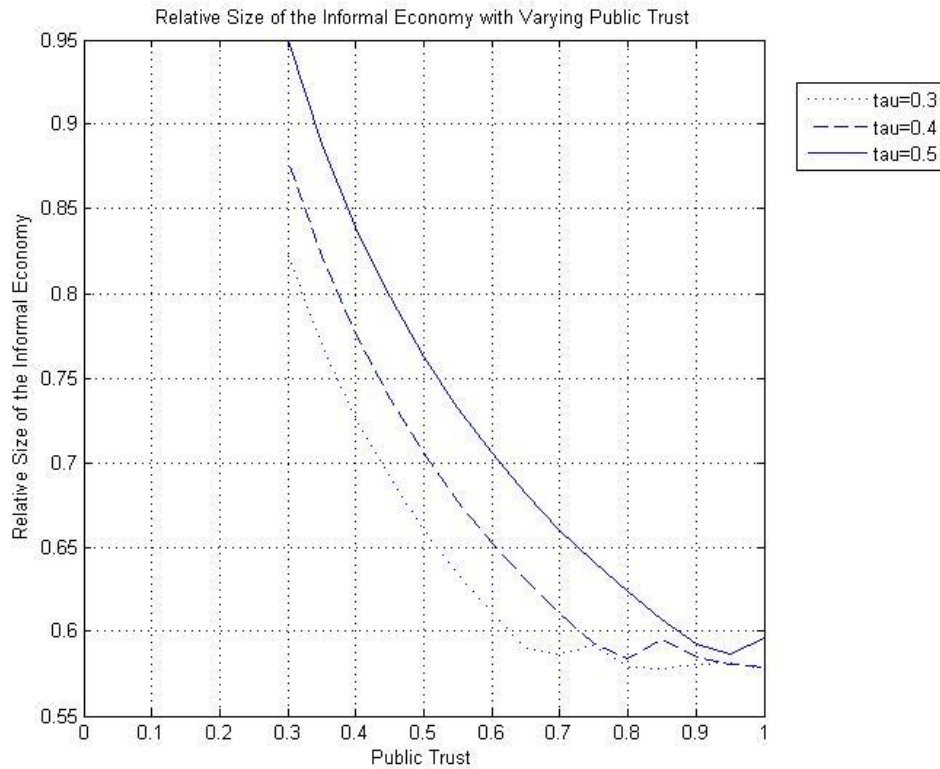


Figure 2.6: Relative Size of the Informal Economy with Varying Public Trust

2.3.2 Optimal Government Choice Given the Firm's Reaction

In this section we analyze the tax choice of the government once firms' reaction is observable. Therefore this section will analyze the optimal tax rate and its relationship with public trust, equilibrium relative size and the equilibrium net tax revenues.

Figure 2.7 gives the government's optimal tax rate which will be imposed on the formal sector in order to maximize net tax revenues. It represents the behavior of the optimal tax rate τ obtained from the government's problem with respect to λ . According to Figure 2.7 the optimal tax rate is zero for low values of government commitment since these low values generate negative tax revenues as was shown on Figure 2.4. After the point 0.5 it can be observed that the higher public trust allows for a government to charge a higher tax rate on the formal sector. As mentioned

earlier higher commitment reduces the relative size and therefore increases the tax base. In this case it is optimal for a government who seeks to maximize its revenue to increase the tax rate since government control already discourages tax evasion. It is known that when λ increases, the government capacity of charging taxes on households also increases. In our numerical analysis, this mentioned positive effect of λ is greater than the negative effect of higher tax rates on the tax base.

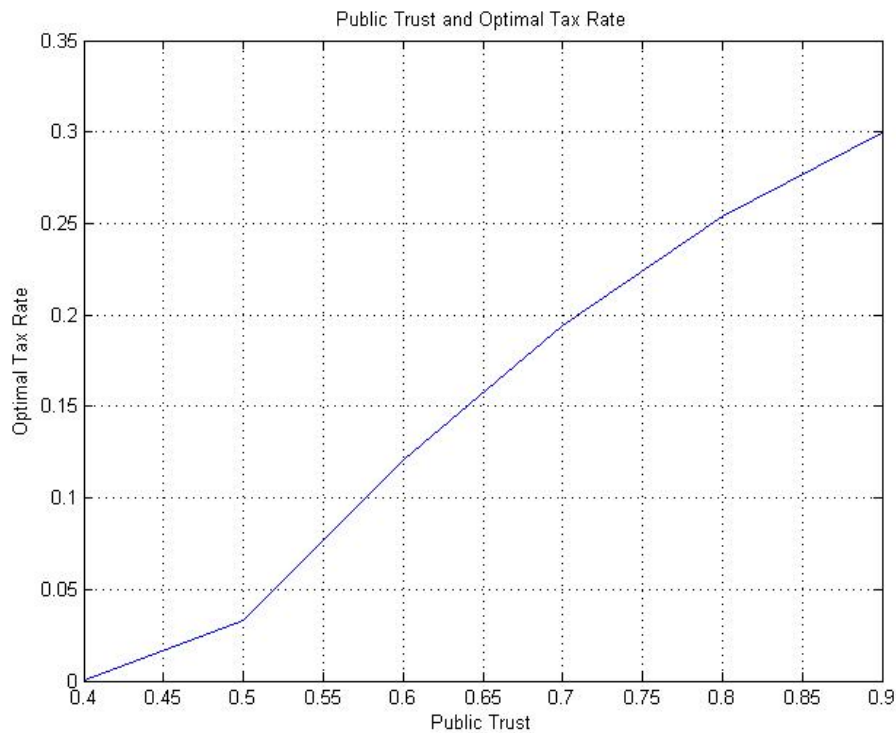


Figure 2.7: Public Trust and the Optimal Tax Rate

As we have seen in Figure 2.7 tax rates that exceed 30% are not optimal for the government. Looking at Figure 2.5 we see that the impact of higher taxes on the relative size is low for values lower than 0.3 for the tax rate. In the interval $\tau \in [0,0.3]$ higher public trust reduces the relative size although an increase in the tax rate increases the relative size. In the considered interval the effect of public trust on the relative size dominates the effect of tax rate. Therefore it is optimal for the government to increase the tax rate in order to increase the net tax revenue without having to fear a fall in the net tax revenues due to a tax evasion (higher relative size).

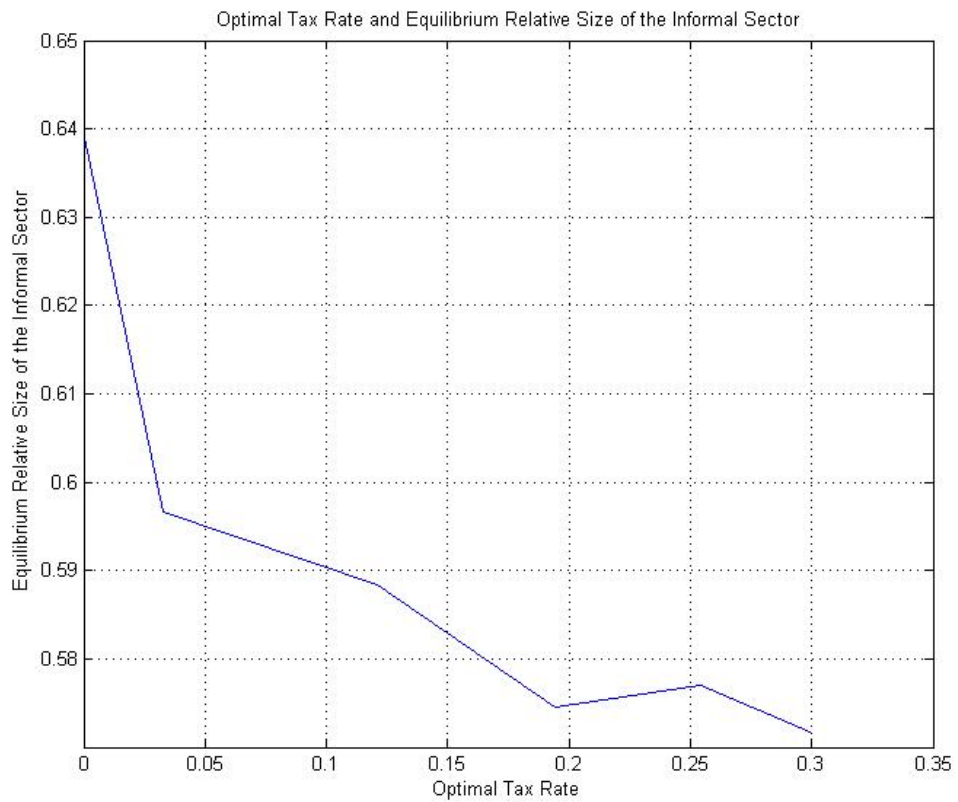


Figure 2.8: Equilibrium Relative Size of the Informal Sector and the Optimal Tax Rate

Figure 2.9 gives the positive relationship between government's optimal tax rate and its net tax revenues. A higher tax rate implies higher tax revenues because the optimal tax rate does not imply an increase in the relative size of the informal sector due to tax evasion. Put differently, since the tax base remains relatively constant any increase in the tax rate increases the net tax revenues. Note that this relationship as well as those given in Figure 2.7 and 2.8 is not valid for implausibly high tax rates such as over 30%.

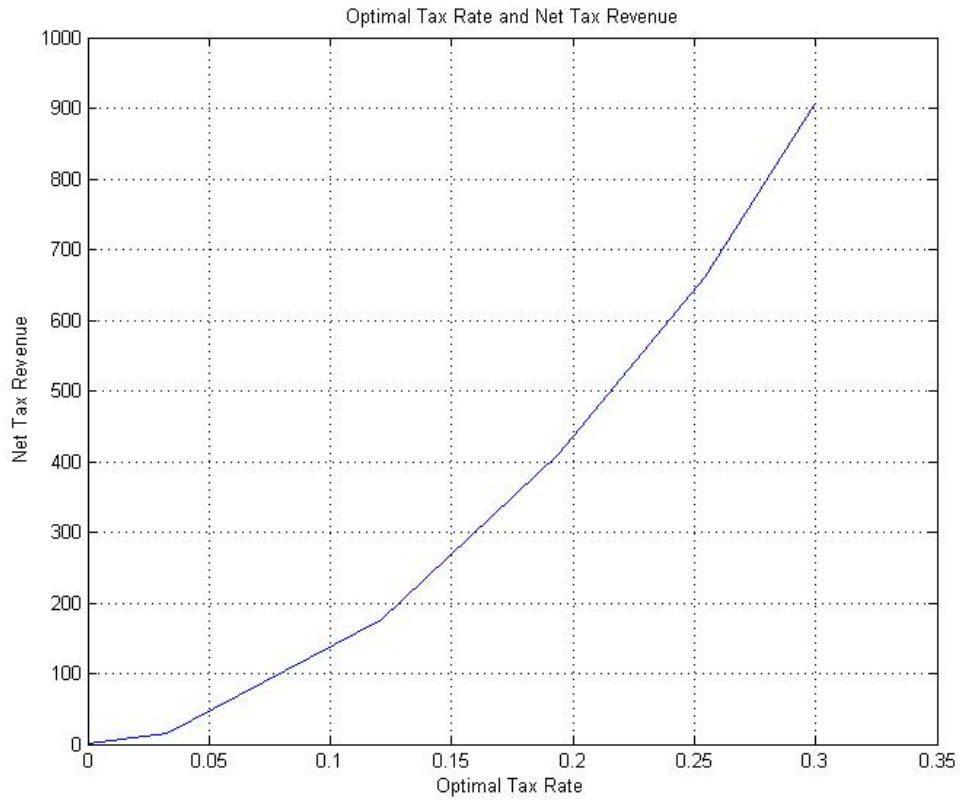


Figure 2.9: Net Tax Revenue and the Optimal Tax Rate

CHAPTER 3 DISCUSSION: EFFICIENCY AND OPTIMALITY OF TAXES

The original framework presented in chapter 3 of the present work encompasses several different streams of research such as the optimal revenue taxation, informal sector evolution and administration costs in taxation. These research themes have common discussion topics. The definition of the design of a tax system given by Alm (1996) summarizes these topics. According to Alm (1996), in public economics, the appropriate design of a tax system is the main issue and such a system is usually viewed as balancing the various desirable attributes of taxation. For instance taxes must be raised (revenue-yield) in a way that treats individuals fairly (equity), that minimizes interference in economic decisions (efficiency), and that does not impose excessive costs on taxpayers or tax administrators. The design given by Alm (1996) implies that tax systems regardless of whether they maximize welfare or tax revenue are likely to induce distortions which may cause efficiency problems. These efficiency problems concern welfare efficiency in the case of welfare maximizing taxes where as revenue maximizing taxes raise production efficiency problems. The present chapter considers the informal sector size and the administration costs as being related to production efficiency.

The remainder of the discussion is organized as follows. Section 1 discusses welfare efficiency against various types of taxes (lump-sum or distortionary) as well as the trade-off between efficiency and equity. Section 2 discusses the effect of taxes on production efficiency along with the interaction between administration costs and taxes.

3.1 Welfare Efficiency

Giertz (2008) defines an optimal tax rate as the one which raises a given amount of revenue with the least distortions to the economy because these distortions

are likely to have welfare costs. Measuring welfare efficiency requires an adequate computation of social welfare.

The literature on optimal taxation addresses the social planner as a utilitarian. Therefore the function of social welfare is defined as depending on the utilities of individuals in the society. This function is in a nonlinear form which captures every individual's utilities. It is expected that this nonlinearity will cause more equal distributions of utility while it is assumed that the social planner should give value only to the average utility. The average utility can be achieved by constituting a social welfare function that is linear in individual utilities (Auerbach and Hines, 2001).

The preferences on consumption and leisure of the individuals in society are accepted as the same while defining the social planner's problem. This assumption makes analysis simple and called as homogeneity assumption. Beside this homogeneity assumption the whole economy is constituted by entirely identical individuals. After defining the objective function, the constraints that social planner faces during the charging tax system are determined. The social welfare is expected to be large when resources are more equally distributed. In addition the labor-leisure choices are affected negatively under the redistributive taxes and transfers. From this point of view finally the main trade-off between efficiency and equity is achieved and this trade-off becomes the important problem of the optimal income tax problem (Mankiw et. al., 2009; Diamond and Saez, 2011).

However certain types of taxes do not affect the optimality of consumption choices and of the labor-leisure trade off. Therefore welfare is not affected by certain types of taxes in contrast other types of taxes enter in the fore mentioned optimality conditions. As a result those optimality conditions no longer hold. In this case the implied welfare losses are called deadweight losses or the excess tax burden (Auerbach and Hines, 2001).

Regardless of whether we consider production or welfare efficiency, the concept of efficiency is concerned with how resources are allocated. When

deadweight losses concerning welfare are equal to zero the outcome is called as the first best allocation. In first best allocations all the conditions for Pareto efficiency are satisfied. As stated by Lipsey and Lancaster (1956-7), any Pareto efficient tax structure is the one such that there is no alternative tax structure which can make some individuals better off without making other individuals worse off. An allocation of resources with this property is described as Pareto-optimal or as Pareto-efficient. The optimal tax structure, given a particular social welfare function, is the Pareto efficient tax structure which maximizes that social welfare function. It should be stated that Pareto efficient allocation is not necessarily equitable. Therefore depending on the initial allocation of resources in an economy, the social planner may face a trade-off between equity and efficiency. This trade-off disappears when taxes are lump-sum under the assumptions of complete markets, perfect information and perfect competition. However, when these assumptions do not hold and taxes are distortionary (as in the case of taxes that are proportional to consumption and labor/production income), the Pareto efficient allocation may not be feasible (Stiglitz, 1981). This trade-off forces the social planner to choose the second best allocation which implies welfare efficiency costs.

Characterizing the second best allocation has been the key topic for the pioneers in optimal taxation literature. For example Ramsey (1927) studies the tax rate that yield the second best allocation when taxes are imposed on consumption by using a simple setup in which only some of the goods can be taxed (in other words all available goods are not taxed in the same way). Given this type of tax structure, Ramsey (1927) finds that taxes should be set in inverse proportion to the consumers' elasticity of demand for a particular good therefore goods with inelastic demand should be taxed more. This result is obtained under several assumptions. First, it is assumed that only linear taxes are allowed, lump sum taxation is prohibited. It should be pointed that if lump sum taxes were allowed, then the first welfare theorem would hold, and the unconstrained optimum would be provided. Additionally all activities of agents are assumed to be observable. Given the set of taxes, government maximizes its objective function according to the agents' actions and this constitutes the condition of competitive equilibrium. This last assumption rules out any information asymmetry between the social planner and the households implying that

the distortionally effect of taxes are known ex-ante by the social planner. However, in reality the informational asymmetries prevent government from observing the distortionally effect when deciding the tax rates. Mirrlees (1971) takes this aspect into account and in his framework the individuals are expected to decide on their labor choices such as its quantity and type then they behave rationally and want to maximize their utility functions which form the social welfare function. This means according to Mirrlees (1971), social welfare function is thought to be a function of utility levels of individuals. These individuals are assumed to have different productivity levels measured by their wages which cannot be observed by the government. The objective of Mirrlees (1971) is to assess how to provide incentives for the agents to reveal higher amount of labor in order to find the optimal efficiency and equity trade-off. It is important to emphasize that the government is accepted to have perfect information about individuals and during the process of the determination the optimal tax it is assumed that there were no costs that government has to carry.

He assumes that an informational friction endogenously limits the set of taxes that apply the optimal allocation. He prefers to use nonlinear taxes including lump-sum taxes. The essential result is that the tax schedule depends on the productivity distribution. Although the income tax is much less effective to fight the inequality, transfers (negative income tax) to the low-skilled while taxing the high-skilled workers seems to be optimal in this framework. However, Mirrlees (1971) reminds that he uses a simple labor-consumption utility function. This implies that other setups with different labor-consumption profile may alter the results.

The model presented in Chapter 2 does not consider welfare efficiency nor equity since it chooses the tax rates so as to maximize tax revenue instead of welfare. Therefore it has no common points with the Ramsey approach. However the heterogeneous productivity profile as well as the sequential structure of the setup implying that government cannot observe the productivity level when setting the tax rate allows us to compare our results to those of Mirrlees (1971). First, as in Mirrlees (1971) in our setup government seeks to choose the tax rates that induces households to operate in the formal sector i.e the tax rates that induces agents to reveal their

income. Second, the tax rate in our setup also depends on the productivity of different households. However in our setup negative income tax is excluded due to the fact that government maximizes tax revenue instead of welfare.

3.2 Production Efficiency

Initially it is appropriate to define the term of production efficiency and shortly this term means making production with optimal combination of inputs under the purpose of producing maximum output with minimum cost. It should be noted that a productively efficient economy may have poor allocative efficiency due to the optimal distribution of resources. In general framework, aggregate production efficiency is desired as one part of achieving a Pareto optimum and if the desired Pareto optimum cannot be achieved, aggregate production efficiency may not be desirable. However Diamond and Mirrlees's (1971) state that production efficiency is desirable despite a full Pareto optimum is not achieved. They support this idea by using optimal commodity taxes to imply the desirability of aggregate production efficiency. According to their analysis the commodity taxes distort the equality of marginal rate of substitution and transformation on top of the optimum condition. In addition they put emphasis on the unnecessary of the income distribution under the regime of absence of lump-sum taxes. In this context their analysis can be evaluated under two different cases: First one is one-consumer case and the second one is many-consumer case. In first case, there is no need to redistribution of income therefore under the increasing returns to scale or fixed expenditures such as defense expenditures and constant returns to scale government has to increase revenue in order to carry the losses. In this situation a Pareto optimum may be achieved by using poll tax or subsidy and it is clear that this is same as maximizing the utility of consumer. In the second case which includes many consumers it is useful to use commodity taxes therefore in economy the second best optimal tax system keeps the production efficiency.

The production efficiency is also affected from the different tax preferences and taxing commodities and factors at different rates provides a distortion and marginal rates of substitution of different factors start to be different across

industries. For instance the corporate income tax or selective employment tax may distort the production efficiency. In addition the exchange inefficiency may occur due to differential tax application of different individuals. Stiglitz and Dasgupta (1971) give progressive income tax and subsidies to housing and food of the poor as an example of such tax groups in their study.

Furthermore the differential tax using may create distortions (Acemoğlu et al., 2008) in the production efficiency such as taxing the intermediate goods cause productive inefficiency by distorting the allocation of factors of production between intermediate and final goods. In order to cope with this inefficiency problem Diamond and Mirrlees (1971) propose to reduce intermediate goods taxation and increase the taxation of consumption or income. In addition Atkinson and Stiglitz (1976) discuss the usage of differential commodity taxes and progressive income tax during the process of creating more redistributive tax system. They indicate that under the specific homogeneity and separability assumptions on preferences, an optimal taxation for government's revenue formation or redistribution is based only on the direct taxation. According to their analysis whether the separability is considered on utility functions of individuals such as goods and leisure, the differential commodity taxes should not be preferred because any information can not be reached about household's ability therefore the income tax may correspond to ability. In this framework in taxation the most important difficulties are related with observing characteristics and they evaluate the screening literature and show that there were administration costs related with even nondistortionary screening systems.

As a result the intuition behind uniform commodity taxation is depended on the undistortionary effect on consumption choices otherwise disincentive effects of taxation is not minimized regardless of the optimal distribution of after tax income across households. Both Diamond and Mirrlees (1971) and Atkinson and Stiglitz (1976) state that the indirect taxation should have a simple structure; the intermediate goods should not be taxed and all final goods should be taxed uniform (Mankiw et al., 2009).

3.2.1 The Effect of Taxes on Production Efficiency through the Informal Sector

The maximizing the tax rates are not equivalent to the production efficiency and also it is known that there is a trade-off between with these two terms. In model presented in Chapter 2, it is also encountered with this trade-off between higher tax rates and the production efficiency and the trade-off is not relevant for the certain tax interval. Being apart from this interval the production efficiency starts to decrease and we can observe this inefficiency in sector base such as more workers want to be the part of the informal sector. It is clear that this trade-off occurrence triggers the tax evasion in economy and by creating misallocations in resource use, the efficiency of the tax system can be affected negatively for instance agents may change their behavior to deceive on their taxes. The tax evasion changes the distribution of income thus it is related with the equity. In government side, the resources may be spent to reduce its size or enforcement costs can be occurred. Furthermore the tax evasion affects the compliance of the taxpayers to tax system and the public services which are received by society. In order to capture the connection between tax rates and the government's tax revenue, tax evasion topic can be evaluate under the analysis of Laffer (1981). Laffer (1981) asserts that tax revenue may affect economy through an income effect, while tax rates operate through a substitution effect. For instance, a change in income tax rates generates a substitution effect by changing the relative rewards to market and nonmarket activity. In literature the curve which is known as "Laffer curve" has been significant role in revenue maximizing taxation issues. It shows the relationship between tax rates and the corresponding levels of government revenue. The concept of taxable income elasticity is represented and taxable income is expected to change according to the changes in the tax rate. The curve states that no tax revenue is increased at the tax rates of zero and one-hundred percent. In addition it must be also at least one point that where tax revenue is on its non-zero maximum (Laffer, 2004).

Following the Figure 3.1 the Laffer curve can be observed². The Laffer curve does not state whether a decrease in tax rates will increase or decrease tax revenues because the factors such as tax system, the time period, the convenience of acting in

² The upward-sloping portion of the curve is called the "normal" range and the downward-sloping segment is the "prohibitive" range.

informal sector, the level of taxes or the legal system may affect the revenue responses to change in tax rates (Laffer, 2004; Malcomson, 1986).

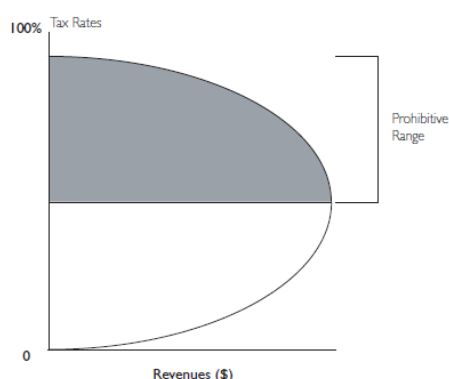


Figure 3.1: The Laffer Curve

Source: Laffer (2004)

Therefore it can be stated that the relationship between tax rates and the tax revenues such as estimated in Laffer curve depends on some other factors like elasticity of supply for labor, technology, public good provision, government expenditures or the administrative costs like already presented and analyzed their effects in Chapter 2. Moreover even in the same economy, the curve can also change over some time due to the taxation structures which are progressive ones, differences in incentive to work or by related policy decisions.

In order to observe the classical and before mentioned trade-off between taxes and the production efficiency Diamond and Mirrlees (1971) prefer to evaluate the government expenditures constant otherwise the consumer utility is expected to be affected from government expenditures. According to Malcomson (1986) government sector has diminishing returns therefore under the single tax regime, raising the average tax rate makes government sector get bigger and government revenue decreases ultimately. This idea supports the downward part of the Laffer curve by the disincentive effects of these higher taxes on labor. He asserts that if changes in prices and wages are taken into account rather than considering a partial equilibrium, the shape of the curve may be change. In this context Malcomson (1986) considers the tax revenues as the product of marginal tax rate and tax base and the technology is an equally important determinant of the slope of the Laffer

curve. For certain technologies, a more negative tax elasticity of labor supply may imply a more positive slope because of general equilibrium effects on wages and profits.

Furthermore the assumption of whether tax revenue is used for providing public goods that is separable in utility and separate from labor supply is questioned by Gahvari (1989). Gahvari states that Laffer curve's negative sloped part depends on the expenditures of the government. The sufficient condition for existence this negative sloped part is related with the usage of these expenditures. If these expenditures are used as cash transfers to individuals rather than used as providing public good than negative slope section of the Laffer curve can subsist.

Finally the study of Laffer (1981) assumes that there are single tax rate and a labor supply however this assumption is used for simplicity in real economy this assumption becomes unrealistic. Fullerton (2008) states that tax revenue may be a multi-valued function of tax rate this means a rise in the tax rate may not correspond in same value of revenue decrease.

In the model presented in Chapter 2, for the certain values of the tax rates which are optimal ones, the trade-off between tax rates and the efficiency is not valid because the informal sector size is not affected by the increase in the tax rates in contrast to many studies in literature which examine the informal activities as a result of higher taxes. For instance Ihrig and Moe (2004) develop a dynamic model to explain the evolution of the informal sector towards steady state and in their analysis the exogenous reductions in tax rates reduce the size of the informal sector. Moreover in Schneider's (1997) study, the informal economy increases due to the higher tax rates and the increasing number of the regulations which may lead to an erosion of the tax base and cause to decrease tax receipts³. According to these two studies informal sector does not pay any taxes and the positive correlation between tax rates and the informal sector size is valid. The important point and problem about all these studies is their incapability of following the recent empirical studies. The

³ See also Rauch (1991), Loayza (1996), Fortin et al. (1997), Ihrig and Moe (2004), Busato and Chiarini (2004), Amaral and Quintin (2006) and Delipalla (2009) in which taxes are taken exogenously and the government is treated as passive.

most of the recent empirical studies do not support this positive relationship between tax rates and the informal sector⁴.

From this point of view we choose a baseline model that which is also added on an administration cost variable to analyze the trade-off between taxes and the informality. The presence of the trade-off depends on both these administration costs and the commitment level of the government. This commitment level can be thought as an institutional factor and in institutional framework it can be stated that the lack of institutional structures in economy can affect the informality and create tax evasion.

For instance Torgler and Schneider (2007) evaluate the governance, institutional quality and tax morale to see their effects on informal sector and they call these variables as societal institutions. They state that these societal institutions have significant effects on informal sector size. The more legitimacy of a government means the lower the size of the informal sector. In addition Loayza (1996) asserts that inefficient government institutions are positively correlated with informal economy. This study also finds positive correlation with tax burden and informal sector size. The legitimacy of the government may also be evaluated with corruption. The more costly bureaucratic system may cause corruption in activities and this corruption factor may be the key factor behind informal sector (De Soto, 1989; Friedman et al., 2000). Indeed in theoretical manner, corruption and the informal sector may be either complements or substitutes. In literature this dual relationship between corruption and the informal economy was evaluated by Dreher and Schneider (2006) and it was indicated that in high income countries the relationship was substitutive and in low-middle income countries it was complement. All these mentioned studies focus on quality of institutions however Aruoba (2010) also focus the degree of tax auditing by the government as an institutional factor while examining the variation in taxes and size of the informal economy. In the study of Aruoba (2010) the purpose of the government is similar to Ramsey's approach which is mainly based on rising revenue by optimizing however the different point

⁴ According to recent empirical studies following Johnson et al. (1997, 1998), Friedman et al. (2000), Torgler and Schneider (2007), Elgin (2011) and Elgin and Garcia (2011) the higher tax rates are associated with the lower informal sector in contrast to the past empirical studies; Frey and Pommerehne (1984), Schneider (1994, 1997), Tanzi (1999) and David and Henrekson (2004).

comes from using inflation as a tool for decrease informal economy rather than just following the revenue motive in model.

As a result all these papers have extended the previous empirical models of the informal economy by showing that tax morale, commitment level and a broad variety of governance/institutional factors matter quite significantly in the determination of the size of the informal economy. In our baseline model, the government can charge taxes on individuals but it collects the receipts depend on level of commitment. This means the public trust is considerable variable in terms of tax evasion occurrence and the growth of the informal sector size. It has been already showed in Chapter 2 that net tax revenues are positive for low values of tax rates and high values of government commitment. This commitment level in our setup represents also the institutional framework of informality analysis beside its effective role in government collecting of its net tax revenues. In our analysis the trade-off between tax rates and size of the informal sector is valid after the tax rate which is equal to 0.7. However this trade-off is affected from the commitment level and higher commitment increases the effect of the tax rate on the relative size falls. As a result a lower relative size can be achieved from: a higher commitment level, lower tax rate or a combination of both. It is known that in optimal taxation framework this commitment level variable implies the tax evasion probability occurrence for certain values and after the level of 0.5, government can charge higher taxes thereby increases its tax base and in our numerical analysis, this mentioned positive effect of public trust is greater than the negative effect of higher tax rates on the tax base. In addition tax rates that exceed 30% are not optimal for the government. It is optimal for government to increase the tax rate in order to increase the net tax revenue without having to fear a fall in the net tax revenues due to a tax evasion (higher relative size) up to the point 0.3.

In our study the higher public trust means lower threshold productivity value. Therefore when government control increases, the threshold productivity falls for a given value of the tax rate. Since we define the informal sector size is equal to the number of firms that operate with a productivity level below the threshold, a fall in the threshold productivity implies the lower relative size. Therefore any factor that

can be effective on productivity value and commitment level may affect the trade-off between tax rates and the size of the informal sector.

In literature the informal economy is also accompanied with the lower productivity in households and firms. Azuma and Grossman (2002) evaluate the informal enterprises as less productive due to the limited access to credit and/or public services. Similarly, the informal sector is often associated with inferior working conditions and low fiscal revenue. In Dessy and Pallage's (2003) study the public infrastructure can be accessed only by the formal agents hence the prevalence of a large, low-productivity, informal sector in developing countries is thought to be related with this lack of accession. In addition in developed nations' side Kuehn (2010) proposes a model by following Lucas's (1978) model which links differences in the size of the informal economy and tax evasion to differences in tax rates and enforcement of tax policy. The different managerial abilities play key role and in model individuals decide to become workers, managers of informal or formal firms. The smaller informal economy is accompanied by larger firms and higher productivity. Moreover Amaral and Quintin (2006) observe that although there is free entry to formal economy the workers in informal sector tend to be less educated and inadequate commitment to financial contracts is accepted as the reason of capital market imperfections. Therefore informal economy can be seen as the result of both these mentioned imperfections and different characteristics of workers across sectors.

3.2.2 The Effect of Taxes on Production Efficiency When Taxation is Costly

In our analysis presented in Chapter 2, it is observed that the costs in taxation has also significant role in order to capture the relation between informality and taxes. In general the optimal taxation framework does not take into account costs during the tax collection or enforcement process and the literature mainly assumes that individuals and firms are taxed at no cost. Indeed this is not relevant for real economic analysis. Indeed there are various costs both imposed on individuals/firms or government which are called compliance and administrative costs.

In Ott's (1998) study these administrative costs are accepted as costs incurred by the tax authority during operating or managing its system related with taxation issues. The gathering or distributing information from taxpayers or organizing various instructions are concerned with administrative parts. The compliance costs are related directly with taxpayers and occurred during conducting their tax assignment. Both of the costs depend on various factors such as complexity of the tax system, the tax base's characteristics, structure of the tax types, tax reforms or efficiency and performance of the tax authority. Tanzi and Pellechio (1995) evaluate main tasks in the administrative process and give some examples as below:

“Registration, organizing and processing tax returns (input of data, processing declarations and payments), coercive collection (closely connected with registration, accounting and return processing), control and supervision (discovering lacking and insufficient tax returns and controls of books and papers in tax administration offices or business activities and books of taxpayers) and legal services and complaints (taking cases to court, defending tax administration in court, explaining procedures which are or are not in accordance with the law)”.

In this context the tax rates are expected to affect administrative and compliance costs. In the study of Shaw, Slemrod and Whiting (2008) initially it is stated that the average costs per pound of revenue collected are likely to fall as the tax rate increases because the cost of complying or inspecting a tax base does not depend on the tax rate except that individuals who are more inclined to avoid or evade taxes at higher rates. Secondly the changes in tax rates may lead to increases in costs for instance if the tax rate is same for both taxes, it is sufficient for government to take into account total sales however if the rates are different then sales should be reported, evaluated and monitored separately therefore the higher amount of costs are expected in this situation. They also focus on the trade-off between both types of costs in their study. To whom the responsibility of calculating the tax liability will belong will be effective role on this trade-off. For governments, providing guidance and help is expected to increase their costs to incur however, decreases the costs to incur of taxpayers.

Although the administration costs of taxation are mainly ignored by tax theory, Heller and Shells (1974) use a standard optimal taxation framework extended to incorporate the other costs of taxation which are mainly different than the distortion costs. In their study gross profits are not so sensitive to profit taxes when marginal costs of administering license fees and subsidies are zero or small or when the administrative sector is small by comparison with the total level of economic activity. It is important to note that the administration costs and transaction costs are not so effective on determination of tax policy before their study. They contribute on the studies of Foley (1970) and Hahn (1971) and extend the theory of optimal taxation to account for costly transactions. The costly transactions involve costs of enforcing tax laws and costs of complying with tax laws as well as costs of information processing and information transmission. In Heller and Shells's (1974) study the administrative feasibility set which was a new concept shows the costs of government tax administration. This feasibility set represents the vector of real resources spent during administration of government tax instruments employed. As a result when transactions are costly, pure production efficiency is optimal only in some conditions. For instance in condition when "production-cum-transaction" feasibility set can be decomposed into separate transaction and production sets, pure production efficiency can be merely optimal.

In this framework it can be stated that the production efficiency is affected negatively when there are costs in taxation. In our study we focus also on administrative dimension of taxation and it is known that administrative dimension have effects on efficiency and informal/formal sector.

Mayshar (1991) also focuses on costs to the taxpayer and to the government from collecting taxes and these costs also affect the conditions that shape the optimal use of the tax. The optimal amount of resources spent by governments in tax enforcement activities are represented by using reduced-form functions and assuming a positive relation between these resources and either the cost borne by individuals to escape from being detected or the maximal tax collection.

Moreover Polinsky and Shavell (1982) indicate in general when a Pigouvian tax is preferred to control an externality-generating activity, administrative costs are occurred. They evaluate the cost of monitoring the externality-generating activity, the time spent completing forms, and the expense of resolving disputes over tax liability. In addition some administrative costs associated with the processing of forms, depend on the number of firms taxed but not on the tax revenue collected; these will be referred to as 'fixed' per firm. The other administrative costs, such as the expense of resolving disputes, may depend on the amount of tax collected (e.g. legal expenditures may rise with the size of the dispute); these are called as 'variable' per firm. Indeed their paper analysis how the optimal Pigouvian tax should be charged to reflect administrative costs when these costs are fixed or variable and when they are provided by the government or the taxed firms. As a result it is found that when the administrative costs are variable and provided by the government, the optimal tax may be above or below the external cost. Finally Wilson (1989) examines the optimal number of commodities to be taxed and where there is some cost to government from the expansion of the optimal commodity tax base then he indicates that the optimal size of the tax base balances the extra administrative costs from taxing more commodities with the efficiency (and revenue-yield) gains from the base expansion.

As a result it can be stated that although there is less systematic analysis on the costs to the government of collecting taxes or the "administrative costs" of taxation the budgetary information and reports show that indeed the costs of collecting taxes are available and in the works of Vaillancourt (1989) and Sandford (1995) these kind of costs such as cost of collecting individual income, business income, and sales taxes are generally in excess of one percent of the revenues from these taxes and sometimes may also be higher.

CONCLUSION

The present work mainly proposes an optimal taxation model for making analyze between tax rates and informal sector size under the tax administration costs. The study is consisted of three main chapters. Chapter 1 gives a brief explanation on informal sector and tax administration in Turkey. Chapter 2 is suitable for obtaining results concerned with the relationship between taxes and the informal sector size based on an optimal taxation model under the tax administration costs. Chapter 3 comprises a discussion about efficiency and optimality of taxes around the existing literature. Under this scheme the all results will be evaluated.

In Chapter 1, we aim to evaluate the informal economy, taxation and tax administration in Turkey by discussing and using several related reports, data bases and action plans of the government. It is observed that lower GDP per capita is associated with higher informal sector and the unequal income distribution also related with informality because the unequal income distribution may limit to achieve technology, the possibilities related with education or obtaining various licenses to stay in formal sector. Moreover it is observed that inflation and the share of the informal sector are not closely related. This means although the high inflation distorts the tax system, this does not affect the behavior of tax evasion. In sectoral differences part, it is observed that the workers in agriculture sector are mainly the part of the informal sector and for that reason any policy that may affect this sector will be related also with informal economy. We also focus on administration side of the government and we think that lack of the government inspection on taxpayers such as lack of number of audits and administration systems such as related with computerized technology or systems have effects on formal or informal sectors. In this context the action plan which was conducted between 2011 and 2013 was discussed and it was realized that the transformation on tax administration in Turkey can also be analyzed with the help of the model presented in Chapter 2.

Elgin and Garcia (2011) contribute to the recent literature by supporting the recent empirical findings by its theoretical foundations which depends mainly on the differences between commitment levels of the governments. On the other hand our setup improves their theoretical framework by redefining the government's problem with a new variable which takes into account the effects of tax administration costs. In the first stage any household decides the level of capital that maximizes the expected profit if he chooses to operate in the formal sector. In the second stage the household decides the productivity level which equates the expected profits in both sectors in order to decide in which sector to work. The government seeks to maximize its tax revenues and a tax plan for charging households is announced by the government and a percentage of their output is collected as a tax.

Initially the solution of the setup is based on the analytical solution of determining the optimal level of capital and finding the level of threshold productivity value. First, households with productivity values for their, observe the tax rate announced by the government who wishes to charge on formal sector's output. Given the credibility of the announcement, households choose between the formal and the informal sectors. Those with a productivity level below the threshold will choose to operate in the informal sector while households with a productivity level above the threshold will prefer the formal sector. Then government observes the threshold productivity, calculates the formal sector size and decides the tax rate by solving equation. The threshold productivity value is the one that leave households indifferent between operating in the formal or the informal sector. According to this definition, this threshold level can be computed by equating the profits in the two sectors. Our last purpose in model solution is calculating the threshold productivity value depending on the tax rates, commitment level and the tax administration costs, by using the backward solution method. This method implies that government first calculates the threshold level and then chooses a tax rate to maximize its total net tax revenues. A sub-game perfect equilibrium is results from the maximization of net tax revenues by the government in order to choose the optimal tax rate taking into account the optimal response of the household given by the optimal output and the capital level. For the numerical evaluation, we first

analyze the firm's reaction when government choice is given as implied by the backward solution method required by the sequential structure of the game. Then we analyze the optimal choice of the government given the optimal reaction of the firms.

In government's problem we prefer to use numerical analysis and we use Matlab codes which perform twenty-five repetitions for thousand households for all simulations and obtains the average values of tax administration costs, tax revenues and the relative size of the informal economy. Administration cost is maximized when the tax rate is approximately 0.7. After this point, tax evasion increases so much that formal sector size falls more than the increase in tax rates. With less firms in the formal sector, the number of firms that government has to control is also lower. Hence administration costs starts to fall as the tax rate approaches to 1. This result does not depend on the value of government commitment. However higher commitment yields a higher value of administration costs for a given tax rate since higher government commitment implies higher efforts to control tax evasion. Moreover the significant relationship between commitment and administration costs appears only for higher tax rates. The positive and linear relationship is remarked between commitment and administration costs. Net tax revenues are given by the difference between the total tax revenues and the total administration costs. The effect of taxes on both total tax revenues and administration costs depend on the value of the tax rate. Therefore the effect of the tax rate on the net tax revenues will also depend on the value of tax rates. Moreover public trust also affects net tax revenues through its effect on administration costs. The net tax revenues are positive for low values of tax rates and high values of government commitment. The reason is that both low values of tax rates and high level of government commitment discourage tax evasion. When public trust is low or tax rates are high net tax revenues become negative since formal sector size decrease in both cases due to tax evasion. The government can use tax rates or public trust as separate tools in order to maximize net tax revenues. Specifically, government can increase the public commitment or decrease the tax rates or use an optimal combination of the two instruments. One should notice that the positive relationship between relative size and the tax rate can be altered depending on the tax choice of the government. The positive relationship mentioned here is a one way reaction of the relative size to any tax rate. However the equilibrium relative size which depends not only on firms'

reaction but also on the government's tax choice will imply a negative relation between the relative size and the tax rate. When government control increases, the threshold productivity falls for a given value of the tax rate. Since the informal sector size is equal to the number of firms that operate with a productivity level below the threshold, a fall in the threshold productivity implies lower relative size. The analysis above shows that a lower relative size results from: a higher λ , lower tax rate or a combination of both. In addition the government's optimal tax rate represents the behavior of the optimal tax rate obtained from the government's problem. The optimal tax rate is zero for low values of government commitment since these low values generate negative tax revenues. The higher public trust allows for a government to charge a higher tax rate on the formal sector. In our numerical analysis, this mentioned positive effect of commitment is greater than the negative effect of higher tax rates on the tax base

As a result tax rates that exceed 30% are not optimal for the government. Up to this point the higher public trust reduces the relative size although an increase in the tax rate increases the relative size. In the considered interval the effect of public trust on the relative size dominates the effect of tax rate. Therefore it is optimal for the government to increase the tax rate in order to increase the net tax revenue without having to fear a fall in the net tax revenues due to a tax evasion. Moreover there is a positive relationship between government's optimal tax rate and its net tax revenues. A higher tax rate implies higher tax revenues because the optimal tax rate does not imply an increase in the relative size of the informal sector due to tax evasion. Put differently, since the tax base remains relatively constant any increase in the tax rate increases the net tax revenues. Note that this relationship is not valid for implausibly high tax rates such as over 30%.

Finally Chapter 3 discusses the efficiency and optimality of taxes under the existing literature and welfare and production efficiency are evaluated respectively. Initially the tax effect on efficiency is examined through informal sector then the same tax effect on efficiency is discussed under the presence of costs especially the administration costs. This part of the study provides the qualitative discussion to the model presented in Chapter 2 and will deepen the insight about the theory and policy applications for further related studies.

REFERENCES

BOOKS

De Soto, H., "**The Other Path: The Invisible Revolution in the Third World**", "Harper&Row", 1989.

Hart, K., "**Informal Economy**", The New Palgrave Dictionary of Economics. Second Edition. Eds. Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan, 2008.

Kaldor, N., "**Indian Tax Reform: Report of a Survey**", "Ministry of Finance", 1956, Department of Economic Affairs

Sandford, C., "**Tax Compliance Costs: Measurement and Policy**", ed., Fiscal Publications, 1995.

Şengül, S., "**Bir Hurafe Kayıt Dışı Ekonomi**", İmaj Yayınevi, 1997, Ankara

Shaw, J., Slemrod, J., Whiting, J., "**Administration and Compliance**", "Oxford University Press, The Institute for Fiscal Studies", 2008.

Simon, C.P., Witte, A.D., "**Beating the System: The Underground Economy**", "Auburn House, Boston", 1982.

ARTICLES

Acemoğlu, D., Golosov, M., Tsyvinski., "Political Economy of Intermediate Good Taxation", "**Journal of European Economic Association**", April-May, 2008, pp.353-366.

Alm, J., "What's an Optimal Tax System?" "**National Tax Journal**", March, 1996, Vol.49, No.1, pp.117-33.

Amaral, P.S., Quintin, E., "A Competitive Model of the Informal Sector", "**Journal of Monetary Economics**", 53/2006, pp.1541.1553

Aruoba, S.B., "Informal Sector, Government Policy and Institutions", "**Meeting Papers Society for Economic Dynamics**", 2010, No.324

Atkinson, A.B., Stiglitz, J.E., "The Design of Tax Structure: The Direct Versus Indirect Taxation", **Journal of Public Economics**, 6(1976), pp.55-75.

Auerbach, A.J., Hines, J.R., "Taxation and Economic Efficiency", "**NBER Working Paper Series**", 2001, No.8181

Azuma, Y., Grossman, H.I., "A Theory of the Informal Sector", "**NBER Working Paper Series**", 2002, No.8823

Busato, F. and Chiarini, B., "Market and Underground Activities in a Two-Sector Dynamic Equilibrium Model", "**Economic Theory**", 2004, No.23, pp.831-861.

Georgiou, C.M., "Measuring the Size of the Informal Economy: A Critical Review", "**Central Bank of Cyprus Working Paper Series 2001-1**".

Davis, S.J., Henrekson, M., "Tax Effects on Work Activity, Industry Mix and Shadow Economy Size: Evidence From Rich-Country Comparisons", "**NBER Working Paper**", 2004, No.10509

Delipalla, S., "Commodity Tax Structure and Informal Activity", "**Bulletin of Economic Research**", 2009, Vol.61, Issue 3, pp. 283-294.

Diamond, P.A., Mirrlees, J.A., "Optimal Taxation and Public Production I: Production Efficiency", "**The American Economic Review**", 1971, Vol.61, Issue 1, pp.8-27.

Diamond, P., Saez, E., "The Case for a Progressive Tax: From Basic Research to Policy Recommendations", "**Journal of Economic Perspectives**", 2011, Vol.25, No.4, pp.165-190.

Cagan, P., "The Demand for Currency Relative to the Total Money Supply", "**Journal of Political Economy**", 1958, 66, pp.303-328.

Chen, M.A., "Rethinking the Informal Economy; Linkages with the Formal Economy and the Formal Regulatory Environment", "**DESA WP.N.46**", 2007.

Dessy, S., Pallage, S., "Taxes, Inequality and the Size of the Informal Sector", "**Journal of Development Economics**", 2003, V.70(1), pp.225-233.

Dreher, A., Schneider, F., "Corruption and the Shadow Economy: An Empirical Analysis", "**CREMA Working Paper Series**", 2006.

Elgin, C., "Vergiler ve Kayıtdışı Ekonomi: Bir Değerlendirme ve Türkiye Örneği", "**Working Papers 2011/05, Bogazici University Department of Economics**".

Elgin, C., "Political Turnover, Taxes and the Shadow Economy", "**Working Papers 2010/08, Bogazici University Department of Economics**".

Elgin, C., Garcia, M.S., "Public Trust, Taxes and the Informal Sector", "**Bogazici Journal of Economic and Administrative Sciences**", 2012, Vol 26(1), pp.27-44.

Elgin, C., Öztunalı, O., “Shadow Economics Around the World: Model Based Estimates”, “**Working Papers 2012/05**”, **Bogazici University Department of Economics, 2012**”.

Elgin, C., Schneider, F., “Shadow Economies in OECD Countries: DGE vs. MIMIC Approaches”, “**Bogazici University, Department of Economics Working Papers**”, 2013, No.13

Feige, E.L., Cebula, R., “America’s Underground Economy: Measuring the Size, Growth and Determinants of Income Tax Evasion in the U.S”, 2011, “**MPRA Paper 29672**”.

Frey, B.S., Pommerehne, W.W., “The Hidden Economy: State and Prospect for Measurement”, “**Review of Income and Wealth**”, 1984, 30, pp.1-23.

Friedman, E., Johnson, S., Kaufmann, D., Zoido-Lobaton, P., “Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries”, “**Journal of Public Economics**”, 2000, No.76(3), pp.459-493.

Foley, D.K., “Economic Equilibrium of with Costly Marketing”, “**Journal of Economic Theory**”, 1970, pp.276-291

Fortin, B., Marceau, N., Savard, L., “Taxation, Wage Controls and the Informal Sector”, “**Journal of Public Economics**”, 1997, No.66, pp.293-317.

Gahvari, F., “The National Government Expenditures and the Shape of the Laffer Curve”, “**Journal of Public Economics**”, 1989, V.40, pp.251-260.

Giertz, S.H., “How Does the Elasticity of Taxable Income Affect Economic Efficiency and Tax Revenues and What Implications Does This Have for Tax Policy Moving Forward?”, “**American Enterprise Institute’s Conference on Tax Policy Lessons from the 2000s**”, 2008.

Hahn, F.H., “Equilibrium with Transaction Costs”, “**Econometrica**”, 1971, No.39, pp.417-440

Heller, W.P., Shell, K., “An Optimal Taxation with Costly Administration”, “**American Economic Association**”, 1974.

Ihrig, J., Moe, K. S., “Lurking in the Shadows: The Informal Sector and Government Policy”, “**Journal of Development Economics**”, 2004, Vol.73(2), pp.541-557.

Isachsen, A.J., Strøm, S., “The Hidden Economy: The Labor Market and Tax Evasion”, “**Scandinavian Journal of Economics**”, 1980, 82, pp. 304-311.

Johnson, S., Kaufman, D., Shleifer, A., “The Unofficial Economy in Transition”, “**Brookings Papers on Economic Activity**”, 1997, pp.159-221.

Johnson, S., Kaufman, D., Zoido-Lobaton, P., “Regulatory Discretion and the Unofficial Economy”, “**The American Economic Review**”, 1998, No.88, pp.387-392.

Kuehn, Z., "Tax Rates, Governance, and the Informal Economy in High-Income Countries", "**Instituto Madrileno de Estudios Avanzados (IMDEA) Ciencias Sociales Working Papers**", 2010.

Laffer, A.B., "Government Exactions and Revenue Deficiencies", "**Cato Journal**", 1981, No.1

Laffer, A.B., "The Laffer Curve: Past Present and Future", "**The Heritage Foundation**", 2004, No.1765.

Lipsey, R.G., Lancaster, K., "The General Theory of Second Best", "**The Review of Economic Studies**", 1956-57, Vol.24, No.1, pp.11-32.

Loayza, N. V., "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America", "**Carnegie-Rochester Conference Series on Public Policy**", 1996, 45, pp.129-162.

Lucas, R.E., "On the Size Distribution of Business Firms," 1978, "**The Bell Journal of Economics**", 9 (2), 508-523.

Lyssioutou, P., Pashardes, P., Stengos., T., "Estimates of the Black Economy Based on Consumer Demand Approaches", "**Economic Journal**", 2004, Vol 114, pp.622-640,

Malcomson, J.M., "Some Analytics of the Laffer Curve", "**Journal of Public Economics**", 1986, 29, pp.263.279.

Mankiw, N.G., Weinzierl, M., Yagan, D., "Optimal Taxation in Theory and Practice", "**NBER Working Paper Series**", 2009, No.15071.

Mayshar, J., "Taxation with Costly Administration", "**Scand. Journal of Economics**", 1991, 93(1), pp.75-88.

Mirrlees, J.A., "An Exploration in the Theory of Optimum Income Taxation", "**The Review of Economic Studies**", 1971, Vol38, No.2, pp.175-208

Mishra, A., Ray, R., "Informality, Corruption and Inequality", "**Bath Economic Research Papers**", 13/10, 2010, Bath, U.K. Department of Economics, University of Bath.

Ott, K., "Tax Administration Reform in Transition: The Case of Croatia", "**Occasional Paper, Institute of Public Finance**", 1998, No.5

Polinsky, A.M., Shavell, S., "Pigouvian Taxation with Administrative Costs", "**Journal of Public Economics**", 1982, pp.385-394

Ramsey, F.P., "A Contribution to the Theory of Taxation", "**The Economic Journal**", 1927, Vol.37, No.145, pp.47-61.

Rauch, J.E., "Modeling the Informal Sector Formally", "**Journal of Development Economics**", 1991, 35, pp.33-48.

Savita and Cautam, L. "Income Tax Planning: A Study of Tax Saving Instruments", **"International Journal of Management and Social Research"**, 2013, Vol2, No5.

Schneider, F., "Measuring the Size and Development of the Shadow Economy: Can the Causes be Found and the Obstacles be Overcome?", **"In Hermann Brandstaetter and Werner Goth, eds. Essays on Economic Psychology"**, Berlin:1994 Springer, pp. 193-212.

Schneider, F., "The Shadow Economies of Western Europe", **"Economic Affairs"**, 1997, 17:3, pp.42-48.

Schneider, F., Buehn, A., Montenegro, C.E., "Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007", **"World Bank Policy Research Working Paper Series"**, 2010, 5356.

Schneider, F., "The Size of the Shadow Economies of 145 Countries all over the World: First Results over the Period 1999 to 2003", **"IZA Discussion Paper Series"**, 2004, No.1431.

Schneider, F., Buehn, A., "Shadow Economies in Highly Developed OECD Countries: What are the Driving Forces?", **"Discussion Paper"**, Department of Economics, University of Linz, 2013.

Schneider, F., "The Shadow Economy and Work in the Shadow: What do we (not) know?", 2012, **"IZA DP No:6423"**.

Shaw, J., Slemrod, J., Whiting, J., "Administration&Compliance", 2008, **"The Institute for Fiscal Studies, Oxford University Press"**.

Singh, A., Jain-Chandra, S., Mohommad, A., "Inclusive Growth, Institutions, and the Underground Economy", **"IMF Working Paper"**, 2012, No.47.

Stiglitz, J.E., "Self-Selection and Pareto Efficient Taxation", **"NBER Working Paper Series"**, 1981, No.632.

Stiglitz, J.E., Dasgupta, P., "Differential Taxation, Public Goods, and Economic Efficiency", **"Review of Economic Studies"**, 1971, Vol.38(114), pp.151.74

Tanzi, V., "Uses and Abuses of Estimates of the Underground Economy", **"Economic Journal"**, 1999, 109: pp.338-347.

Tanzi, V., "The Underground Economy in the United States: Estimates and Implications", **"Banca Nazionale del Lavoro Quarterly Review"**, 1980, 135, pp.427-453.

Tanzi, V., Pellechio, J., "The Reform of Tax Administration", 1995, **"International Monetary Fund"**, Fiscal Affairs Department

Thomas, J., "Quantifying the Black Economy: 'Measurement without Theory' Yet Again", **"Economic Journal"**, 1999, Vol.109, pp.381-389.

Torgler, B., Schneider, F. “Shadow Economy, Tax Morale, Governance and Institutional Quality: A Panel Analysis”, “**IZA Discussion Papers**”, 2007, 2563.

Vaillancourt, F., “The Administrative and Compliance Costs of the Personal Income Tax and Payroll Tax System in Canada” “**Canadian Tax Paper 86**”, 1989, Canadian Tax Foundation.

OTHER SOURCES

İkiz, A., “Kayıt Dışı Ekonomi ve Türkiye’de Kayıt Dışı Ekonomik Büyüme Üzerine Etkileri, the unpublished phd thesis, Dokuz Eylül University Social Graduate School of Sciences, 2000.

OECD, “Employment Outlook”, 2012, “Ch.2: Declaring Work or Staying Underground: Informal Employment in Seven OECD Countries”.

Sarıca, A.O., “Kayıt Dışı İstihdam ve Mücadele Yöntemleri”, 2006, “Planlama Uzmanlığı Tezi”, DPT

TÜSİAD. “Dolaylı ve Dolaysız Vergilerin Türk Mali Sistemi İçerisindeki Yeri: Siyasal, Sosyal ve Ekonomik Sonuçları”, 2012/10/532.

INTERNET SOURCES

Action Plan of Strategy for Fight Against the Informal Economy, (2008-2010), <http://www.vmhk.org.tr/wp-content/uploads/2011/08/ACTION-PLAN-OF-STRATEGY-FOR-FIGHT-AGAINST-THE-INFORMAL-ECONOMY-2008-2010.pdf>

Action Plan of Strategy for Fight Against the Informal Economy, (2011-2013), http://www.gib.gov.tr/fileadmin/beyannamerehberi/Kayit_disi_2009.pdf

For Figure 1.6, http://www.nationmaster.com/graph/eco_inf_eco-economy-informal

Annual Reports of Revenue Administration, <http://www.gib.gov.tr/index.php?id=107>

For Figure 1.2, <http://www.kayitliekonomiyegecis.gov.tr/>

Winkelried, D., “Income Distribution and the Size of the Informal Sector”, 2005, core.kmi.open.ac.uk/.../pdf/9309386.pdf

APPENDICES

APPENDIX A

Derivation of equation (17)

We define the equation (A1) as below:

$$B = \left[\frac{\alpha\lambda(1-\tau)}{r} \right] \quad (\text{A1})$$

Then we insert equation (A1) into equation (16)

$$z(i)[Bz(i)]^{\alpha/1-\alpha} - r[Bz(i)]^{1/1-\alpha} - [\lambda\tau + (1-\lambda)]z(i)[Bz(i)]^{\alpha/1-\alpha} = z(i) \quad (\text{A2})$$

The required arrangement is conducted on equation (A2) to obtain $z(i)$. Initially we use bracket as follows:

$$z(i)^{1/1-\alpha} \left[B^{\alpha/1-\alpha} - rB^{1/1-\alpha} - [\lambda\tau + (1-\lambda)]B^{\alpha/1-\alpha} \right] = z(i) \quad (\text{A3})$$

Then we put all $z(i)$ s on the right-hand side of the equation

$$B^{\alpha/1-\alpha}\lambda(1-\tau) - rB^{1/1-\alpha} = z(i)^{-\alpha/1-\alpha} \quad (\text{A4})$$

Finally equation (A5) is found.

$$\lambda(1-\tau) \left[\frac{\alpha\lambda(1-\tau)}{r} \right]^{\alpha/1-\alpha} - r \left[\frac{\alpha\lambda(1-\tau)}{r} \right]^{1/1-\alpha} = z(i)^{-\alpha/1-\alpha} \quad (\text{A5})$$

Note that that we have already defined A and equation (17) which are expressed respectively as below:

$$A := \alpha^{\alpha/1-\alpha} - \alpha^{1/1-\alpha}.$$

$$z(i) = A \left[\frac{\lambda(1-\tau)z(i)}{r^\alpha} \right]^{\frac{1}{1-\alpha}} \quad (17)$$

After the appropriate arranging on equation (A5), the reduced form is expressed on equation (A6):

$$z(i) = \frac{r}{\lambda(1-\tau)^{1/\alpha} A^{1-\alpha/\alpha}} \quad (A6)$$

Finally we insert equation (A6) into equation (17) which can be seen on equation (A7).

$$z(i) = A \left\{ \frac{\lambda(1-\tau)}{r^\alpha} \left(\frac{r}{\lambda(1-\tau)^{1/\alpha} A^{1-\alpha/\alpha}} \right) \right\}^{1/1-\alpha} \quad (A7)$$

After applying required arrangements, the last form of the equation can be achieved as below:

$$z(i) = \frac{r}{A^{\frac{1-\alpha}{\alpha}} \lambda(1-\tau)^{1/\alpha}} \quad (A8)$$

CIRRICULUM VITAE

Ayça AYDIN

Address: Cumhuriyet Mah. Izzetpasa Sok. 39/2 Bomonti-Sisli/Istanbul, Turkey

E-mail: aycaaydin88@gmail.com

EDUCATION

GALATASARAY UNIVERSITY, Istanbul, 2011-2013

Graduate School of Social Sciences, M.A. in Economics (CGPA: 3.29/4.0)

- **Thesis title:** Optimal Taxation and the Informal Sector with Administration Costs

ANADOLU UNIVERSITY, Eskisehir, 2006-2010

Faculty of Economic and Administrative Sciences, B.S. in Economics (CGPA: 3.61/4.0)

- Ranked second among 2010 graduates in Program in Economics (English)

EMPLOYMENT

GALATASARAY UNIVERSITY, Istanbul

Graduate School of Social Sciences

Department of Economics

Research Assistant, January 2012-

NAMIK KEMAL UNIVERSITY, Tekirdag

Faculty of Economic and Administrative Sciences

Department of Economics

Research Assistant, January 2011- January 2012

RESEARCH INTERESTS

Informal Economy, Optimal Taxation, International Macroeconomics

ADDITIONAL INFORMATION


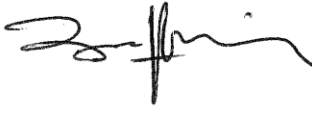
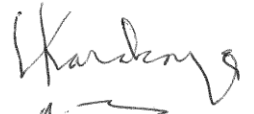


Languages : English (Fluent), Italian (Basic)

Computer Literacy : Matlab, R, E-views, MS Office Programs

TEZ ONAY SAYFASI

Üniversite : Galatasaray Üniversitesi
Enstitü : Sosyal Bilimler Enstitüsü
Adı Soyadı : Ayça AYDIN
Tez Başlığı : Optimal Taxation And The Informal Sector With The Administration
Costs
Savunma Tarihi : 07.03.2014
Danışmanı : Doç. Dr. İrem ZEYNELOĞLU ve Doç. Dr. Burak GÜRBÜZ

JÜRİ ÜYELERİ

Ünvanı, Adı, Soyadı	İmza
Doç. Dr. İrem ZEYNELOĞLU	
Doç. Dr. Burak GÜRBÜZ	
Prof. Dr. Sahir KARAKAYA	
Yrd. Doç. Dr. Mustafa ULUS	
Yrd. Doç. Dr. Engin SORHUN	


Enstitü Müdürü

Prof. Dr. Sibel YAMAK