SERVING TWO MASTERS: THE ROLE FOR TAX PRACTITIONERS

by

Suzanne M. Paquette

A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Accounting

Waterloo, Ontario, Canada, 1994

ISBN 0-315-94774-8

Name Suzanne Marie Paquette

Dissertation Abstracts International is arranged by broad, general subject categories. Please select the one subject which most nearly describes the content of your dissertation. Enter the corresponding four-digit code in the spaces provided.

Business Administration; Accounting — SUBJECT TERM

0272 — SUBJECT CODE

U·M·I

Subject Categories

THE HUMANITIES AND SOCIAL SCIENCES

COMMUNICATIONS AND THE ARTS
Architecture 0729
Art History 0377
Cinema 0900
Dance 0378
Fine Arts 0357
Information Science 0723
Journalism 0391
Library Science 0399
Mass Communications 0708
Music 0413
Speech Communication 0459
Theater 0465

EDUCATION
General 0515
Administration 0514
Adult and Continuing 0516
Agricultural 0517
Art 0273
Bilingual and Multicultural 0282
Business 0688
Community College 0275
Curriculum and Instruction 0727
Early Childhood 0518
Elementary 0524
Finance 0277
Guidance and Counseling 0519
Health 0680
Higher 0745
History of 0520
Home Economics 0278
Industrial 0521
Language and Literature 0279
Mathematics 0280
Music 0522
Philosophy of 0998
Physical 0523
Psychology 0525
Reading 0535
Religious 0527
Sciences 0714
Secondary 0533
Social Sciences 0534
Sociology of 0340
Special 0529
Teacher Training 0530
Technology 0710
Tests and Measurements 0288
Vocational 0747

LANGUAGE, LITERATURE AND LINGUISTICS
Language
- General 0679
- Ancient 0289
- Linguistics 0290
- Modern 0291

Literature
- General 0401
- Classical 0294
- Comparative 0295
- Medieval 0297
- Modern 0298
- African 0316
- American 0591
- Asian 0305
- Canadian (English) 0352
- Canadian (French) 0355
- English 0593
- Germanic 0311
- Latin American 0312
- Middle Eastern 0315
- Romance 0313
- Slavic and East European 0314

PHILOSOPHY, RELIGION AND THEOLOGY
Philosophy 0422
Religion
- General 0318
- Biblical Studies 0321
- Clergy 0319
- History of 0320
- Philosophy of 0322

Theology 0469

SOCIAL SCIENCES
American Studies 0323
Anthropology
- Archaeology 0324
- Cultural 0326
- Physical 0327

Business Administration
- General 0310
- Accounting 0272
- Banking 0770
- Management 0454
- Marketing 0338

Canadian Studies 0385
Economics
- General 0501
- Agricultural 0503
- Commerce-Business 0505
- Finance 0508
- History 0509
- Labor 0510
- Theory 0511

Folklore 0358
Geography 0366
Gerontology 0351
History
- General 0578
- Ancient 0579
- Medieval 0581
- Modern 0582
- Black 0328
- African 0331
- Asia, Australia and Oceania 0332
- Canadian 0334
- European 0335
- Latin American 0336
- Middle Eastern 0333
- United States 0337

History of Science 0585
Law 0398
Political Science
- General 0615
- International Law and Relations 0616
- Public Administration 0617

Recreation 0814
Social Work 0452
Sociology
- General 0626
- Criminology and Penology 0627
- Demography 0938
- Ethnic and Racial Studies 0631
- Individual and Family Studies 0628
- Industrial and Labor Relations 0629
- Public and Social Welfare 0630
- Social Structure and Development 0700
- Theory and Methods 0344

Transportation 0709
Urban and Regional Planning 0999
Women's Studies 0453

THE SCIENCES AND ENGINEERING

BIOLOGICAL SCIENCES
Agriculture
- General 0473
- Agronomy 0285
- Animal Culture and Nutrition 0475
- Animal Pathology 0476
- Food Science and Technology 0359
- Forestry and Wildlife 0478
- Plant Culture 0479
- Plant Pathology 0480
- Plant Physiology 0817
- Range Management 0777
- Wood Technology 0746

Biology
- General 0306
- Anatomy 0287
- Biostatistics 0308
- Botany 0309
- Cell 0379
- Ecology 0329
- Entomology 0353
- Genetics 0369
- Limnology 0793
- Microbiology 0410
- Molecular 0307
- Neuroscience 0317
- Oceanography 0416
- Physiology 0433
- Radiation 0821
- Veterinary Science 0778
- Zoology 0472

Biophysics
- General 0786
- Medical 0760

EARTH SCIENCES
Biogeochemistry 0425
Geochemistry 0996
Geodesy 0370
Geology 0372
Geophysics 0373
Hydrology 0388
Mineralogy 0411
Paleobotany 0345
Paleoecology 0426
Paleontology 0418
Paleozoology 0985
Palynology 0427
Physical Geography 0368
Physical Oceanography 0415

HEALTH AND ENVIRONMENTAL SCIENCES
Environmental Sciences 0768
Health Sciences
- General 0566
- Audiology 0300
- Chemotherapy 0992
- Dentistry 0567
- Education 0350
- Hospital Management 0769
- Human Development 0758
- Immunology 0982
- Medicine and Surgery 0564
- Mental Health 0347
- Nursing 0569
- Nutrition 0570
- Obstetrics and Gynecology 0380
- Occupational Health and Therapy 0354
- Ophthalmology 0381
- Pathology 0571
- Pharmacology 0419
- Pharmacy 0572
- Physical Therapy 0382
- Public Health 0573
- Radiology 0574
- Recreation 0575
- Speech Pathology 0460
- Toxicology 0383

Home Economics 0386

PHYSICAL SCIENCES
Pure Sciences

Chemistry
- General 0485
- Agricultural 0749
- Analytical 0486
- Biochemistry 0487
- Inorganic 0488
- Nuclear 0738
- Organic 0490
- Pharmaceutical 0491
- Physical 0494
- Polymer 0495
- Radiation 0754

Mathematics 0405
Physics
- General 0605
- Acoustics 0986
- Astronomy and Astrophysics 0606
- Atmospheric Science 0608
- Atomic 0748
- Electronics and Electricity 0607
- Elementary Particles and High Energy 0798
- Fluid and Plasma 0759
- Molecular 0609
- Nuclear 0610
- Optics 0752
- Radiation 0756
- Solid State 0611

Statistics 0463

Applied Sciences

Applied Mechanics 0346
Computer Science 0984
Engineering
- General 0537
- Aerospace 0538
- Agricultural 0539
- Automotive 0540
- Biomedical 0541
- Chemical 0542
- Civil 0543
- Electronics and Electrical 0544
- Heat and Thermodynamics 0348
- Hydraulic 0545
- Industrial 0546
- Marine 0547
- Materials Science 0794
- Mechanical 0548
- Metallurgy 0743
- Mining 0551
- Nuclear 0552
- Packaging 0549
- Petroleum 0765
- Sanitary and Municipal 0554
- System Science 0790

Geotechnology 0428
Operations Research 0796
Plastics Technology 0795
Textile Technology 0994

PSYCHOLOGY
General 0621
Behavioral 0384
Clinical 0622
Developmental 0620
Experimental 0623
Industrial 0624
Personality 0625
Physiological 0989
Psychobiology 0349
Psychometrics 0632
Social 0451

I hereby declare that I am the sole author of this thesis.

I authorize the University of Waterloo to lend this thesis to other institutions or individuals for the purpose of scholarly research.

I further authorize the University of Waterloo to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

The University of Waterloo requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

ABSTRACT

SERVING TWO MASTERS: THE ROLE FOR TAX PRACTITIONERS

This thesis explores the extent to which tax practitioners can be involved in eliciting more truthful reporting from taxpayers. The proposed tax agency strategy consists of establishing standards and specifying practitioners' responsibilities concerning their investigation of taxpayers' financial affairs. The enforcement mechanism is operationalized by having the tax agency strategically choose a new policy variable, the required *level* of practitioner investigation. A game-theoretic model is used to study the effects of this policy on taxpayers' hiring, communication, and reporting decisions, and on the tax agency's expected tax revenue.

A major characteristic of the model is that taxpayers' compliance strategies involve a trade-off between their desire to engage in tax evasion and minimization. This thesis distinguishes between these two activities and the differential costs associated with them, and captures taxpayers' incentives to hire practitioners. Practitioners can help taxpayers minimize by resolving their uncertainty about their tax rate. However, practitioners reduce taxpayers' incentives to evade by investigating the level of income communicated to them. An important feature is the modelling of the information asymmetry between the taxpayer and the practitioner. Despite the possibility that evasion may be discovered, taxpayers may still consult the practitioner, due to the offsetting gains from minimization and potential

savings of the expected tax agency audit costs.

The analysis demonstrates that the tax agency can, under most circumstances, affect the equilibrium proportion of taxpayers who hire practitioners as well as those who lie about their level of income. The tax agency, therefore, chooses the optimal levels of evasion and minimization that determine its expected revenue.

In equilibrium, the level of evasion need not be zero. Eliminating evasion may not be desirable because the required level of practitioner investigation will affect the level of minimization. Also, the expected taxes, penalties, and interest charges collected from evaders must be greater than the expected cost of auditing taxpayers. Therefore, the tax agency must trade off the levels of evasion and minimization. The model thus implies that there exists an optimal shifting of the burden of tax enforcement to the private sector.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. William R. Scott for his guidance and unfailing support throughout the dissertation process. As well, I am indebted to Dr. Lutz-Alexander Busch, Dr. Jennifer Kao, and Dr. Stan Laiken, my dissertation committee members, and Dr. Alan Macnaughton, who gave generously of their time when asked for comments and suggestions. I also thank Dr. Paul Beck whose suggestions were well appreciated.

A special note of gratitude is extended to my fellow Ph.D. students Paul André, Glenn Feltham, Robert Mathieu, Amin Mawani, and Ping Zhang, who provided invaluable assistance, both tangible and intangible. Sincere thanks are also due to my family, to whom this work is dedicated.

Finally, the financial support of the Ontario Institute of Chartered Accountants, the Social Sciences and Humanities Research Council of Canada, the University of Waterloo, and the Université Laval was greatly appreciated.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Opening Remarks

One of the tax agency's[1] stated primary objectives is to "encourage and achieve the highest possible degree of voluntary compliance in accordance with the tax laws and regulations" (American Bar Association Commission on Taxpayer Compliance [1987]). However, a significant amount of taxable economic activity in Canada and in the United States, among other countries, remains untaxed.[2] This problem has been attributed, in part, to "taxpayer error or to unfamiliarity with tax laws, but to some extent payment of tax is knowingly evaded" (Canada, Auditor General's Office [1990, 555]). Although it is difficult to measure the extent of evasion, studies indicate that the underground economy seems to constitute from 2 to 10 percent of the GNP in most Western-style industrialized economies (Cowell [1990, 24]). In Canada, the most recent estimate reported by Statistics Canada is that the estimated size of the Canadian underground economy is approximately $18.5 billion or 2.7 percent of gross domestic product (Reuter News Service-Canada [1994]). In the U.S., the IRS Commissioner has estimated that the 1992 tax gap, the difference between taxes owed as assessed by the IRS auditors and tax receipts based on

---

[1]The term "tax agency" is used to refer to the administrative and enforcement body: for example, Revenue Canada, Taxation (hereafter RCT) in Canada, and the Internal Revenue Service (hereafter IRS) in the U.S.

[2]This thesis focuses mainly on the Canadian and U.S. tax systems. The author does not attempt to specifically model the tax structure of a particular jurisdiction; however, the general model presented may encompass some of the features of the tax system of a specific country, in particular, Canada.

voluntary reporting, was $119 billion[3] (Hershey Jr. [1993, B3]). Different concept definitions and methods are adopted in computing estimates about taxpayer noncompliance. The magnitude of these estimates may be over- or understated because of measurement problems but, nevertheless, they provide evidence that the study of tax compliance and enforcement is an important area of research since even the modest estimates are not trivial in their implications for the taxing authorities.[4]

The extent to which tax practitioners affect taxpayer compliance is an issue of interest to both researchers and taxing authorities. Researchers have only recently concentrated on analyzing the role of tax practitioners in the compliance and enforcement process, including the various services that they provide, the factors which affect taxpayers' demand for their services, and the impact that practitioners may have on taxpayer compliance. Although studies have demonstrated that practitioners play an important role, results from these studies (empirical and theoretical) indicate that they have an ambiguous effect on compliance and on tax agency revenues (e.g., Klepper, Mazur, and Nagin [1991], Klepper and Nagin [1989], Reinganum and Wilde [1991], and Erard [1993]).

The main purpose of this thesis is to develop and analyze a tax agency strategy which focuses on the potential contribution of practitioners in fostering compliance. This proposed strategy is described further below.

1.2 Defining Taxpayer Compliance

A fundamental issue in tax compliance research is the meaning of the term

---

[3]Note that, according to the article, this amount does not include income from illegal activities such as drug dealing.

[4]For recent studies in Canada on tax evasion and the underground economy, see "Survey of Canadian Attitudes Towards Taxation" (KPMG [1994]) and "Report on the Underground Economy in Ontario, 1993-94" (Ontario, Legislative Assembly [1994]).

compliance. The NAS panel[5] (Roth et al. [1989, 2]) adopted the following definition which will be utilized in this thesis:[6]

> Compliance with reporting requirements means that the taxpayer files all required tax returns at the proper time and that the returns accurately report tax liability in accordance with the Internal Revenue Code, regulations, and court decisions applicable at the time the return is filed.

There are two major implications of interest to this definition: first, noncompliance constitutes over- and underreporting of income, both of which may be deliberate (conscious acts of intentional noncompliance with tax laws) or may be due to misinformation, misunderstanding, negligence, or some other cause (unintentional acts of noncompliance). Second, noncompliance excludes taxpayers' attempts to structure their financial affairs within the law to reduce taxes, even in ways that were not intended by the tax legislators. Furthermore, *ambiguous* reports are viewed as compliant reports; that is, any interpretation of the law that is asserted by taxpayers with a legal basis is compliant behaviour, even if the tax authorities disagree with this position (Roth et al. [1989, 22]).

Following from the above definition, two types of activities, tax evasion and tax minimization are distinguished. *Tax evasion* refers to conscious acts of intentional noncompliance with tax laws or the illegal reduction of tax; taxpayers knowingly report a tax liability that is less than the amount payable under the law with an attempt to deceive. *Tax minimization* refers to taxpayers' attempts to legally reduce, defer, or eliminate their tax liability[7] within the framework of the law; however, due to complexities or ambiguities in the tax requirements, taxpayers face uncertainties with

---

[5]In response to an IRS request, the National Academy of Science (NAS) established the Panel on Taxpayer Compliance Research in 1984 to study tax compliance. Its findings and recommendations are frequently referred to as the NAS panel findings or the "Panel Report".

[6]RCT adopts a similar definition of compliance (Revenue Canada, Taxation [1989, 27]).

[7]For ease of exposition, the term "tax liability" is used to refer to the aggregate of the tax liability and other costs (e.g., cost of being audited; among others).

respect to the interpretation and application of the existing tax laws to their particular situation.[8] These uncertainties may lead to unintentional noncompliance due to a taxpayer's *incorrect assessment of his or her tax liability induced by the uncertainty in interpreting or applying the tax laws.*

This thesis examines taxpayers' incentives to engage in one or both types of activities, tax evasion and tax minimization. As noted by Slemrod [1989, 176], the introduction of uncertainty into the models is problematic "...because its effect is to blur the distinction between evasion and avoidance [or minimization]", thereby making the distinction between intentional and unintentional misreporting ambiguous. This thesis distinguishes between these two types of activities by explicitly modelling the joint evasion/minimization decision and the differential penalties imposed by the tax agency when intentional or unintentional misreporting occurs.[9] The approach used assumes that taxpayers know their true level of income and, thus, any misreporting of the level of income is treated as intentional noncompliance, i.e., an attempt to evade. However, taxpayers are uncertain about the category to which their income belongs; therefore, any misreporting of the type of income (tax rate) is treated as unintentional noncompliance, i.e., an unsuccessful attempt at tax minimization. This approach captures the trade-offs faced by both the tax agency and the taxpayers in their choice of strategy.

---

[8]Although the term *tax avoidance* is normally utilized to refer to the legal practice of tax reduction, this thesis utilizes the term *tax minimization* and distinguishes between the two terms as follows: both tax avoidance and tax minimization refer to taxpayers' structuring of their financial affairs to reduce, defer, or eliminate their tax liability by taking advantage of various provisions of the income tax laws (e.g., interest deductions or depreciation allowances; among others). The academic literature normally assumes that tax avoidance schemes are risk-free; that is, taxpayers are assumed to know the tax laws with certainty (Alm [1988b]). However, in this thesis, taxpayers are uncertain about the existing tax laws and may unintentionally misreport. The term tax minimization is adopted to recognize the presence of uncertainty and the possibility of misreporting.

[9]Klepper and Nagin [1989] and Klepper et al. [1991] also make a distinction between intentional and unintentional misreporting, however, as will be discussed in the literature review (Chapter 2), practitioners perform a different role.

1.3 The Nature of Taxpayer Noncompliance

Non-compliance can be attributed to a number of factors, including: (1) failure to file a tax return; (2) failure to declare on the tax return earned income, which may include non-money income such as benefits and services, income from self-employed individuals and corporations or income from sources that are difficult to trace (e.g., moonlighting, cash transactions, and illegal activities); and (3) the reduction of taxable income arising from the incorrect reporting of tax deductions, exclusions, or credits.[10]

A number of empirical studies have attempted to measure the extent of noncompliance.[11] Among these is a 1983 IRS study (Roth et al. [1989][12]) which provided estimates of the income tax gap for certain years between 1973-1981, segregating the measure into various components. The 1981 income tax gap was estimated at $90.5 billion of which approximately 10% or $9 billion could be attributed to the illegal sector (illegal drugs, illegal gambling, and prostitution), 7% involved corporate returns, 58% involved unreported income from legal activities, and 14% could be attributed to overstated personal and business expenses. Non filers accounted for approximately 3% of the total income tax gap. Although these estimates are subject to various measurement problems they provide interesting insights about the sources of noncompliance.

1.4 The Role of Practitioners

Tax practitioners perform an important role as providers of tax advice and pure services. Tax advice includes advice pertaining to the sanctionability of acts, where the advice may or may not be definitive (advice on how to reduce or eliminate uncertainty in the determination of the correct tax liability), advice which enables taxpayers to lower the probability or magnitude of sanctions, and advice concerning the probability or

---

[10]See RCT, "Final Report of the Committee on the Restructuring of Compliance Programs", [1989, 30] and Boidman [1983].

[11]For a listing, see Cowell [1990, 22-23].

[12]Originally published estimates were taken from IRS [1983, Table I-1, P.3].

magnitude of sanctions, or *risk advice*.[13] The pure service aspects encompass primarily return preparation services and client representation during an audit or an appeals process.

Tax practitioners prepare a significant portion of all individual tax returns (e.g., approximately 50 percent of all individual federal tax returns are prepared by practitioners in the U.S. (U.S. IRS [1992]). As such, they affect a much larger proportion of returns than tax agency examiners (auditors). Furthermore, they are "more easily monitored by [tax agencies] than taxpayers since they are a smaller group" and are "more vulnerable to punitive actions by the IRS [taxing authority] or by professional organizations" (Roth et al. [1989, 35]). The tax agency may therefore utilize its authority to enforce regulations which increase the duties and responsibilities of practitioners to the tax agency.

This thesis develops and analyzes a tax agency strategy (policy) which focuses on an expanded role for practitioners in the compliance and enforcement process. A policy whereby the taxing authority imposes an *increased* level of responsibility on practitioners for eliciting more truthful reporting (and for detecting non-truthful reporting) from those taxpayers who seek their advice is analyzed. Although the professional codes (for accountants and lawyers), the Internal Revenue Code (hereafter referred to as the IRC), and the Canadian Income Tax Act (hereafter referred to as the CITA) currently impose a duty to advise clients against illegal or fraudulent actions and prohibit tax advisors from wilfully deceiving the IRS or RCT about the true financial position of their clients, tax advisors do not currently have a duty to verify the financial information provided to them by taxpayers, nor do they necessarily ensure that all income has been reported.[14] The policy analyzed therefore provides for the imposition of additional responsibilities on practitioners by the taxing authority beyond those currently required[15].

---

[13]The categorization of the types of advice is taken from Shavell [1988].

[14]For example, in Canada, tax practitioners have included a disclaimer on the tax return which states that the tax return was prepared without verification from information supplied by the client.

[15]The partial shifting of the auditor/enforcer role from the tax agency to the tax practitioner and the transfer of the enforcement costs from the tax agency to the taxpayers seems consistent with current IRS enforcement programs which involve increased third-

Tax practitioners can be viewed as performing a dual role. As taxpayer advocates, practitioners are expected to utilize their knowledge of the tax laws to advise their clients about tax minimizing strategies. However, they also have a responsibility to the tax system -- "to see that our laws and courts operate properly in the interests of society at large" (Fuke [1985, 32]).[16] In the U.S. environment, taxing authorities view preparers and practitioners[17] as contributing significantly to taxpayer noncompliance and, as such, various sanctions aimed at tax return preparers have been enacted by Congress. Practitioners, in particular CPAs, perceive that their traditional role of taxpayer advocate is being shifted gradually to that of government agent (Jackson and Milliron, [1989, 77]). The IRS is viewed as demanding a "greater legal accountability of tax return preparers" (92 CCH ¶ 2370). It imposes a number of rules regulating the conduct of practitioners in tax practice which include penalties imposed under the IRC as well as regulations contained in IRS Circular 230. Tax return preparers may be subject to civil liability for a number of reasons, including an understatement of taxpayer liability attributable to "a willful attempt to understate the client's tax liability or for any reckless or intentional disregard of rules or regulations by a return preparer" (92 CCH ¶ 2370).[18] The IRS

---

party information reporting requirements to the IRS. According to a recent statement made by the IRS executive director of information reporting, "we [the IRS] are shifting the burden of tax enforcement to the private sector, because if we don't, it's going to cost the taxpayer more" (Novack, [1994, 92]).

[16]An understanding of this dual role is recognized both in Canada by Chartered Accountants (CAs) (Fuke, [1985]) and in the U.S. by Certified Public Accountants (CPAs) (Jackson and Milliron [1989]).

[17]In the U.S., both preparers and practitioners provide tax preparation services; however, practitioners (e.g., lawyers, accountants, and enroled agents) are distinguished from preparers in that they are qualified to represent clients before the IRS (during audits and other enforcement actions) (American Bar Association Commission on Taxpayer Compliance [1987]). Furthermore, practitioners are also viewed as having the ability to identify tax minimizing strategies.This thesis also adopts this distinction and focuses on tax practitioners. The term tax preparer is the general term and includes tax practitioners.

[18]For example, in the case of *J. Brockhouse*, CA-7, 84-2 USTC ¶ 10,005, a negligence penalty was imposed on the preparer for failing to follow normal office procedures in the

provides guidelines for determining whether a penalty should be applied and considers factors such as the nature of the error causing the understatement, as well as the frequency and the materiality of the errors.

Under current U.S. practice, a practitioner "may in good faith rely without verification upon information furnished by the taxpayer."[19] However, the "preparer shall make reasonable inquiries if the information as furnished appears to be incorrect or incomplete" (Reg. Sec. 1.6694-1(b)(2)(ii)). In 1984, the U.S. Senate attempted (unsuccessfully) to introduce a preparer verification measure which would have required that "any income tax return preparer who prepares a return ...shall verify that adequate contemporaneous records have been kept supporting deductions to which [subsection 274(d)] may apply before signing such return" (AICPA [1984, 11]). This measure, which would have required preparers to physically examine the detailed records substantiating business expenses, was viewed by some as the "first step toward using the CPA as an "examiner" for the IRS" [P.11]. Although this bill was blocked by the AICPA, the IRS has introduced practice regulations and proposed additional changes to these regulations which have been viewed by many as "increasing dramatically the tax practitioner's exposure to IRS regulatory sanctions." (Boyles III and Feldman [1988, 162]).[20]

In Canada, although practitioners may face charges under the CITA[21] for conspiring to file a false or deceptive return, they are not subject to government imposed

---

preparation of a tax return.

[19]The IRS practice regulations provide an example of a case where the preparer would not be required to verify the financial information provided by taxpayers. In the example noted, the preparer had completed a taxpayer's return without requesting underlying documentation for medical expenses incurred by the taxpayer. Although the taxpayer had overstated these expenses, there was no reason to believe that the information received from the taxpayer was incorrect. Consequently, the preparer would not be subject to penalties.

[20]For example, proposed changes to the practice regulations include the formulation of a new standard of conduct for tax professionals who practice before the IRS (Holden [1991, 327]).

[21]See subsections 239(1) and 163(2) of the CITA.

practice regulations as in the U.S.. However, practitioners and preparers have received increased attention from the taxing authority. In 1993, a tax scam, which the then Minister of National Revenue described as "one of the largest tax frauds in our history" prompted the Minister to agree that " 'it wouldn't be a bad idea' to weigh the pros and cons of regulating tax preparation" (Appleby [1993, B2]).[22] More recently, the new Revenue Minister stated that "it's particularly distressing to me that there are some lawyers and accountants who counsel clients on how to cheat the tax system" (Middlemiss, [1994, 1]). While he acknowledged "that legal and accounting firms do not hesitate to get rid of clients who want to operate illegitimately" and that the tax fraud problem involves mostly unregulated tax preparers, he further stated that his department would crack down on those who attempt to defraud.

1.5 Proposed Tax Agency Policy

The proposed tax agency strategy consists of establishing standards and setting forth the rules governing the performance of duties by practitioners in their expanded role. Prescriptive guidelines and regulations may include probes for unreported income, probes for documentation supporting claimed deductions, as well as a more intense investigation of taxpayers' financial affairs. These procedures are referred to and modelled as the *level of investigation* performed by tax practitioners. The tax agency's problem of delegating an optimal level of investigation to practitioners is analyzed.

From a practical perspective, the proposed policy will only be interesting to the extent that the tax agency can implement an increased level of responsibility on practitioners. It must consider not only the incentives of the taxpayers but also those of the practitioners as well as the interrelationships between taxpayers, practitioners, and the taxing authority itself. The implementation of the suggested policy would require that the tax agency design a mechanism, which would include a monitoring and a disciplining

[22]Revenue Canada investigators discovered that at least 32 tax preparers (small independents) in the Toronto area assisted about 5,000 clients falsely claim more than $60-million from RCT. To date, 2 of these preparers have been convicted of preparing fraudulent tax returns.

component, to motivate practitioners to adopt the desired level of investigation. This level of investigation could be motivated by a penalty structure optimally chosen by the tax agency. The tax agency would, therefore, specify the duties and responsibilities of practitioners concerning the investigation of taxpayers' financial affairs. Penalties would be imposed on practitioners who disregard the rules and regulations.

The approach to the implementation is not inconsistent with the development of a professional association of tax practitioners who would be responsible for establishing and enforcing tax practice standards. The tax agency could then motivate the professional association to adopt the desired standards.[23]

Whether the tax agency can motivate (induce) *any* desired level of investigation depends in part on the type of evasion activity which is being targeted. The tax agency may not be able to impose responsibility on practitioners for detecting all forms of evasion activities. Responsibility may be restricted to types of income and expenses where there exists some "realistic" probability that evasion can be uncovered given some level of investigation. The proposed policy does not attempt to target all forms of noncompliance. For example, the large corporate sector, the illegal sector and non filers are not considered and are excluded from further discussion. Furthermore, it may be reasonable to assume that practitioners could not be made responsible for detecting evasion resulting from unreported cash transactions, falsification of documents, and unreported foreign income. Thus, this policy would apply to a subset of types of evasion activities such as certain business and personal expenses, exclusions, or credits, as well as certain types of unreported income. For example, the taxpayer may have incentives to omit the reporting of sales of financial instruments (e.g., T-bills, bonds, stocks). The practitioner may be required to verify taxpayers' transaction records from investment companies or brokerage houses. Furthermore, since in Canada taxpayers who file their

[23]Note that in the U.S., the AICPA tax division has issued Statements on Responsibilities in Tax Practice (SRTPs). Although these are not enforceable standards, they are intended to provide guidance to its professional members regarding tax practice. In most instances, the SRTPs parallel the practice requirements found in IRS rulings, procedures, regulations, or court cases.

returns electronically do not have to submit supportive documentation, this policy may be aimed at increasing the responsibilities of practitioners who prepare tax returns in this manner.

A requirement similar to the proposed policy analyzed in this thesis was considered (although later abandoned) by the Ontario Finance department. The 1993 Ontario budget proposed the introduction of a corporate minimum tax (CMT). The twist was that all corporations subject to CMT would have been required to prepare audited financial statements in accordance with GAAP (subject to a specified threshold) (Jakolev [1993]). The CMT audit requirement would potentially have affected many corporations who otherwise may have been exempt from an audit and would have significantly upgraded the information to be filed with Ontario corporate tax returns.

As an example of the type of activity that this thesis envisages, the tax agency may want to consider increasing the responsibility of practitioners regarding the nature of transactions between the shareholder/owner-manager and the corporation. To illustrate, consider the case *Greenspoon and Mid-North Iron and Metals Limited v The Minister of National Revenue,* 82 DTC 1181 (T.R.B.), in which the taxpayers were charged and convicted for wilful evasion of payment of taxes. Taxpayer G (Greenspoon), the president and principal shareholder of M-N (Mid-North Iron and Metals Limited), a scrap metal business, had failed to declare income in the amount of $54,166.20 for the taxation years 1971-1975. Furthermore, amounts received by taxpayer G's business operation were deposited into various bank accounts and were not reported as income of M-N. Certain amounts had been credited to M-N's account with the shareholder, other amounts were deposited in a personal chequing account of taxpayer G, while yet other amounts were credited to other related corporations' accounts with shareholders (depending on which company required money at that particular time). In the years in question, unaudited financial statements were prepared by taxpayer G's accountant. However, when the accountant was replaced after the investigation and the issuance of the first reassessments, the new company's accountant realized that the sales were made by M-N and had never been reflected in the financial statements. A "substantial remedial job" had to be done and necessary corrections were made to rectify the accounting records. This was accomplished through reconciliation of balances by using suppliers' statements, confirmation from banks, reconciliation from purchases and reconciliation of the intercompany loan account. Since the new accountant was able to make the necessary corrections, it seems plausible that some level of investigation could have been imposed on the previous practitioner for detecting certain improperly recorded transactions between the shareholder/owner-manager and the corporation.

The implementation of this proposed policy may require that different procedures and methods of inquiry and investigation be used by practitioners depending on the type of evasion activity being targeted and the level of assurance sought by the tax agency. However, the description of specific procedures and guidelines is not the focus of this thesis. Such considerations are left to policy makers, legislators, and the professions. Furthermore, although it is recognized that challenging issues surrounding the practical implementation aspects of this proposed policy arise, further examination of these issues is beyond the scope of this thesis.

From a theoretical perspective, the relationship between the tax agency and practitioners can be viewed as a contractual relationship whereby the tax agency sets the terms of the contract through specifying the duties and responsibilities of practitioners.[24] To the extent that the tax agency can specify a complete set of contractual terms and the level of investigation exerted by the practitioner is observable at least probabilistically, the tax agency can enforce its optimally chosen level of investigation through imposing penalties on practitioners who disregard the rules and regulations specified by the tax agency. Where the tax agency is imperfect, the court system can serve to enforce the tax agency's rules and regulations.

However, implementation is more complex because contracts may be incomplete. The tax agency cannot foresee *all* contingencies or may choose to not incorporate all

---

[24]A similar relationship is described in Scholes and Wolfson [1992, 3] where, from the taxpayer's perspective, the taxing authority is viewed as an "uninvited party to all contracts". The taxing authority specifies the set of contractual terms through specific tax rules (e.g., IRC or CITA) by which taxpayers must abide.

foreseeable contingencies.[25] In cases where the tax agency cannot specify explicitly all investigation procedures or appropriate actions for every situation faced by practitioners, the courts and professional standards may play an even greater role in determining whether or not practitioners have violated the rules and regulations (terms of the contract). Although the courts may be imperfect, they can be viewed as a disciplining mechanism for tax practitioners and a final arbitrator (see, for example, Melumad and Thoman [1990]).

An analogy to the auditing literature can be made. Auditing standard setting bodies face a similarly complex task when implementing rules and procedures for professional auditors. A substantial body of this literature has examined the auditor's optimal choice of the level of audit intensity (effort level) and the incentive effects of various aspects of the auditor-client-owner relationships including due care standards, auditor loss functions, auditor judgment and legal liability (e.g., Antle [1982], Baiman, Evans, and Noel [1987], Balachandran and Nagarajan [1987], Moore and Scott [1989], Dye[1992] and Schwartz [1993]; among others). Since, even in the presence of incomplete contracting, auditing has attained credibility in the marketplace, this attests to the ability of rules, regulations, and the courts to enforce a standard of due care.

In the presence of a utility-maximizing practitioner and an imperfect taxing authority, the courts would suffice to discipline the practitioners and would enable the taxing authority to implement an incomplete contract, knowing that the incompleteness can be resolved. However, since the game analyzed in this thesis is complex (because of the large number of strategic choices for the agents), some simplifications are necessary. Specifically, the practitioner is modelled as mechanistic; that is, the practitioner performs the duties and responsibilities as required and reports honestly. This assumption is also made to focus on and obtain a better understanding of the strategic interactions between the tax agency and the taxpayers. This enables a tractable model but retains the essence of the problem. Furthermore, in place of a formal penalty structure, the mechanistic nature of the practitioner enables the level of investigation to be optimally chosen and imposed

---

[25] Baiman [1990] provides a good overview of complete and incomplete contracts.

by the tax agency.

These simplifications provide an analytical framework for studying and comparing the effect of different levels of investigation which may be selected by the tax agency on taxpayers' incentives to engage in tax evasion and tax minimization activities and, hence, on its own expected tax revenue.

1.5.1 Taxpayers' Perspective

From the perspective of taxpayers, the proposed policy will have an effect on their reporting decisions, on their demand for practitioners, as well as on the information communicated to practitioners (if one is hired). Taxpayers choose their compliance strategy to minimize their expected tax liability. In doing so, they may want to engage in either one or both of tax evasion and tax minimization activities, as explained below.[26]

Taxpayers' strategies are influenced, in part, by the underlying uncertainty with respect to the current tax law;[27] that is, taxpayers cannot determine their true tax liability with certainty because of complexities and ambiguities in the tax requirements and the difficulties in applying these requirements to their particular situation. Where uncertainty in the tax liability exists, taxpayers may have incentives to seek assistance from practitioners who possess a superior knowledge of the tax legislation and the tax agency's assessing practices. Practitioners may influence the compliance strategy of taxpayers by reducing or resolving taxpayers' uncertainties about their tax liability and by providing advice in reporting or structuring transactions to minimize their tax liability. Consequently, practitioners can help taxpayers engage in tax *minimization*. Taxpayers

---

[26]For example, taxpayers may seek advice in determining whether or not certain expenses may justifiably be claimed for tax purposes, thus reducing or resolving their uncertainty regarding the correct tax treatment. However, taxpayers may contemporaneously engage in tax evasion by inflating such expense claims, i.e., reporting inflated amounts to the practitioners.

[27]This thesis assumes that the tax laws are specified exogenously and, therefore, takes as given the uncertainties inherent in the tax legislation.

derive benefits from obtaining assistance either through reducing the amount of tax paid to the tax agency or through saving the expected costs associated with filing an incorrect return. Note that in this thesis, the facts have already transpired and, thus, the practitioner's advice relates solely to the resolution of the taxpayer's uncertainty and not to the identification of alternative tax minimizing strategies.

Taxpayers may also have incentives to engage in tax *evasion* activities. Taxpayers weigh the benefits of evasion against the risk of detection and penalty. Where practitioners are hired and, to the extent that they act as enforcers as required under the proposed policy, they affect taxpayers' abilities to engage in tax evasion. Taxpayers' hiring and information transmission decisions (to practitioners) depend on the level of investigation undertaken by practitioners in their examination of taxpayers' financial affairs and on the probability that they make correct inferences from their investigation. This study therefore focuses on a dual role for tax practitioners: that of enforcer and of tax minimizer (tax advisor). Furthermore, the model captures an endogenous demand for practitioners; that is, taxpayers may still consult the practitioner despite the possibility that the evasion may be discovered by the practitioner due to the offsetting gains from minimization and/or savings of the expected cost of being audited by the tax agency.

It follows from the discussion above that taxpayers' compliance strategies involve a trade-off between their desire to engage in tax evasion and their opportunity to engage in tax minimization. Much of the past research has been concerned with the study of tax evasion; however, taxpayers' opportunities to engage in tax minimization may alter their incentives to evade and *vice versa* and, furthermore, affect the tax agency's behaviour; that is, its strategic choice of the level of investigation.

Although a number of studies have examined the role of tax practitioners where uncertainties in the tax laws exist (e.g., Scotchmer [1989], Beck, Davis, and Jung [1994], Klepper et al. [1991], and Melumad, Wolfson, and Ziv [1991]; among others), most studies assume that practitioners will be associated with returns they know are in error and will allow taxpayers to underreport optimally, and perhaps, even intentionally assist in tax evasion[28] (Reinganum and Wilde [1991], Long and Swingen [1991, 653]). However, in view of the earlier discussion, practitioners may refuse to wilfully deceive the tax agency and to be associated with returns which include unequivocal breaches of the law, either under the current regulations and, in particular, under the proposed policy. Furthermore, most studies have assumed that taxpayers provide all the relevant facts to practitioners and, thus, have ignored the information asymmetry between the taxpayer and the practitioner. However, taxpayers who seek tax advice may have incentives to withhold information regarding their sources of income and their underlying transactions and specific circumstances so that they can engage in tax evasion activities. Erard [1990, 126] states that survey evidence exists which suggests that "taxpayers aren't always honest with tax preparers, and tax preparers do not always ask for supporting documentation". This thesis extends previous research by modelling formally the information asymmetry between taxpayers and practitioners. Furthermore, under the proposed policy, practitioners are responsible for performing a certain level of investigation, thereby possibly discovering information withheld by taxpayers and, thus, reducing taxpayers' incentives to evade. Taxpayers' decisions to obtain assistance will involve a trade-off primarily between the net (of costs) benefits derived from evading and the net (of costs) benefits from engaging in tax minimization.

1.5.2 Taxing Authority's Perspective

From the taxing authority's perspective, the policy considered will have an effect on its expected tax revenue, net of enforcement costs. The taxing authority chooses the

---

[28]These models allow for practitioners to be compensated by taxpayers for preparing a return which is non-compliant by having practitioners charge an amount equal to the expected monetary penalty in addition to the fee. However, practitioners may be subject to additional disciplinary actions by the taxing authority (and/or the professional associations) which include suspension or disbarment (in the extreme). Findings (from surveys) suggest that "in general, paid tax preparers show a marked aversion to breaking the tax laws" (Harwood, Larkins, and Martinez-Vazquez [1990, 26]). Although compensation could also be paid for the expected additional disciplinary actions, it would be prohibitively expensive to do so.

level of investigation that it requires practitioners to exert in detecting evasion, anticipating the effect that this chosen level will have on the taxpayer's strategy, which in turn, is chosen strategically in response to the taxing authority's strategy. It is therefore necessary to consider the objectives of the taxing authority, the trade-offs that it faces, and how these affect the determination of the level of investigation.

The taxing authority is viewed as an economically rational agent whose objective is to maximize total revenue, *including* penalties, net of audit costs. A number of studies have adopted this representation of the tax agency's preferences (e.g., Graetz, Reinganum and Wilde [1986], Scotchmer [1989], Scotchmer and Slemrod [1989], Beck and Jung [1989b], Reinganum and Wilde [1991], and Beck, Davis, and Jung [1994]; among others). This objective function seems consistent with the *actual* audit policy of the IRS which uses the expected *yield* criterion for the selection of returns for audit.[29] Researchers have also modelled the tax agency as maximizing tax revenue, *excluding* penalties, net of audit costs (e.g., Reinganum and Wilde [1991]). They presume that this objective function comes closest to the IRS's (tax agency's) stated objective, that of encouraging compliance.[30] Finally, Hemmer, Stinson, and Vaysman [1993] assume that the tax agency maximizes taxpayer compliance which is defined as the percentage of taxpayers who have paid the correct tax at the end of the reporting and auditing game.

The tax agency's choice of the level of investigation which maximizes total expected revenue may not be the same level which achieves the highest degree of compliance. Results from previous theoretical studies (Scotchmer [1989], and Beck and Jung [1989a,b]) suggest that increased uncertainty can, under certain conditions, increase

---

[29]This objective function is also consistent with the White House's Office of Management and Budget statement that the IRS should increase audits of lower-income taxpayers and decrease audits of higher-income taxpayers reportedly because the lower-income audits are more cost effective (Calmes [1991, A2]).

This objective function also seems consistent with the objective of Revenu Québec which has recently set higher targets for its tax auditors; tax auditors are expected to generate 30 per cent more in tax receipts for the 1994-95 tax year (*Bottom Line* [1994]).

[30]Additional discussion regarding alternative specifications of the tax agency's objective function is provided in the literature review (Section 2.2.2).

tax agency revenue because taxpayers who face greater uncertainty about their tax liability, report on average, higher taxable income. However, since increased uncertainty may cause taxpayers to overreport, unintentional noncompliance may actually increase. In this thesis, an increase in the level of investigation will affect the levels of tax evasion and tax minimization. Under certain conditions, compliance may increase while tax agency revenues decrease (and *vice versa*). Although encouraging compliance may be an important objective for the tax agency, this thesis adopts the first view, that the tax agency maximizes total revenue, including penalties, net of audit costs.

The policy analyzed is intended to provide benefits to the taxing authority through increased (net) revenue. Revenue may increase as a result of an increase in taxes, interest, and penalties collected or as a result of a decrease in its own enforcement costs. Previous research suggests that taxpayers' use of practitioners to reduce the uncertainty associated with the determination of their tax liability (to engage in tax minimization) usually results in lower expected tax revenues (Scotchmer [1989]). However, this thesis differs from prior research in that tax practitioners also play an important role in the detection of nontruthful reporting and, therefore, in the deterrence of evasion. As a result, tax agency revenues may either increase or decrease. Furthermore, the tax agency may be able to reduce its enforcement costs since, in this model, the tax agency's audit probability is lower when a return is practitioner-prepared than when it is self-prepared. The tax agency's choice of strategy therefore involves a trade-off between the amount of evasion and minimization which occurs. The net result of the two trade-off effects on tax agency revenue is ambiguous and depends on the assumptions about the parameter values.

1.6 Overview of the Model

A one-period game-theoretic model is utilized to study the effects of the proposed policy. A brief overview of the model setting is presented below. Simplifying assumptions are explained in greater detail in the description of the model (Chapter 3).

Taxpayers are endowed with private information regarding their underlying transactions and specific circumstances. This information is divided into two components. First, taxpayers privately observe their *level of income* which may take one of two values, high or low. Although taxpayers know with certainty their level of income, practitioners and the taxing authority do not observe this information; however, the prior distribution of taxpayers over income levels is common knowledge to all participants. Second, taxpayers observe private information regarding their transactions and the facts underlying their situation which is essential in the determination of the *category* to which their income belongs (*type of income*). Since taxpayers face uncertainties with respect to how the tax requirements apply to their particular situation, they cannot determine with certainty the *category* to which their income belongs and, thus, their true tax liability. Uncertainty in the tax liability is modelled as uncertainty with respect to the effective tax rate (hereafter "tax rate"), which incorporates different inclusion rates for different categories of income. Taxpayers hold probabilistic beliefs that the tax rate may be high or low. Although tax practitioners and the tax agency know how to apply the laws to individual fact situations, they do not observe the facts or transactions underlying an individual taxpayer's circumstances, nor do they observe the beliefs assessed by a particular taxpayer. However, the prior distribution of taxpayers' beliefs over tax rates is assumed to be common knowledge to all participants.

Taxpayers are risk neutral individuals who seek to minimize their expected tax liabilities. Having observed their private information, the level of investigation selected by the tax agency, and given the presence of uncertainty in the tax liability, taxpayers decide whether to submit their own tax return or to hire a practitioner. Where a practitioner is hired, taxpayers provide the practitioner with confidential information concerning both their *level of income* and the facts and transactions underlying their circumstances utilized in the determination of the true *tax rate*. In this setting, taxpayers may have incentives to withhold information regarding their level of income (e.g., omit or understate certain sources of income) as they would like to engage in tax evasion.[31]

---

[31]Taxpayers can viewed as communicating their "type" (level of income) with noise, or providing a message about their type which is correlated with their true type. Note that in papers such as Melumad et al. [1991], it was not necessary to assume that taxpayers would not transmit all their information because taxpayers had the option to file their own return if they wanted to play the tax lottery after practitioners had given them advice.

However, a taxpayer's ability to engage in tax evasion may be reduced because the practitioner must perform an investigation of the taxpayer's declared level of income. It is assumed that taxpayers truthfully provide all the information required by practitioners in determining the correct tax rate; that is, taxpayers (weakly) do not have incentives to withhold rate-relevant information because they do not know how this information will be processed by practitioners in determining how the tax requirements apply to their particular situation. Where a practitioner is not hired, or where taxpayers have been rejected by the practitioner (as explained below), taxpayers must file their own return, choosing both the level of income and the tax rate.

Under the policy analyzed in this thesis, practitioners attempt to determine whether or not taxpayers have truthfully communicated all information regarding their level of income. Practitioners are assumed to be mechanistic monitors who investigate taxpayers' financial affairs utilizing the level of investigation chosen by the taxing authority and who report honestly. It is assumed that, given the costs of investigation, the practitioner is imperfect and cannot determine the taxpayer's true level of income with certainty; that is, the practitioner may incorrectly conclude that the taxpayer has misrepresented his or her type and, therefore, may make a type I error, or the practitioner may fail to detect a discrepancy between the taxpayer's message and his or her true level of income and, thus, may make a type II error. Based on the results of the investigation, the practitioner either refuses to be associated with the tax return (rejects the client) or accepts the client, thereby providing advice to the taxpayer and completing and filing the return on behalf of the taxpayer. If the practitioner rejects the client, the taxpayer must file his or her own tax return and bear the additional costs, through not resolving the uncertainty in his or her tax liability and through facing a higher probability of audit by the tax agency.

The tax agency's objective is to maximize its expected total tax revenue, including penalties, net of costs. It achieves its objective by optimally choosing the level of investigation that it requires practitioners to exert in detecting tax evasion. This level of investigation is selected after the prior distributions over taxpayer income levels and tax rates are observed but before taxpayers choose their strategies. Furthermore, this level of investigation is observable by all participants.

Upon receipt of the taxpayer's return, the tax agency, based on its exogenously specified audit policy, decides whether to accept the taxpayer's return or to perform an audit. For simplification purposes, the tax agency is assumed to conduct a perfect audit. If the tax agency detects errors, it collects any additional tax liability, penalties, and/or interest charges. Otherwise, the return is accepted as filed.

The analysis consists of characterizing the equilibrium strategies of the taxpayers and the tax agency and examining the equilibrium interactions among them. Further, the effects on taxpayers' demand for professional assistance, on their incentives to engage in tax evasion and tax minimization, and on tax agency revenues, net of enforcement costs, are examined.

To the extent that taxpayers continue to hire practitioners, this policy has the effect of shifting the auditor/enforcer role from the tax agency to the practitioner and of transferring a portion of the enforcement costs from the tax agency to the taxpayers. From a social welfare perspective, this policy may have important implications for tax equity and tax efficiency. However, an evaluation of the social desirability of the proposed policy is beyond the scope of this thesis.

This thesis is comprised of six chapters. Following this introductory chapter, a review of the literature is presented in Chapter 2. Chapter 3 provides a description of the model and the assumptions utilized. Chapter 4 presents the analysis of taxpayers' and the tax agency's decisions whereas Chapter 5 examines the equilibrium configurations and demonstrates the existence of an equilibrium. Concluding remarks and directions for future research are discussed in Chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Concern about taxpayer noncompliance has generated a considerable amount of research both by academics and by tax administrators. An important benchmark in the development of the field of taxpayer compliance was the study undertaken by the NAS Panel on Taxpayer Compliance Research. Its mandate was to critically review previous research on the factors which influence taxpayer compliance with reporting requirements and to suggest directions for future research.[1] In its summary findings, the Panel identified four compliance strategies utilized by the tax agency (IRS) in its attempts to enhance compliance. These are: (1) increasing the probability of detection; (2) decreasing the costs of compliance; (3) encouraging compliance through public communications; and (4) regulating practitioners. Since then, additional compliance strategies have been examined such as the use of amnesty programs and self-audit programs. A significant amount of research has concentrated on the probability of detection and the costs of compliance. This thesis contributes to the existing literature by analyzing a proposed tax agency strategy which focuses on increasing the legal responsibilities of practitioners to the tax agency beyond those currently required. The potential contribution of practitioners in the compliance and enforcement process is examined.

Researchers have only recently concentrated on analyzing the role of tax

---

[1]The findings and recommendations were published as a two-volume work entitled *Taxpayer Compliance* (Roth et al. [1989]). These results were subsequently reviewed and updated by Long and Swingen [1991]. Additionally, several reviews of the compliance literature have recently been published (see e.g., Alm [1991], Cowell [1990], Jackson and Milliron [1986], and Fischer, Wartick, and Mark [1992]).

practitioners in the compliance process, including the various services that they provide, the factors which affect taxpayers' hiring decisions, and the impact that practitioners have on taxpayer compliance. A significant portion of this chapter reviews the main contributions in this area and the implications for the proposed strategy analyzed in this thesis.

Due to the substantial amount of compliance literature, it is necessary to limit the scope of the review. Attention will be focused mainly on the areas of compliance research which are most closely related to this thesis. Emphasis will be placed on theoretical studies although studies utilizing different methodologies will be discussed where appropriate.

The remainder of this chapter is organized as follows. A brief overview of the general compliance research and the primary findings is provided in Section 2.2. This section examines the early theoretical models, the introduction of the tax agency as a strategic agent, and the related empirical evidence. Section 2.3 examines the role of uncertainty in taxation, while Section 2.4 reviews the role of practitioners in taxpayer compliance. Concluding remarks are provided in Section 2.5.

2.2. General Overview

2.2.1 Early Theoretical Models

Early theoretical models of taxpayer compliance evolved from Becker's [1968] economics-of-crime model which was first applied to tax evasion by Allingham and Sandmo [1972] and Srinivasan [1973]. The basic model assumes that individuals maximize their expected utility of after-tax income by weighing the benefits of successful evasion against the risk of detection and penalty. Most models[2] predict that reported income increases in the detection probability and the penalty rate. Furthermore, where individuals' preferences exhibit decreasing absolute risk aversion, reported income

---

[2]For a comprehensive review of these models, see Witte and Woodbury [1983], Cowell [1985b], Graetz and Wilde [1985], Skinner and Slemrod [1985], and Jackson and Milliron [1986].

increases in the tax rate and the penalty rate (Yitzhaki [1974] and Cowell [1985b]), but decreases as true income increases (Cowell [1985b]).

The self-interest model of taxpayer compliance has evolved substantially over the last two decades. Extensions and refinements include the examination of the taxpayer's choice of reported income jointly with variables such as labour supply (e.g., Cowell [1985a]) or income allocated to tax avoidance (e.g., Cross and Shaw [1981,1982] and Alm [1988a]), alternative tax and penalty functions (e.g., Pencavel [1979]), and multi-period models with more complex timing and audit selection strategies (e.g., Lansberger and Meilijson [1982], Greenberg [1984]). Recent studies which analyze the impact of complexity and uncertainty about tax liabilities, as well as the influence that practitioners have on compliance are discussed in Sections 2.3 and 2.4.

2.2.2 Modelling a Strategic Tax Agency

One of the most significant contributions to the literature has been the incorporation of the tax agency as a strategic player in the compliance process. Researchers have modelled the strategic interactions between the taxpayers and the tax agency utilizing one of two game-theoretic approaches: the principal-agent model, first utilized by Reinganum and Wilde [1985], and the Nash equilibrium model (including refinements) introduced into tax compliance by Graetz, Reinganum, and Wilde [1986]. Although the tax agency can strategically select various policy variables, most models have focused on the audit probability as the central policy choice variable. By allowing the tax agency to utilize information from taxpayers' returns in determining its optimal audit strategy, taxpayers face differing probabilities of audit depending on the level of income reported. In the principal-agent model, the tax agency announces and commits to the audit policy before receiving taxpayers' reports. Under the Nash equilibrium approach, the tax agency and the taxpayers are assumed to play against each other without pre-announcing their strategies.

Modelling a strategic tax agency requires that assumptions regarding the specification of its objectives be made. Two approaches have been utilized in the literature. The first approach views the taxing authority, like other participants in the compliance process, as an economically rational player, pursuing its own objective(s) subject to a set of constraints. This approach is adopted in this thesis. As mentioned in Chapter 1, although some presume that maximizing tax revenue, excluding penalties, net of audit costs is the objective function which comes closest to the IRS's (the tax agency's) stated objective, that of encouraging compliance, most studies assume that the tax agency's objective is to maximize "total" revenue, including penalties, net of audit costs (e.g., Graetz et al. [1986], Scotchmer [1989], and Beck et al. [1994], among others). It is argued that this objective function seems consistent with the actual audit policy of the IRS which uses the expected *yield* criterion for the selection of returns for audit. This objective function also seems consistent with the audit policy of RCT which utilizes a point rating system to select returns for audit (Schmidt [1993]).

An alternative specification of the tax agency's objective function has been utilized in studies whereby the tax agency is concerned with maximizing taxpayers' expected welfare (maximizing a utilitarian welfare function) subject to a revenue constraint. The objective function utilized reflects concerns for both equity and efficiency. For example, Melumad and Mookherjee [1989] utilize this objective function to consider the tax agency's objectives of raising revenue for public good and for redistribution of income. Mookherjee and P'ng [1989] employ this objective function to model the tax agency's choice of taxes, penalties, and probability of audit, as well as the taxpayer's choice of action. The representation of the government's problem through the use of a social welfare function may be useful when examining whether an improvement in social welfare is possible through collecting revenues more efficiently, through lowering the risks and the costs of compliance to taxpayers, and through reducing the tax agency's enforcement costs.

The public choice literature may provide useful insights as to the appropriateness of the objective function chosen; however, a comprehensive study of this literature is beyond the scope of this review.

2.2.3 Empirical Studies

Empirical studies have utilized the data made available by the IRS through the

Taxpayer Compliance Measurement Program (TCMP)[3] to estimate the impact of various policy parameters, including marginal tax rates, audit rates, and penalty rates, upon various measures of tax evasion.[4] Although these studies have provided some evidence that taxpayer compliance behaviour is influenced by detection and punishment, results have been inconsistent and highly sensitive to the assumptions underlying the models tested. Additional factors not included in the self-interest model have also been identified as important determinants of taxpayer compliance (Jackson and Milliron [1986]). Furthermore, the theoretical recognition of the strategic interaction between taxpayers and the tax agency has been an important development for structuring econometric research; however, Roth et al. [1989], among others, suggest that econometric methods, the quality of the data,[5] and the models need further refinement.

2.3 Uncertainty of True Tax Liability

Taxpayers' compliance strategies are affected by various forms of uncertainty related to taxation: uncertainty with respect to the current law (ambiguity or complexity in the current tax law), with respect to enforcement (including audit probability, detection, reassessment, and penalty), and with respect to changes in legislation. Much of the recent studies have been concerned with the investigation of the effects of uncertainties induced by current tax laws on the taxing authority's and the taxpayers' incentives. Although these studies acknowledge that taxpayer compliance is affected by these uncertainties, conflicting results have been obtained.

Uncertainty may arise as a result of difficulties in interpreting and in applying the existing tax laws and, therefore, in determining the taxpayer's correct tax liability. Alm

---

[3]The TCMP data includes estimates of voluntary compliance rate by audit (amount and source of income) and aggregate data on numerous characteristics (see Roth et al. [1989] and Alm [1991] for additional information about the data and its limitations).

[4]For a review of empirical studies, see Jackson and Milliron [1986], Roth et al. [1989], Alm [1991], and Fischer et al. [1992]; among others.

[5]The quality of the data has been one of the most problematic issues in the empirical studies (e.g., due to the level of aggregation and measurement problems).

[1988b], Beck and Jung [1989a], and Scotchmer and Slemrod [1989] were among the first to examine analytically the effects of uncertainty on taxpayer compliance. These studies found that the effects of increased taxpayer uncertainty about tax liabilities depend upon various factors including taxpayer risk-taking attitudes, penalties, and the perceived audit probability. Results generally show that, if taxpayers exhibit declining (or nonincreasing) absolute risk aversion, increased uncertainty can increase tax agency net revenues since taxpayers who face greater uncertainty about their tax liability report, on average, higher taxable income. Beck and Jung [1989a] however, obtain mixed results. For a range of parameters (which in their opinion, would be expected to occur commonly), they show that, unless taxpayers are highly risk-averse, an increase in income uncertainty will likely lead to a reduction in reported income.[6] For example, under the assumption that the distribution over the possible assessed outcomes is a truncated normal probability distribution, a risk neutral taxpayer reporting income below the mean of possible assessments will report a lower level of income when the variance of possible assessed incomes increases (while preserving the mean). This result is obtained because the increase in the dispersion of possible assessed incomes increases the probability that the taxpayer's true income level is low.

The models discussed above assume that taxpayers face proportional monetary penalties for underpayment of taxes and that the audit probability is invariant with respect to the amount of taxable income declared. Many of the studies' results are predicated on these assumptions. Beck and Jung [1989b] were among the first to investigate the consequences of uncertainty on taxpayers' reporting decisions in a setting where both the taxpayers and the tax agency are strategic. They incorporated taxpayers' uncertainty about their tax liabilities and about the tax agency's costs of performing audits. Their analysis shows that increasing taxpayer uncertainty about tax liabilities induces taxpayers to report a higher level of income (where penalties are proportional to the tax deficiency); however,

[6]Beck and Jung's results are derived under the assumption of a continuous distribution of taxable income. Their analysis implies that the effects of increased tax liability uncertainty depend primarily upon the underlying income distribution, taxpayers' risk-taking attitudes, and the approach utilized to model the uncertainty in the tax liability.

divergent effects are obtained with respect to the audit cost uncertainty.[7]

It follows from the studies above that an increase in uncertainty in tax requirements may or may not increase compliance even though, under certain conditions, it generates increased net revenues to the tax agency. Patterns of taxpayer compliance which have emerged from various IRS studies indicate that:

> ...of taxpayers who misreport income, about 12% overreport, of those who misreport subtractions about one-third fail to claim all to which they are entitled, among nonfilers about 40% have already had enough tax withheld and many would receive refunds if they filed (Roth et al. [1989, 2-3]).

To the extent that the misreporting of income is unintentional and results from uncertainty induced by complexities in tax laws, greater uncertainty about taxpayers' tax liabilities may actually reduce compliance since more errors are possible, *ceteris paribus.*

The models discussed in this section have ignored taxpayers' information acquisition decisions (hiring of practitioners) as a means of reducing the uncertainty prior to the filing decision. Section 2.4 examines this issue as well as the broader issue concerning the role of practitioners in the compliance process.

2.4 Tax Practitioners and Taxpayer Compliance

The extent to which tax practitioners affect taxpayer compliance is an important issue to both researchers and taxing authorities. As mentioned in Chapter 1, taxing authorities view practitioners as contributing significantly to taxpayer noncompliance. Researchers, however, have found that taxpayers may be more or less compliant in the presence of tax practitioners.

From the taxpayers' perspective, practitioners may influence taxpayers' actions at various stages in the compliance process, including the planning, the filing, and the appeals stages. They may therefore affect taxpayers' costs of compliance, the probability of detection, the severity of penalties, as well as taxpayers' error rates. From the tax

---

[7]Beck et al. [1992] provide experimental evidence which is consistent with the theoretical result that uncertainty about tax liability affects compliance and its effects depend upon the degree of risk aversion and the levels of tax, audit and penalty rates. For a review of the experimental studies, see Alm [1991].

agency's perspective, practitioners play a significant role in compliance and enforcement. Although most of the research has focused on the influence of practitioners on taxpayers, it is important to examine how practitioners affect the taxing authority's actions, its revenue collected, and its costs of enforcement. Since practitioners influence taxpayers' decisions, a strategic tax agency will choose its own actions anticipating these potential influences which, in turn, may affect taxpayers' actions. In obtaining a better understanding of the interactions between the tax agency and taxpayers in presence of practitioners, the implications of various tax agency policies may be more adequately evaluated.

2.4.1 Factors Affecting the Demand for Tax Preparers and Tax Practitioners

A number of empirical and survey studies have analyzed the characteristics of taxpayers who use preparer services and the factors affecting taxpayers' decisions to hire a preparer. These studies have provided evidence that the usage of paid preparer assistance is positively associated with the level of income, the marginal tax rate, tax return complexity, the opportunity cost of taxpayers' time in preparing their return, demographic characteristics, and occupation, and is negatively associated with the level of education (see e.g., Slemrod and Sorum [1984], Slemrod [1985], and Long and Caudill [1987]). Additionally, Yankelovich, Skelly and White, Inc. [1984] find that the key reason taxpayers employ a preparer is that they fear making mistakes.

Collins, Milliron, and Toy [1990] identify two primary taxpayer objectives which influence the decision to hire practitioners: that of filing the most correct return[8] and of minimizing taxes. Where the objective is to file the most correct return, low tax knowledge, and high tax return complexity are associated with higher taxpayer demand for preparers. Where tax minimization is the objective of taxpayers, the decision to hire a preparer is associated with high income, low tax knowledge, and increased age.

Recent empirical studies have utilized improved econometric techniques and/or

---

[8]Taxpayers whose primary objective is to file the most correct return could be viewed as "habitual" compliers, as described in Graetz, Reinganum, and Wilde [1986].

data, and have provided additional (and sometimes contrary) evidence on tax preparer usage.[9] For example, Dubin et al. [1992], utilizing a two-stage estimation procedure to focus on taxpayers' choices of return preparation services, find that higher audit rates increase the demand for paid tax preparers (practitioners) who are able to represent taxpayers before the IRS. Christian, Gupta, and Lin [1992], utilizing longitudinal tax return data, find that, contrary to Long and Caudill [1987], marginal tax rate and income are not associated with preparer usage. Furthermore, while time savings has only a small marginal effect, tax return type (as measured by the type of schedule filed by taxpayers) and being self-employed have a material effect on preparer usage.

In addition to examining taxpayers' decisions to hire a preparer, a number of empirical studies have examined whether compliance levels are different between paid-prepared and self-prepared returns. For example, Long and Caudill [1987] find evidence that income tax liability is relatively lower on paid-prepared than self-prepared returns with the same income, filing status, number of exemptions, and other characteristics. However, a number of these studies have defined noncompliance as the failure to report the correct amount of tax due. As Erard [1990] points out, this definition should include "in IRS's opinion" [P.124]. The database employed in most studies, the IRS TCMP data file, defines noncompliance from the perspective of the revenue authority, that is, what the IRS examiner determined to be the correct amount due (the initial assessment) rather than the final reassessment. This definition does not take into consideration successful challenges by the taxpayers and subsequent adjustments to their returns. Utilizing the IRS's definition of noncompliance, Erard [1990] finds that, after controlling for a number of factors including complexity of return and type of preparer, the amount of noncompliance, is much higher on paid-prepared than self-prepared returns.

2.4.2 Theoretical Developments

Researchers have attempted to provide a theoretical framework for analyzing the

---

[9]For a discussion of the limitations of previous research on the determinants of paid tax preparer usage, see Christian, Gupta, and Lin [1992].

role of practitioners and the impact that they have on taxpayer compliance. This section reviews the developments in the literature, distinguishing between two types of services provided by practitioners: the provision of (i) tax advice and (ii) pure services.[10]

i) Service Aspects

One of the primary roles of tax practitioners (and preparers) is to provide assistance to taxpayers in the preparation of returns. Practitioners' services include filling out tax forms, signing the return, and representing the client during an audit or an appeals process. Reinganum and Wilde [1991] develop a game theoretic model of taxpayer, tax practitioner, and tax agency behaviour which focuses on these services. They assume that taxpayers have the same information as practitioners regarding tax requirements (taxpayers are capable of preparing their own return in an optimal manner) but may engage practitioner services to lower the costs of filing returns and of complying with the tax agency's enforcement action. When a practitioner is utilized, these costs are incurred by the practitioner and are assumed to be lower than the costs faced by taxpayers preparing their own returns. The benefits to taxpayers from hiring practitioners are therefore dependent upon the trade-off between the practitioner fee (which includes the expected monetary penalty faced by practitioners for preparing a noncompliant return) and the gains resulting from lower costs of compliance and possibly lower tax liabilities.

Reinganum and Wilde characterize four types of equilibria, depending upon whether taxpayers prefer to use practitioners and whether the tax agency prefers them to use practitioners. From the tax agency's perspective, depending on the parameters, the use of practitioners results in greater efforts at detection (higher tax agency audit probability), and may result in more or less taxpayer compliance in equilibrium, and in higher or lower

---

[10]As mentioned in Chapter 1, tax advice includes advice pertaining to the sanctionability of acts, where the advice may or may not be definitive (advice on how to reduce or eliminate uncertainty in the determination of the correct tax liability), advice which enables taxpayers to lower the probability or magnitude of sanctions, and advice concerning the probability or magnitude of sanctions, or *risk advice*. The pure service aspects encompass primarily return preparation services although additional services, which will be discussed, may also be included.

expected net revenue to the tax agency.

The authors' main contribution is in the examination of the impact of differential costs faced by taxpayers filing a self-prepared or a practitioner-prepared return on their decisions to seek professional assistance, on compliance, and on tax agency enforcement assuming that both taxpayers and practitioners have the same information about tax requirements. However, important issues in the tax compliance problem cannot be addressed in their paper. For example, given that practitioners' superior knowledge of the tax legislation is ignored, the model precludes the analysis of the role of practitioners in reducing the occurrence of errors by taxpayers who file their own returns. Where practitioners can reduce the occurrence of errors, they may actually increase compliance and provide benefits to both the taxpayer and to the tax agency. Furthermore, Reinganum and Wilde assume that practitioners will be associated with returns they know are in error. However, allowing taxpayers to underreport optimally may result in a practitioner's clients facing a disproportionate amount of auditing if the practitioner has been assessed penalties frequently or, in the extreme case, practitioners may be suspended or disbarred from practice before the IRS. The impact of such actions cannot be analyzed given the structure of their model.

ii) Tax Advice

Advice to lower the probability or magnitude of penalties

Klepper and Nagin [1989] and Klepper et al. [1991] were among the first to analyze both theoretically and empirically the types of taxpayers that seek advice from tax professionals, where taxpayers are endowed with two types of income: ambiguous and unambiguous income.[11] Their main theoretical contribution is in the examination of the role of practitioners in providing advice on how to lower the probability or magnitude of

[11]They define unambiguous income as income which will not be measured differently by the IRS and a taxpayer making a good faith effort at compliance (e.g., salary, dividend, and interest income). Ambiguous income is income where the amount that should be reported is not unequivocally prescribed by statute, regulation, or case law (e.g., self-employment income and capital gains income).

penalties: that is, practitioners possess superior knowledge of the tax legislation and can provide assistance in organizing transactions to either reduce the risk of noncompliance being detected or the expected penalty if noncompliance is detected. The model provides a theoretical basis for the "enforcer/ambiguity-exploiter" characterization of preparers posed by Klepper and Nagin [1989]. Their primary result is that practitioners appear to contribute to compliance by enforcing legally unambiguous features of the tax code but appear to contribute to noncompliance by exploiting ambiguous aspects of the tax code. These predictions provide support for their empirical findings.[12] Furthermore, their results suggest that a greater amount of ambiguous income, a greater perceived time cost of self-preparation, an increase in the practitioner's ability to reduce the penalty for detected noncompliance on ambiguous income, higher tax rates, and lower preparation penalties will encourage the use of practitioners.

Although the model captures important institutional complexities, the results obtained are essentially driven by the assumption that the use of practitioners automatically results in a lower penalty on ambiguous income. Furthermore, it is assumed that the tax agency's audit probability is independent of whether or not a practitioner is utilized. Analytically, their results must hold given that a decision theoretic framework is utilized, thereby precluding the various strategic interactions between the players. For example, in a strategic setting, the tax agency may choose its penalty structure, its audit probability, and/or its decision to reassess taxpayers, taking into consideration the impact that such choices have on its own objective and on taxpayers' responses.

Empirically, the measurement of noncompliance as concerns ambiguous items may be overstated, as the measurement of ambiguity is based on the IRS's initial assessment of the tax return (see earlier discussion). Measuring noncompliance after the taxpayer has appealed and possibly successfully challenged the reassessment may provide a different

[12]Practitioners help taxpayers exploit ambiguous features of the tax law such that a reporting position "grounded in legal ambiguity may prevail if challenged" and "if the taxpayer is found noncompliant, the penalty per dollar of noncompliance is likely to be less if the reporting position is based on a credible interpretation of the law" (Klepper and Nagin [1989, 168]).

level of noncompliance (especially where the tax treatment of the item is ambiguous). Unfortunately, information about taxpayer appeals and final reassessments are not readily available. Empirical results should therefore be interpreted with caution in light of these measurement problems.

Advice pertaining to the tax treatment of outcomes

Theoretical models which have explored the effects of uncertainty regarding the current tax legislation and the consequent determination of the taxpayer's correct tax liability on taxpayer compliance (Section 2.3) have subsequently been extended to incorporate taxpayers' decisions to hire practitioners. Through possessing superior knowledge of the tax legislation, practitioners may either reduce or resolve the tax liability uncertainty.

Shavell [1988] was among the first to utilize a model of rational choice to analyze taxpayers' decisions to seek advice, where taxpayers are uncertain about their tax liabilities. The author demonstrates that risk neutral taxpayers will engage the services of practitioners if the expected value of advice, which is obtained by multiplying the probability that taxpayers will alter their decisions by the expected benefit that they would obtain as a consequence, exceeds its cost.

Scotchmer [1989] further examines the use of tax practitioners in reducing taxpayers' uncertainty induced by complexities in the tax law. Under a set of very restrictive assumptions,[13] the author demonstrates that risk averse taxpayers would always choose to resolve their uncertainty. She concludes that "the more confused or risk averse the taxpayer is, the more valuable advice is. We would thus expect to observe that taxpayers with complicated returns seek tax advice" [P.186]. The author further demonstrates that resolving uncertainty may reduce tax agency revenue as imperfectly informed taxpayers report higher taxable income on average than perfectly informed

[13]For example, Scotchmer assumes that: penalties are never imposed on preparers; preparers allow taxpayers to underreport income optimally; advice is costless; and, the advice does not alter the penalty for underreporting.

taxpayers (even though their true level of income is lower). The insights gained are limited by the use of the restrictive assumptions and are further limited by assuming away the strategic interactions among the different agents. For example, as in Klepper et al. [1991], Scotchmer assumes that the tax agency's audit probability is independent of whether or not a practitioner is utilized. Furthermore, although the role of preparer penalties is addressed in the paper, the trade-offs between the risk effects and the penalty effects are not formally modelled.

Melumad et al. [1991] and Beck et al. [1994] extend the models of Scotchmer [1989] and Shavell [1988] by employing a game theoretic framework to examine the strategic interdependencies between the tax agency's and taxpayers' decisions. In both models, practitioners perform not only an informational role but also provide a signalling role: that is, the presence or absence of a practitioner's signature on a tax return provides, under certain conditions, incremental information to the taxing authority.

Beck et al. [1994] examine taxpayers' decisions to seek practitioner advice and to disclose this fact to the tax agency. Taxpayers are uncertain about their tax liability and assess a probability that it is one of two outcomes: high or low. It is assumed that both the practitioners and the tax agency have the ability to resolve all tax liability uncertainty. The tax agency conditions its audit strategy on taxpayers' hiring and reporting decisions which, in turn, are affected by the tax agency's strategy. A separating equilibrium is obtained whereby taxpayers divide themselves into at most three groups: the lowest types[14] report low tax liabilities; the middle types hire a practitioner and; the highest types report high tax liabilities. The tax agency's optimal audit strategy is to conduct an audit when a low tax liability is reported on a tax return without a practitioner's signature and the cost of auditing is smaller than the expected benefit. The effect of practitioners on the tax agency's audit strategy is to conduct fewer audits in equilibrium. Beck et al. demonstrate that while the expected tax liabilities reported by taxpayers who hire practitioners will not necessarily decline, the expected monetary transfers to the tax enforcement agency (on a

[14]Different taxpayer types are distinguished in terms of their probability assessments regarding the deductibility of certain items.

post-audit basis) decrease due to a reduction in penalty payments.[15]

An important conclusion in Beck et al. is that the tax agency never audits practitioner-prepared returns as practitioners will never be associated with returns containing errors. Since it is common knowledge in their model that practitioners have the ability to resolve taxpayers' uncertainty, severe penalties would be imposed on practitioners if they were discovered to have knowingly signed erroneous returns. Beck et al. support their assertion by assuming that there is some probability that tax evasion will be discovered due to events outside the normal audit process -- TCMP audits;[16] however, this element is not incorporated into the model. The model does not capture the reality that the taxing authority audits returns prepared by practitioners and that these returns may be noncompliant.

In contrast to the conclusions reached by Scotchmer [1989] and Beck et al. [1994], that tax practitioners reduce taxpayers' uncertainty and therefore lead to a decrease in the IRS revenues, Melumad et al. [1991] find that the taxing authority's revenues may, under certain conditions, increase when taxpayers utilize practitioner services. The main contribution of their study is the investigation of the desirability of an alternative mechanism, the subsidization of tax preparation fees, for encouraging (or discouraging) the use of tax practitioners. As in Beck et al. [1994], the signalling role of practitioners is an important element in the model. The results indicate that the taxing authority would like to "price discriminate" in subsidizing tax practitioner involvement in the tax compliance process. In particular, only taxpayers whose returns are signed by practitioners and are not audited subsequently by the IRS should sometimes have their tax-preparation fees refunded.

Studies discussed in this and other sections do not explicitly model the tax agency's choice of the optimal amount of uncertainty (complexities and/or ambiguities)

---

[15]Beck et al. [1994] have also tested the predictions of their model experimentally. The results of their experiment provide support for their predictions with the exception of the effect that tax practitioners have on post-audit tax collections.

[16]In the U.S., the IRS randomly selects taxpayers for audit under the TCMP.

which should exist in the tax legislation but examine changes in the amount of uncertainty either through the hiring of practitioners or an exogenous shift in the uncertainty of the tax legislation.[17] In contrast to these studies, Thoman [1992] explicitly models the interaction between the clarity[18] of the tax code (IRC) and taxpayers' prior beliefs as to whether a particular deduction applies. In particular, she examines the relationship among the clarity level, taxpayers' hiring decisions, and the taxing authority's audit policies. The optimal level of ambiguity is a function of the fraction of the population whose taxable income is reduced by that section of the tax legislation. For example, if the particular section of the tax code describes a deduction which applies to a small proportion of the population, the taxing authority prefers an ambiguous code combined with the threat of frequent audits, inducing uninformed taxpayers into reporting high levels of taxable income. Furthermore, practitioners can, under certain conditions, increase the tax agency's net revenues since the enforcement costs may decrease by an amount greater than the decline in taxes and fines collected. As in Melumad et al. [1991] and Beck et al. [1994], the practitioner plays an important signalling role.

Risk Advice

An additional function of tax practitioners is the provision of risk advice, or advice concerning the probability or magnitude of penalties. Most theoretical models assume that taxpayers know the relevant detection probabilities and penalties; however, as noted in Roth et al. [1989], "individuals make systematic errors in estimating low probabilities" [P.90]. Practitioners can therefore provide risk advice to taxpayers which Roth et al. [1989, 172] define as follows:

---

[17]The amount of ambiguity and complexity in the tax legislation can be determined partly by the legislative bodies (through tax design), and/or partly by the revenue authority through its administrative procedures, the issuance of rulings, and its communication strategy (e.g., Internal Revenue Bulletins in the U.S., Interpretation Bulletins and Information Circulars in Canada; among others).

[18]Thoman defines the clarity of the tax code as "the probability that a taxpayer and the IRS would reach the same conclusion when applying the tax code" [P.1].

> Risk advice ... emphasizes knowledge of IRS administrative practices, detection probabilities, and sanctioning practices rather than knowledge of tax regulations. In providing risk advice, practitioners advise clients on such matters as what reports are least likely to be challenged, which types of income are least likely to be found in audits, or what dollar amounts are likely to be ignored by the IRS.

Shavell [1988]) demonstrated that in a decision theoretic framework, the provision of risk advice usually leads to an increase in noncompliance. Erard [1990], in his discussion of the impact of tax practitioners on tax compliance posits a potential explanation for some of the noncompliance:

> [T]ax practitioners are more aware of true audit rates; more aware of cases where IRS's arguments are likely to be challengeable; more likely to know what the true possibility of penalty is...results in more noncompliance, in IRS's opinion [P.124].

In contrast to the explanations and results obtained above, Klepper and Nagin [1989] find empirical evidence that practitioners contribute to compliance by acting as important conduits for communicating tax agency enforcement priorities to taxpayers.

2.5 Concluding Remarks

Research to date suggests that practitioners perform an important role as providers of services and as providers of information to taxpayers. One of the primary benefits to taxpayers from hiring a practitioner arises from the practitioner's ability to resolve or reduce the uncertainty in taxpayers' tax liabilities. Furthermore, practitioners may perform a signalling role by providing incremental information to the tax agency concerning the true tax liability of taxpayers.

Long and Swingen [1991] have noted that many studies have treated all forms of noncompliance and tax evasion as nearly interchangeable. They have further noted the need to distinguish among different forms of noncompliance. As mentioned in Chapter 1, the introduction of uncertainty into the models has the effect of blurring the distinction between evasion and minimization, thereby making the distinction between intentional and unintentional misreporting ambiguous. This thesis contributes to the existing literature by explicitly modelling taxpayers' joint evasion/minimization decisions. Taxpayers choose both the level of income to be reported and the tax rate to be applied in the calculation of their tax liability. Since taxpayers know their true level of income, any misreporting is treated as intentional (i.e., an attempt to evade); however, since they are uncertain about the tax rate applicable to their particular situation, any misreporting is treated as unintentional (i.e., an unsuccessful attempt at tax minimization). Taxpayers' incentives to engage in one or both types of activities are examined.

From the tax agency's perspective, existing theoretical research has provided mixed results regarding the role of practitioners in the compliance process. While a number of studies demonstrate that the use of practitioners in reducing the uncertainty in taxpayers' tax liabilities usually results in lower expected tax revenues (due to a decrease in penalty payments) and in either an increase or a decrease in compliance, other studies have provided contrary results. Additional work on the role of practitioners in the compliance process is therefore required.

An element which has been ignored in the existing research is the information asymmetry between taxpayers and practitioners. Taxpayers have private information about the facts and transactions underlying their particular situation which must be communicated to practitioners when hiring occurs. However, taxpayers may have incentives to conceal information from practitioners so that they can evade. As mentioned in Chapter 1, survey evidence suggests that taxpayers are not always honest with practitioners and that practitioners do not always ask for supporting documentation. Since practitioners do not currently have a duty to verify all the financial information provided to them by taxpayers, evasion may occur even when returns are practitioner-prepared. This thesis further contributes to the existing literature by modelling taxpayers' communication of information regarding their sources of income and deductions (i.e., level of income). Additionally, an expanded role for practitioners is examined whereby practitioners have an increased responsibility for detecting evasion by verifying financial information provided to them by taxpayers. The proposed tax agency policy is expected to affect taxpayers' hiring decisions as well as their incentives to engage in tax evasion and tax minimization activities. The trade-offs faced by taxpayers are examined. Furthermore, the effect of this proposed policy on tax agency revenues is analyzed.

CHAPTER 3

DESCRIPTION OF THE MODEL

3.1 Introduction

This section presents a scenario in which the taxpayer and the tax agency are strategic participants in the compliance process and the practitioner is mechanistic.[1] A one-period model is analyzed whereby the tax agency first strategically chooses the optimal level of investigation that it requires practitioners to exert in detecting tax evasion. Given knowledge of this level of investigation, taxpayers then strategically decide whether to seek practitioner assistance, what information to provide the practitioner (if one is hired), and what report to file to the tax agency (if self-preparing the return). The precise sequence of events and actions is presented in Section 3.6.

3.2 Taxpayers' Private Information

Taxpayers privately observe information regarding their underlying transactions and specific circumstances which is relevant in determining their tax liabilities. In this model, this information is divided into two components. First, taxpayers privately observe their exogenously specified *level of income* which may take one of two values, high or low (denoted by H and L, respectively).[2] Taxpayers are referred to as *high-type* taxpayers or *low-type* taxpayers where taxpayer types, $\theta \in \{H,L\}$, are drawn from some objective

---

[1]Papers in auditing, such as, Titman and Trueman [1986] and Datar, Feltham, and Hughes [1991], have modelled the auditor as a mechanistic monitor. Although the modelling of the practitioner as a strategic agent may be desirable, the approach utilized in this thesis provides a simpler setting for understanding the strategic interactions between the tax agency and the taxpayers and for analyzing all the possible equilibria.

[2]For convenience to the reader, a table of notation is provided in Appendix A.

distribution p(θ). The prior distribution of taxpayer types over income levels is common knowledge to all participants. However, only taxpayers observe their own type.

Second, taxpayers observe private information regarding their transactions and the facts underlying their situation which is essential in the determination of the *category* to which their income belongs and, therefore, of the applicable *rate of tax*. It is assumed that the tax laws are exogenously specified (e.g., in the CITA or the IRC) and are provided to all participants.[3] However, taxpayers cannot process all the information that they possess to correctly determine which tax rate should be utilized in the calculation of their tax liability as they do not know how the law specifically applies to an individual fact situation. Tax liability uncertainty to the taxpayers is therefore modelled as uncertainty with respect to the taxpayer's effective tax rate (hereafter referred to as "tax rate"), which incorporates different inclusion rates for different categories of income. Taxpayers assess an unbiased probability, β, that for a given set of facts and transactions, the tax rate is high and a complementary probability, 1-β, that the tax rate is low. In this thesis, a high tax rate, t_I, refers to the rate at which *ordinary income*, I, is taxed, whereas a low tax rate, t_{CG}, refers to the rate at which *capital gains*, CG, are taxed.[4] Different taxpayers are

---

[3]This assumption is consistent, to some extent, with reality where the laws are enacted by the legislative body (e.g., Parliament (in Canada) or Congress (in U.S.)) and are interpreted, enforced, and collected by the tax agency (e.g., RCT or the IRS).

[4]Beck and Jung [1989a,b] and Beck et al. [1994] model the beliefs about the tax liability in a similar manner except that the uncertainty relates to the level of taxable income as opposed to the tax rate. To the extent that the effective tax rates reflect differences in inclusion rates (i.e., the fractional amount included in the calculation of taxable income), the scope of the present model encompasses uncertainty about taxable income and thus, uncertainty about tax liability. The terms t_I and t_{CG} are utilized for expositional purposes, however, the analysis is not restricted to ordinary income and capital gains income. Sources of income which are fully, partially, or non-taxable may be analyzed within the same framework.

Taxpayers' beliefs may be considered to be subjective and based on past experience; however, they are also the probabilities chosen by Nature, in accordance with taxpayers' subjective probabilities. Furthermore, since practitioners are assumed to give definitive advice, these beliefs constitute the prior probabilities utilized in the determination of the expected benefit of advice provided by practitioners.

distinguished by their beliefs, β, about the tax rate, t_K, $t_K \in \{t_I, t_{CG}\}$. They are referred to as *income* taxpayers or *capital gains* taxpayers.

Tax practitioners and the tax agency know how to apply the laws to individual fact situations; however, they do not observe the facts or transactions underlying an individual taxpayer's circumstances, not do they observe the beliefs assessed by a particular taxpayer. The entire population of taxpayers holding beliefs β is assumed to be common knowledge and is modelled by the probability density $f(\beta)$ having [0,1] support and mean

$$\bar{\beta} = \int_0^1 \beta f(\beta) d\beta . \quad (1)$$

The determination of taxpayers' tax liabilities is therefore affected by two elements: the level of income and the tax rate. Although there exists a possibility that wealthier taxpayers may face a more complex tax rate structure, it is assumed that the distribution over taxpayer income levels is independent of the distribution over taxpayer beliefs about tax rates; whether a taxpayer's level of income is H or L provides no information about his or her tax rate, t_I, or t_{CG} (or *vice versa*). This assumption is equivalent to the assumption that minimization opportunities do not have an impact upon evasion opportunities (and *vice versa*); that is, taxpayers' abilities to evade through their choice of the level of income reported on their return does not affect their opportunity to minimize through their attempt at resolving their uncertainty about their tax rate. The joint distribution is $g(\theta, \beta) = p(\theta) \times f(\beta)$.

3.3 The Taxpayer's Decision Problem

Taxpayers are assumed to be risk neutral individuals who seek to minimize their expected tax liabilities and other costs (or maximize their expected after-tax income for a given level of pre-tax income, net of costs). Taxpayers, having observed their private information (H, or L, and β), must decide whether to submit their own tax return or to hire a practitioner. Given the presence of uncertainties in the tax liability, taxpayers may have an incentive to seek advice from tax practitioners, who, through possessing a superior knowledge of the tax legislation, know how to apply the laws to individual fact situations.[5,6] It is assumed that, for a given set of facts, practitioners provide *perfect* or *definitive advice* regarding the application of the tax laws and, therefore, the determination of the true tax rate: tax minimization schemes can be viewed as risk free.[7] By resolving taxpayers' uncertainties about the tax rate, practitioners can assist taxpayers in reducing their expected tax liability: they help taxpayers engage in tax minimization. Taxpayers derive benefits from obtaining assistance either through learning with certainty that they can utilize the lower tax rate, t_{CG} (when a higher tax rate would be utilized where practitioner assistance is not sought), thus reducing the amount of tax paid to the tax agency, or through learning that the higher rate, t_I, is the true tax rate, thereby saving the expected interest charges on the tax deficiency and possibly the expected cost of being audited. The expected benefit is determined by multiplying the probability that advice will lead taxpayers to alter their behaviour by the benefit obtained from their altered behaviour.

Where hiring occurs, taxpayers provide practitioners with confidential information concerning both their level of income (H or L) and the facts and transactions underlying

---

[5]Shavell [1988] and Beck et al. [1994] demonstrate that risk neutral taxpayers may derive benefits from obtaining assistance if practitioners can increase taxpayers' expected after-tax income, net of costs.

[6]It is assumed that the individual taxpayer cannot call the tax agency to obtain the required information about the tax rate. This assumption is reasonable as the tax agency does not generally provide tax (planning) advice but only provides information about the law for which there is a requested interpretation. Furthermore, the tax agency may have a moral hazard problem in giving advice about tax minimizing strategies to taxpayers.

[7]Practitioners can be viewed as providing advice with certainty or perhaps recommending a position where substantial authority exists and such an interpretation is considered compliant behaviour. When practitioners resolve all uncertainty, taxpayers who seek advice will have posterior probabilities of either zero or one, depending upon whether they are told that their tax rate is t_{CG} or t_I. Since practitioners possess superior knowledge of the tax legislation (as compared to taxpayers), even if practitioners provide imperfect advice, taxpayers' posterior probabilities will *converge* to zero or one. Although the assumption of perfect advice is made for simplification purposes, it captures the expertise of the practitioner.

their circumstances which are utilized in the determination of the correct tax rate (t_I or t_{CG}). Taxpayers may have incentives to withhold information regarding their *level of income* as they would like to retain their opportunity to engage in tax evasion. However, a taxpayer's ability to engage in tax evasion may be reduced (or eliminated) because the practitioner must perform an investigation of the taxpayer's message regarding his or her declared level of income. A taxpayer who, in the absence of a practitioner, would claim a low level of income when his or her true level of income is high and face the risk of audit and detection by the tax agency as well as the imposition of penalties may, under certain conditions, face an even greater probability that his or her evasion activities will be detected by a practitioner (if one is hired).[8]

Taxpayers, however, truthfully provide all the information required by practitioners in resolving their uncertainty about the *tax rate*; that is, they do not have incentives to withhold rate-relevant information as they do not know how this information will be processed by practitioners in determining how the tax requirements apply to their particular situation. The interpretation of the information involves the practitioner's use of expertise, which is unobservable by taxpayers.[9] A practitioner can therefore assist a taxpayer engage in tax minimization.

Taxpayers' decisions to obtain assistance involve a trade-off between their desire to engage in tax evasion, by incorrectly reporting their level of income, and their opportunity to engage in tax minimization, by resolving their uncertainty about the tax

---

[8]The extent to which taxpayers face a greater probability that the understatement will be detected when hiring occurs depends on the relationship between the tax agency's audit probability and the level of investigation that the tax agency requires practitioners to exert in detecting evasion.

[9]For example, the determination of whether the profit on the sale of vacant land in Canada is treated as income or capital gain is a question of fact. Some of the factors which are considered include the taxpayer's intention with respect to the land at the time of its purchase, the extent to which intention is carried out by the taxpayer, and factors which motivated the sale of the land (see IT-218R). Since the taxpayer may underestimate the significance of facts which are essential in determining the tax result, the taxpayer is not expected to withhold rate-relevant information.

rate, given the expected costs and benefits of each action. This framework therefore allows the demand for tax practitioners to arise endogenously. Taxpayers' hiring decisions are affected in part by their level of income, their underlying uncertainty with respect to the current law (beliefs β about the tax rate), and the level of investigation undertaken by the practitioner. Their decisions are also affected by the level of the exogenous parameters in the model: the probability that the tax agency performs an audit, the cost of being audited, and the level of penalties and interest charges (these parameters are described in Section 3.5).

Where a practitioner is hired, taxpayers must decide which level of income, $\hat{\theta} \in \{\hat{H},\hat{L}\}$, to communicate to the practitioner given that their true level of income is θ. This communication, denoted by $R_{\hat{\theta}}$, will be referred to as the taxpayer's message.[10] When a taxpayer's message is accepted (d=a, where d is the practitioner's decision), the practitioner provides tax advice, and completes and files the return on behalf of the taxpayer.[11] Where a practitioner is not hired or where taxpayers have been rejected by the practitioner (d=r) (as will be explained below), taxpayers must file their own return without having resolved their uncertainty about their tax rate. They must decide which level of income, $\hat{\theta} \in \{\hat{H},\hat{L}\}$, to report on their tax returns (which may or may not necessarily be the same as the level of income communicated to the practitioner), as well as which tax rate, $t_J \in \{t_I,t_{CG}\}$, to apply in the calculation of their tax liabilities. A

---

[10]The term "message" is used as opposed to "report" as the term report refers to the tax return provided to the tax agency.

Since taxpayers are assumed to truthfully communicate information relevant to the practitioner's determination of the true tax rate, the transfer of tax rate-relevant information is not explicitly modelled.

[11]Melumad et al. [1991] assume that taxpayers have the option to file their own return after receiving advice from practitioners; however, it is more reasonable to assume that, since tax practitioners possess expertise not only in interpreting the legislation but also in completing the required forms and that both types of information are costly to communicate, they provide advice to taxpayers only if they complete and file taxpayers' returns. A taxpayer's option to file his or her own return is further limited by the advent of electronic filing by practitioners.

taxpayer's report to the tax agency is denoted by $R^{i}_{\hat{\theta},I_j}$ when the return is self-prepared and $R^{p}_{\hat{\theta},I_j}$ when the return is practitioner-prepared.

The taxpayer's decision problem can be summarized as consisting of optimally choosing a sequence of actions from the following set of actions: ({Hire, No hire}, $\{R_{\hat{H}}, R_{\hat{L}}\}$, $\{R^{i}_{\hat{H},I_I}, R^{i}_{\hat{H},I_{CG}}, R^{i}_{\hat{L},I_I}, R^{i}_{\hat{L},I_{CG}}\}$). The specification of taxpayers' expected payoffs under the various strategies is provided in Appendix B.

3.4 Role of Tax Practitioners

Prior to providing tax advice and to completing the taxpayer's return, the practitioner must perform an investigation of the taxpayer's message, $R_{\hat{\theta}}$, to determine whether or not the taxpayer has truthfully communicated his or her level of income. As mentioned previously, it is assumed that practitioners are mechanistic; they perform the required amount of work utilizing the level of investigation, $\zeta_{\hat{\theta}}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$, chosen by the tax agency and report honestly.

Given the tax agency's chosen level of investigation and the results of the practitioner's investigation, the practitioner either accepts the taxpayer's message, thereby providing tax advice and completing the taxpayer's return, or rejects his or her message, (rejects the hypothesis that the client has truthfully revealed his or her income level), thus refusing to provide these services to the taxpayer.[12] It is assumed that, given the costs of investigation, the practitioner is imperfect and may fail to correctly detect the taxpayer's true income level. The practitioner may incorrectly conclude that the taxpayer has misrepresented his or her type and, therefore, makes a type I error with probability (1-w($\zeta_{\hat{\theta}}$)) (incorrectly rejects a true message). Additionally, the practitioner may fail to detect a discrepancy between the taxpayer's message and his or her true level of income and,

[12]As in Melumad et al. [1991], the possibility of "opinion shopping" is excluded from the analysis.

therefore, makes a type II error with probability $(1-v(\zeta_\theta))$ (incorrectly accepts a false message).[13]

This thesis focuses on the required level of investigation and the resulting probability of making correct inferences from the test results, rather than on the trade-off between type I and type II errors as analyzed by Shibano [1989]. The level of investigation, ζ_θ, $\zeta_\theta \in [0,1]$, can be interpreted in terms of the level of precision, which in turn, is a function of the size of the sample of observations from the taxpayer's records that the practitioner examines.[14] The investigation technology is exogenously specified and has the following properties: conditional on practitioners being hired, it is assumed that, as the required level of investigation increases, the probability of making correct inferences increases, at a decreasing rate; that is, $w'(\zeta_\theta)$, $v'(\zeta_\theta) > 0$ and $w''(\zeta_\theta)$, $v''(\zeta_\theta) < 0$. Furthermore, $w(\zeta_\theta = 0)$ and $v(\zeta_\theta = 0)$ may be equal to zero or one depending upon whether the tax agency prefers that the practitioner always accepts or rejects the message without performing an investigation.

The costs to the tax agency from choosing a certain level of investigation are decreased tax, penalty, and interest revenue and increased resources for enforcement. These are the costs to the tax agency when practitioners commit type I or type II errors. As mentioned in Chapter 1, the tax agency's choice of strategy involves a trade-off between the levels of evasion and minimization which, in turn, affect the tax agency's

---

[13]Melumad et al. [1991] assume that only type II errors occur. However, this model recognizes that, where the practitioner's investigation is imperfect, type I errors may also occur since taxpayers may not be able to provide sufficient evidence that they have not excluded income without incurring substantial practitioner (investigation) fees.

[14]Shibano [1989] derives a functional representation of the trade-off between type I and type II errors in a strategic decision theoretic setting, under the assumption that the auditor be restricted to a single sample with a fixed sample size (a restriction utilized in Blackwell and Girshick [1954]). Shibano asserts that allowing the choice of sample size within his setting "involves considerable expansion of the strategy spaces" [P. 42] and is not a trivial problem. Since this thesis is concerned with setting investigation standards and, thus, determining the sample size, the trade-off between the two types of errors is not examined.

revenue. The tax agency's decision problem is discussed in Section 3.5.

In this thesis, the practitioner is not required to report to the tax agency any discrepancies between the results of the investigation and the level of income communicated by the taxpayer to the practitioner.[15] As a result, the tax agency does not obtain information about taxpayers who hired practitioners and were rejected by them.

Tax practitioners are assumed to operate in a competitive industry and charge a fee, denoted by F(·), in exchange for their services. Services include the investigation of the taxpayer's message regarding the level of income and, where the practitioner accepts the taxpayer's message, the provision of tax advice and the preparation and filing of the tax return. Consequently, the fee has two components: the first component pertains to the practitioner's cost of investigation which is an increasing function of ζ_θ, the level of investigation required by the tax agency when taxpayers communicate the message R_θ. As the tax agency's required level of investigation increases, the fee charged to taxpayers increases, at an increasing rate; that is, $F'(\zeta_\theta)>0$ and $F''(\zeta_\theta)>0$. Furthermore, $F(\zeta_\theta=1)=\infty$; that is, a perfect investigation of the level of income is unobtainable.[16] The second component comprises the cost of providing advice and completing the taxpayer's return. It is assumed that this cost is fixed as practitioners can resolve the uncertainty in the tax liability without exerting additional effort (e.g., tax research); they are compensated for their existing technical knowledge of the tax laws. It is further assumed that the fee is independent of the results of the practitioner's investigation and that all taxpayers that seek advice pay for the cost of advice and return preparation even though they may not

---

[15]This assumption is consistent with current practice. Although current practice does not require practitioners to perform an investigation, when practitioners become aware of underreporting, they cannot sign or cannot be associated with the erroneous return. However, they have no legal obligation to tattle on their client.

[16]These assumptions are consistent with those in the auditing literature (see for example, Dye [1993], Moore and Scott [1989], and Schwartz [1993]).

enjoy the benefits of these services (because their message has been rejected).[17] Accordingly, the practitioner fee can take one of two values: $F(\zeta_{\hat{r}})$ or $F(\zeta_{\hat{n}})$.

3.5 Tax Agency's Decision Problem

The tax agency's objective is to maximize expected total tax revenue, *including penalties*, net of audit costs. Its objective is achieved through its optimal choice of the level of investigation that it requires practitioners to exert in detecting evasion. This level of investigation is selected after the prior distributions over taxpayer income levels and tax rates are known but prior to taxpayers' choice of strategies. It is assumed that the tax agency takes as given its own audit policy and the tax and penalty schedules. These assumptions are made for simplification purposes and, also, to focus on the trade-offs which arise from the adoption of the proposed enforcement mechanism. Specifically, attention is focused on the effect of different levels of practitioner investigation which may be selected by the tax agency on taxpayers' incentives to engage in tax evasion and tax minimization activities and, hence, on its own expected tax revenue.[18] These assumptions are consistent with those adopted in Scotchmer [1989] and Scotchmer and Slemrod [1989]; among others. For example, Scotchmer and Slemrod [1989] focus on another aspect of the tax system that affects underreporting: that taxable income as it would be assessed by an auditor is a random variable.

The exogenous audit policy adopted provides for different levels of audit in order

---

[17]The analysis precludes the use by practitioners of fees contingent on the results of the practitioner's investigation and/or whether advice is provided. A future study could examine the effects of modelling a more complex fee structure.

[18]Most game theoretic models do not attempt to derive optimal tax and penalty schedules; however, they usually focus on the reporting and auditing relationship between taxpayers and the tax agency (with or without the presence of a practitioner), thereby making the audit probability a central choice variable. A number of models have assumed that the tax agency can commit to an audit policy (e.g., Scotchmer [1989] and Thoman [1992]) while others have assumed an inability to commit; that is, the tax agency chooses its probability of an audit conditional on the report observed (e.g., Beck and Jung [1989b], Beck et al. [1994]; among others).

to take into consideration some effects of the policy and the need to differentiate between certain taxpayer reports. This audit policy is specified as follows. First, the probability that the tax agency audits a return depends upon whether the return is self-prepared or practitioner-prepared, where γ^i and γ^p denote the respective probabilities. Second, the probability that the tax agency audits a self-filed return $R^i_{\hat{H},t_I}$, or a practitioner-prepared return $R^p_{\hat{H},t_I}$, or, $R^p_{\hat{H},t_{CG}}$ is zero since the tax agency is already collecting the maximum amount of revenue at the minimum cost.[19] Third, the probability that the tax agency audits a self-prepared return other than $R^i_{\hat{H},t_I}$ is $\gamma^i \in (0,1)$. Finally, the probability that the tax agency audits a practitioner-prepared return $R^p_{\hat{L},t_I}$ or $R^p_{\hat{L},t_{CG}}$ is $\gamma^p \in (0,1)$, where $\gamma^p \leq \gamma^i$.

The audit probabilities γ^i and γ^p may be viewed as applying to a particular class of taxpayers. These taxpayers have a number of relevant characteristics in common which place them in a particular audit class. The assumption that γ^i and γ^p and, thus, the audit resources available, are not optimally chosen within the period has some institutional support in that the parameters of the IRS audit-selection formulas are obtained using previous years' data and not updated annually. As reported in the *Wall Street Journal* [1994, 1], the "audit-selection formulas are out-dated: The most recent research audits

[19]Note that where hiring occurs, the tax agency never audits a taxpayer who reports a high level of income regardless of the tax rate utilized because practitioners provide perfect advice with respect to the tax rate and taxpayers truthfully provide all the information necessary to the determination of the tax rate.

covered 54,000 personal returns for 1988."[20]

The tax agency's decision problem consists of choosing the optimal level of investigation, ζ_θ, $\theta \in \{\hat{H},\hat{L}\}$, associated with each message, R_θ, communicated by taxpayers to practitioners. This endogenously determined level of investigation will directly affect the fee charged by practitioners, the probability that they make incorrect inferences (the level of type I and type II errors) and, consequently, the communication and hiring decisions of taxpayers (or equivalently the proportion of taxpayers who seek practitioner assistance and who communicate either a high or a low level of income). As a result, the tax agency's revenue (including penalties) net of audit costs, will either increase or decrease in response to a change in the level of investigation through affecting the levels of tax evasion and tax minimization. For example, an increase in ζ_θ will increase the practitioner fee as well as the probability that the practitioner will correctly discover the taxpayer's true level of income. Consequently, for a given level of tax rate uncertainty, the proportion of taxpayers who seek advice will decrease if the fee increases at a faster rate than the expected benefit. The effect of this decrease in hiring is as follows. First, depending on the exogenous probability that a self-filed return is audited by the tax agency, tax evasion will either increase or decrease. Second, where a smaller proportion of taxpayers seek assistance, successful tax minimization is expected to decrease since those who do not hire cannot resolve the uncertainty about their true tax liability. However, tax minimization may increase if a greater proportion of those who

[20]As described in Roth et al. [1989, 67], the IRS selects returns for audit utilizing a Discriminant Index Function (DIF). The DIF parameters are estimated using previous years' data from the IRS's TCMP (Taxpayer Compliance Measurement Program). The parameter estimates from the DIF formulas are then used to score incoming returns with an indicator of the potential yield from audit. Furthermore, separate DIF formulas and selection rules are created for predetermined audit classes, which are defined in terms of income ranges and return characteristics. The actual number of returns selected for audit depends on the reporting behaviour of taxpayers, the type and number of audit personnel available, and the amount of audit resources available. Furthermore, DIF score thresholds are set for district offices at the beginning of the year (Roth et al. [1989]) (see Tauchen and Witte [1986] for additional details regarding the audit selection process of the IRS).

hire communicate their information truthfully to practitioners. The tax agency's choice of ζ_θ must therefore take into account the optimal behaviour of taxpayers.

Upon receipt of the taxpayer's return and based on its audit policy, the tax agency either performs an audit or accepts the return. It is assumed that the tax agency has a higher probability than practitioners of discovering incorrect reports. The tax agency has access to information which is not available to the practitioner and which allows it to conduct an audit with greater accuracy.[21] For simplification purposes, it is assumed that the tax agency audit is perfectly revealing; that is, it detects any errors and confirms accurate reports.[22]

When an audit occurs, the tax agency incurs a cost of auditing, denoted by C, and the taxpayer incurs a cost of being audited, denoted by A. The cost to the taxpayer not only includes the opportunity cost of time spent preparing for an audit and the disutility for the audit experience, but also the costs of preparing and providing supporting documentation for the tax auditor, and the costs incurred by tax agency examiners at the taxpayers' premises.[23]

When the tax agency discovers an understatement of the level of income (the taxpayer has evaded taxes), it collects the additional tax liability, $t_K(H-L)$, and assesses a penalty, $mt_K(H-L)$, as well as an interest charge, $\pi t_K(H-L)$, where m and π are the proportional penalty and interest rates respectively, $\pi<m$, and $t_K \in \{t_I, t_{CG}\}$ is the true tax

[21]For example, the tax agency performs matching procedures utilizing information from payroll deductions databases which allows it to identify certain unreported sources of income. The tax agency has access to third party information and to other taxpayers' returns. Furthermore, under certain circumstances, the tax agency has rights under various provisions of the tax legislation to inspect records and property and to require the production of documents or information. Such rights are not available to practitioners.

[22]Furthermore, by assuming that the tax agency conducts a perfect audit, it is not necessary to model the reassessment and appeals process. For a description of this process, see Porcano and Porcano [1985] and Feltham [1990].

[23]These costs are incurred even when the taxpayer is found to be compliant.

rate.[24] The interest cost represents a charge on the amount of tax that is not paid on or before the prescribed date of payment. The penalty is assessed for filing a fraudulent return. Additional penalties may be assessed for other reasons; however, for purposes of this thesis, the fraud penalty is the only penalty explicitly considered. When the underpayment of tax relates solely to the application of the incorrect rate of tax, taxpayers pay the additional tax liability $(t_I\theta - t_{CG}\theta)$, and are assessed interest, $\pi(t_I\theta - t_{CG}\theta)$, where $\theta \in \{H,L\}$. It is assumed that, as regards the tax rate, the taxpayer's position has a reasonable basis in law or the misreporting is unintentional; hence, penalties for evasion are not assessed. However, even though the taxpayer has not committed evasion, the taxpayer must bear some cost, the interest charge, for an inaccurate return.[25] Where both the income level and the tax rate are incorrect, the tax agency collects the additional tax liability, $(t_K H - t_J L)$, and assesses a penalty, $m(t_K H - t_K L)$, and an interest charge $\pi(t_K H - t_J L)$, where t_K is the true tax rate, t_J is the reported tax rate, and $J \neq K$. When the tax agency discovers that the taxpayer has overreported, it refunds the overstated tax but does not remit interest on the overstatement. Whereas most papers assume that taxpayers incur penalties even when unintentional misreporting occurs, this thesis captures an institutional feature, that unless the misreporting is deemed wilful (or negligent), penalties are not usually imposed. Thus, differential costs are incurred depending upon the type of misreporting.

A specification of the tax agency's expected payoffs under the various strategies is provided in Appendix B.

---

[24]The penalty and interest costs are not deductible for tax purposes.

[25]In addition to the interest on the underpaid tax, this interest charge may include costs such as interest and penalties on deficient tax instalments. Although these latter costs are not necessarily proportional to the underpaid tax, proportionality is assumed for simplification purposes. Furthermore, the total interest charge (which is not deductible for tax purposes) is reduced by the taxpayer's after-tax cost of capital. Under most circumstances, the taxpayer must bear some cost, in addition to the expected cost of being audited, for filing an incorrect return.

3.6 Sequence of Events and Actions

To summarize the model, the following outlines the sequence of actions and events:

1. Nature chooses each taxpayer's true income level $\theta \in \{H,L\}$ from the prior distribution $p(\theta)$; taxpayers privately observe their own type.
2. Nature chooses the true tax rate $t_K \in \{t_I, t_{CG}\}$; taxpayers assess a probability β that the tax rate is t_I, and $1-\beta$ that the tax rate is t_{CG}. The entire population of taxpayers holding beliefs β about the tax rate is assumed to be common knowledge and is modelled by the probability density $f(\beta)$.
3. The tax agency strategically chooses the level of investigation, $\zeta_{\hat{\theta}}$, $\hat{\theta} \in \{\hat{H}, \hat{L}\}$, that it requires practitioners to utilize in their examination of taxpayers' financial affairs and the resulting levels of type I and type II errors.
4. Taxpayers strategically decide whether to submit their own return or to hire a practitioner.
5. Where hiring occurs, taxpayers strategically choose the message, $R_{\hat{\theta}}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$, that they communicate to practitioners. Where hiring does not occur, taxpayers strategically choose the report, R^{i}_{θ,t_j}, that they submit to the tax agency.
6. Where hiring occurs, the practitioner performs an investigation of the taxpayer's message utilizing the required level of investigation (as determined by the tax agency) and, based on the results of this investigation, either accepts or rejects the taxpayer's message. Where a taxpayer's message is accepted, the practitioner provides advice, prepares and files the return on behalf of the taxpayer. Where the message is rejected, taxpayers strategically choose the report, R^{i}_{θ,t_j}, that they submit to the tax agency.
7. Upon receiving the taxpayer's return, the tax agency, based on its audit policy, performs an audit or accepts the taxpayer's return as filed.
8. If the tax agency detects errors, it collects the additional tax liability, penalties, and/or

interest charges, or refunds any overreported tax.

The evolution of the game is presented in Figure 3.1.

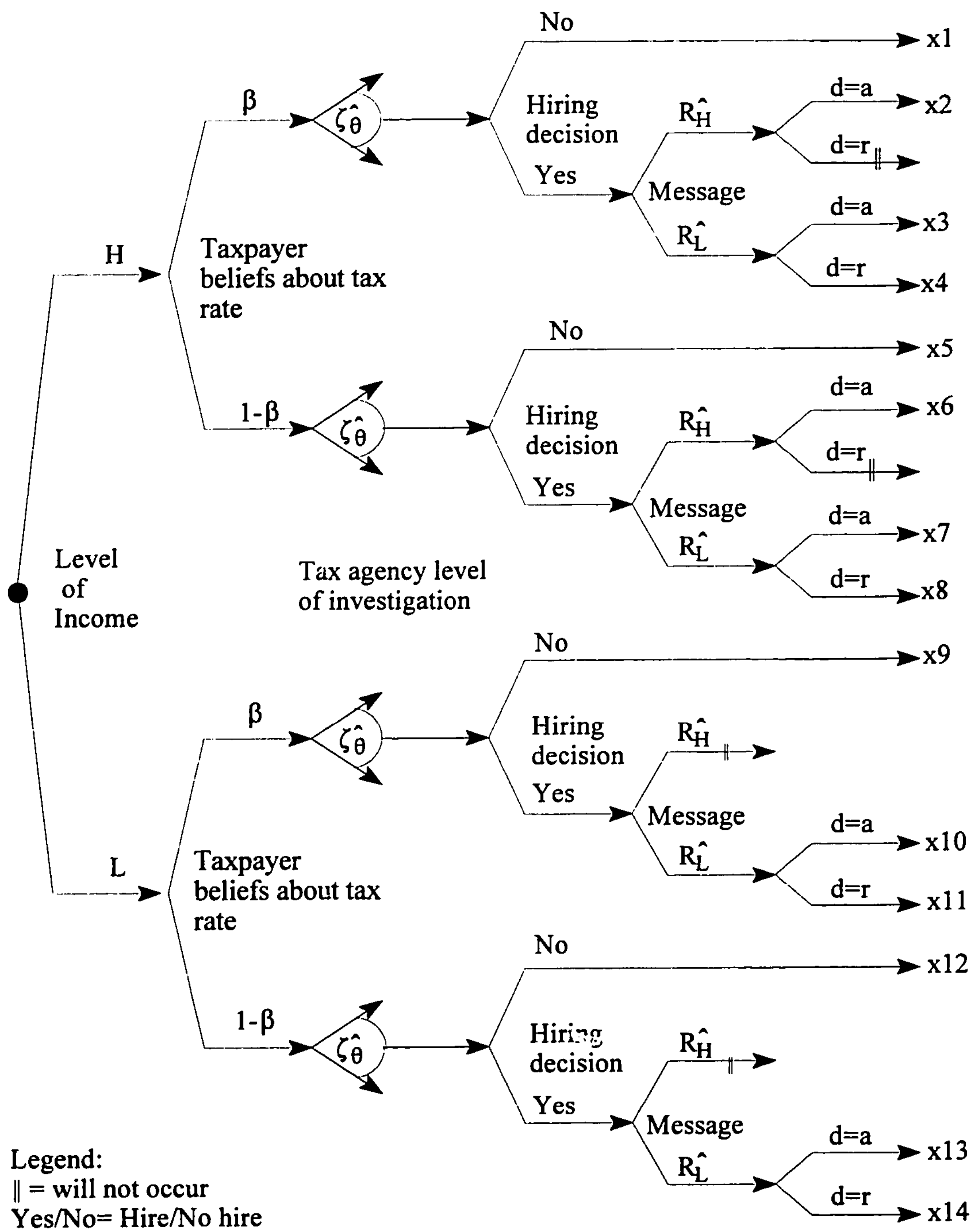
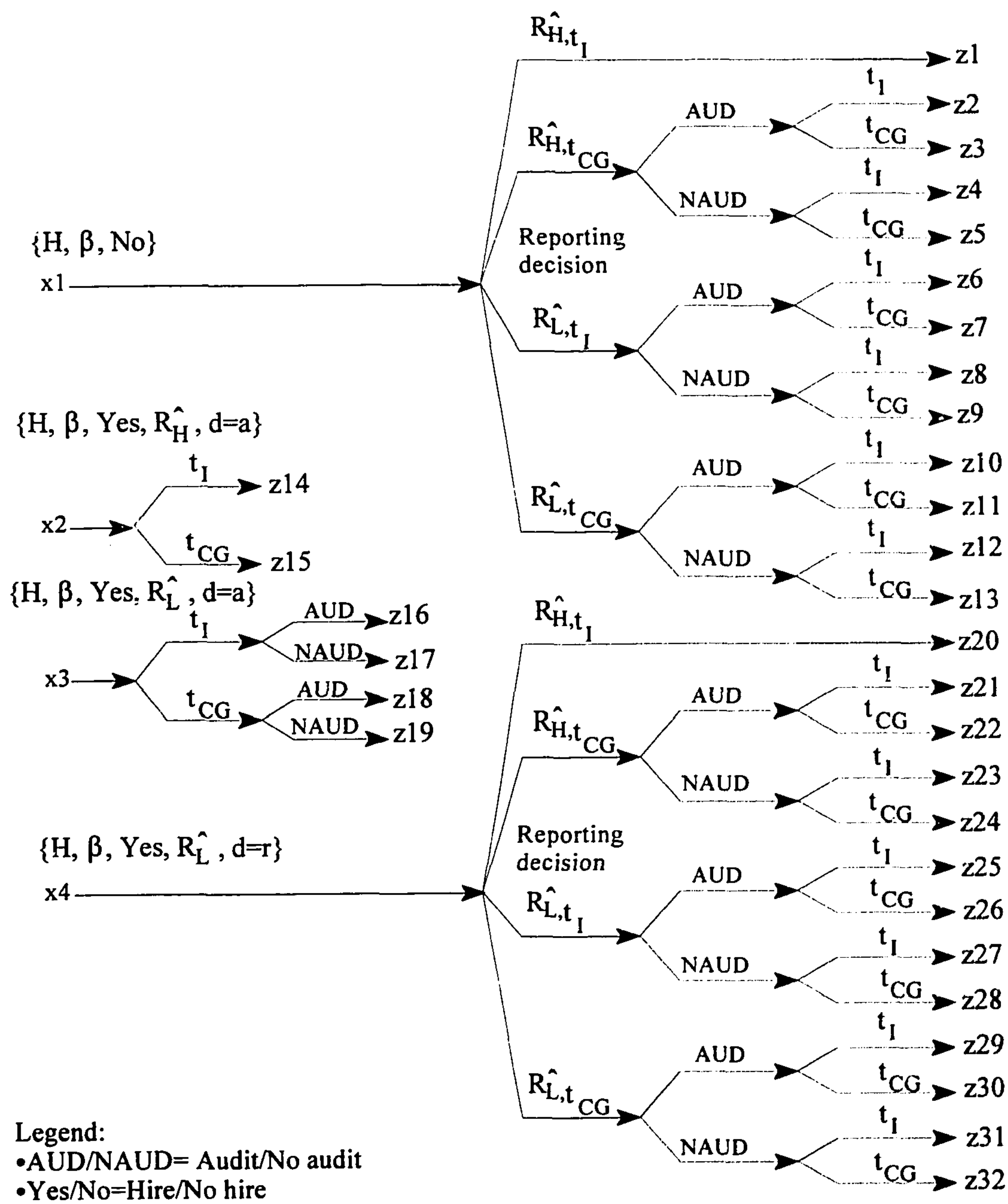


FIGURE 3.1a
EVOLUTION OF THE GAME



Legend:
•AUD/NAUD= Audit/No audit
•Yes/No=Hire/No hire
•Payoffs (terminal nodes) defined in Appendix B

FIGURE 3.1b
EVOLUTION OF THE GAME POST a/r DECISION BY PRACTITIONER

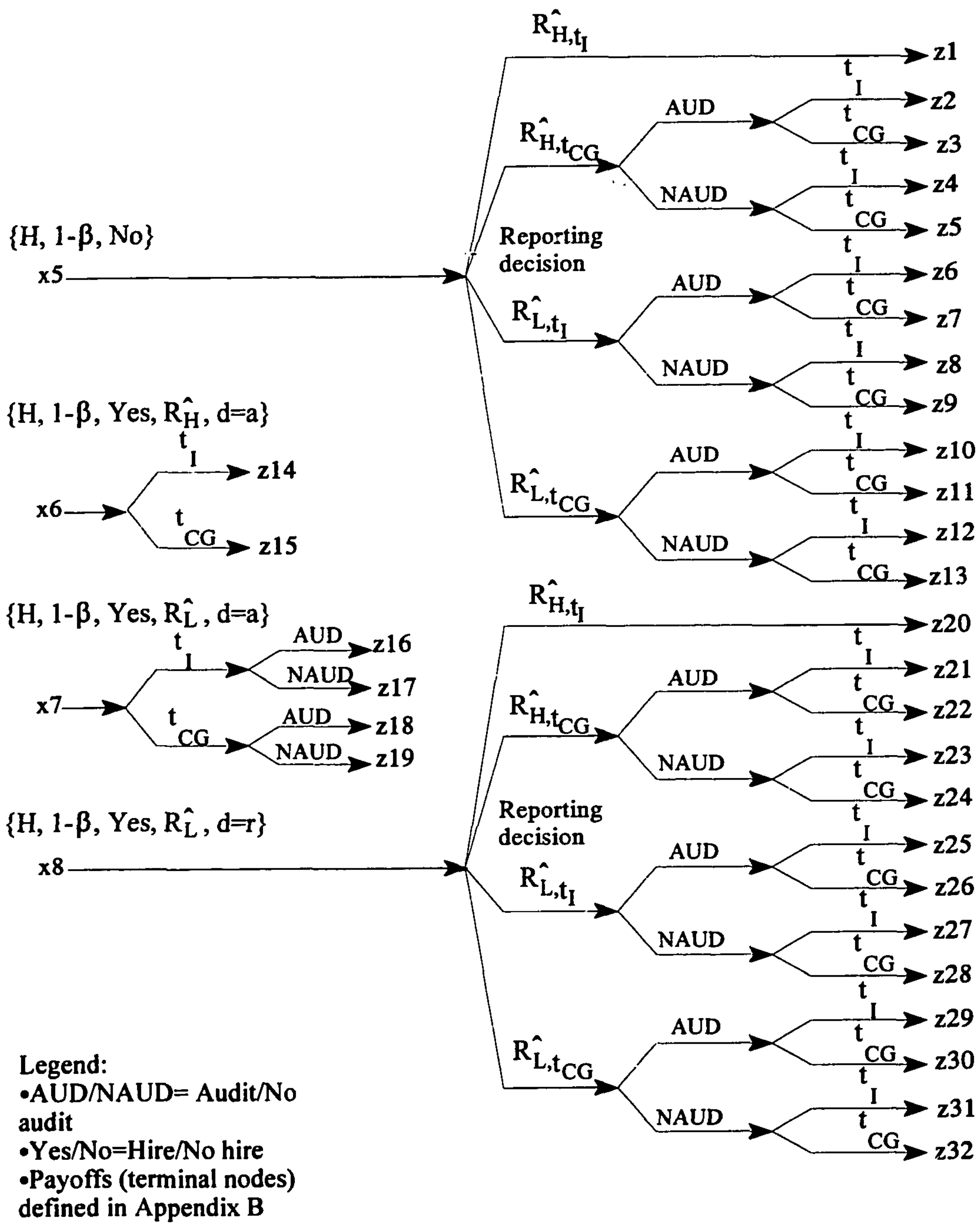


FIGURE 3.1c
EVOLUTION OF THE GAME POST a/r DECISION BY PRACTITIONER

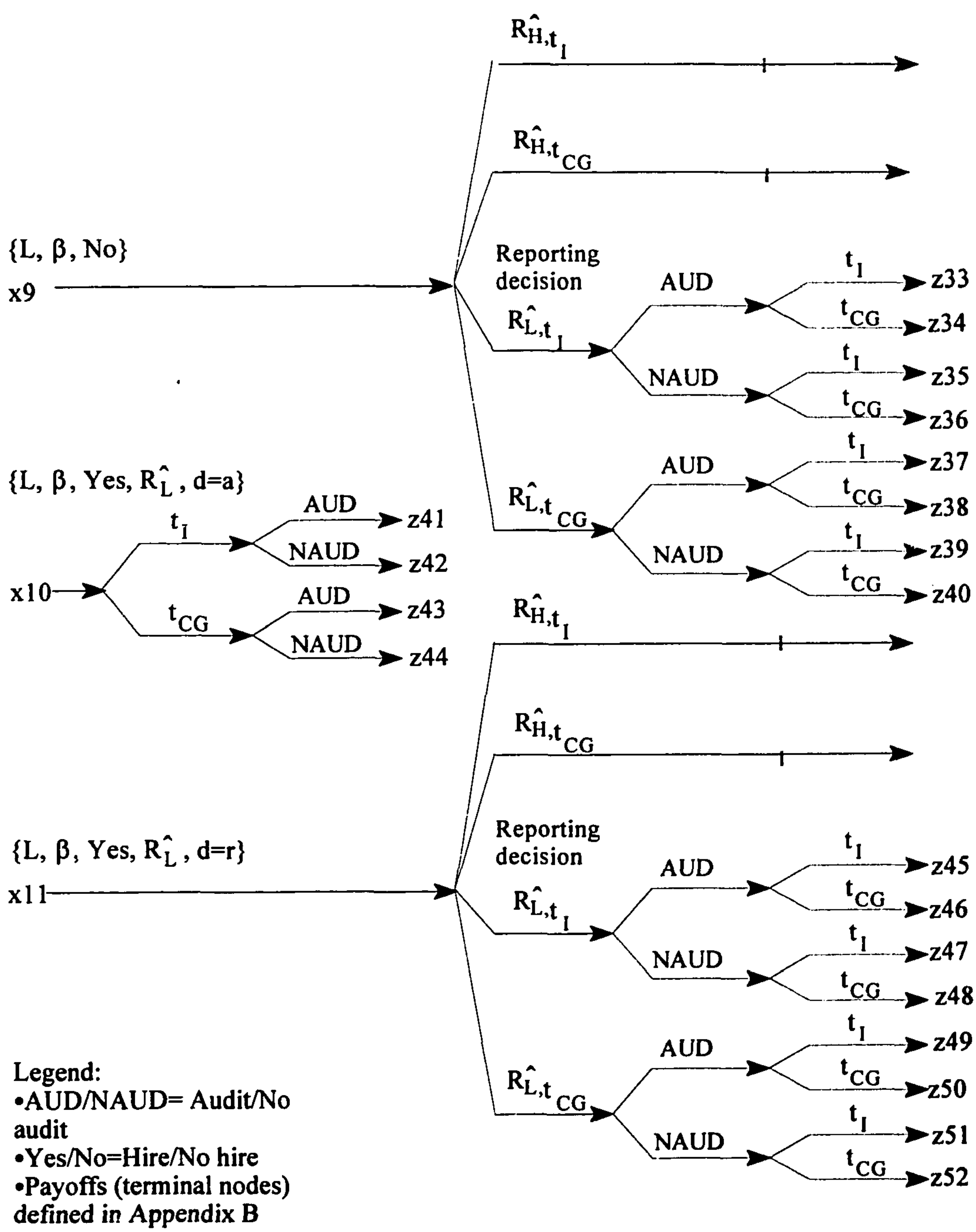


FIGURE 3.1d
EVOLUTION OF THE GAME POST a/r DECISION BY PRACTITIONER

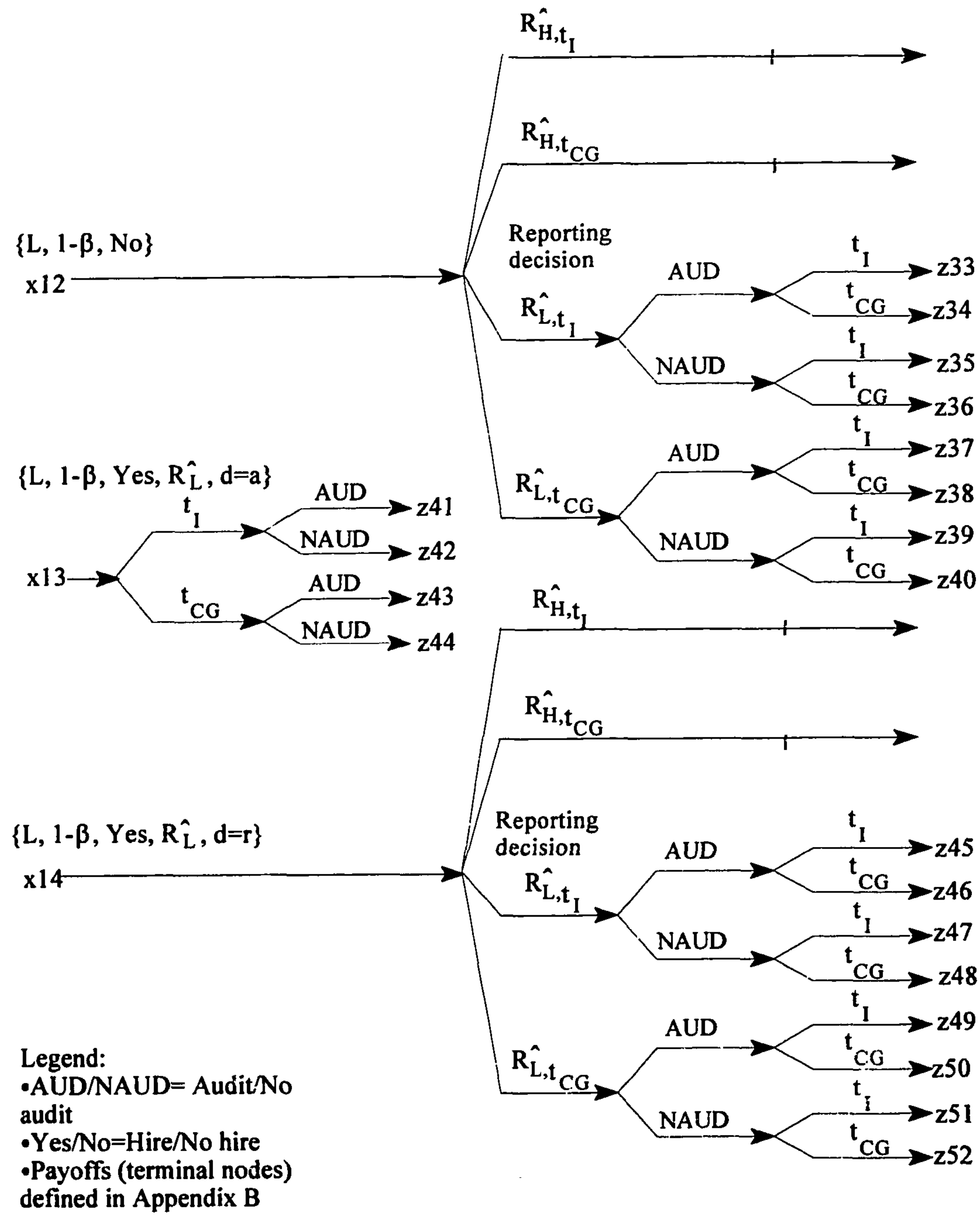


FIGURE 3.1e
EVOLUTION OF THE GAME POST a/r DECISION BY PRACTITIONER

CHAPTER 4

ANALYSIS OF TAXPAYER AND TAX AGENCY DECISIONS

4.1 Introduction

This chapter focuses on the taxing authority's and taxpayers' strategic choices and characterizes their optimal decisions. The results are then utilized in Chapter 5 in the analysis of the equilibria of the game.

The structure of the game is similar to that of the von Stackelberg extensive form game in which the taxing authority (Stackelberg Leader) moves first followed by the taxpayers (Followers).[1] For each possible level of investigation, ζ_{θ}, selected by the tax agency, where $\zeta_{\theta} \in [0,1]$ and $\hat{\theta} \in \{\hat{H},\hat{L}\}$, taxpayers choose the strategy that minimizes their expected tax liability. In determining its own strategy, the tax agency, anticipating the effect that the chosen level of investigation has on taxpayers' hiring, communication, and reporting decisions, calculates taxpayers' best responses (reaction curves) to different levels of ζ_{θ}. Given these best responses, it selects the level of ζ_{θ} (and the resulting levels of $v(\zeta_{\theta})$ and $w(\zeta_{\theta})$) which maximizes its expected tax revenue. In equilibrium, the best responses calculated by the tax agency are identical to the characterizations of taxpayers' optimal decisions.

Although a number of events and actions have been specified in the description of the model (see Chapter 3, Section 3.6), the game can be analyzed as a four-stage game where each stage corresponds to a player's (tax agency's or taxpayer's) decision. In the first stage, the tax agency chooses the level of investigation ζ_{θ} associated with each

---

[1]See Fudenberg and Tirole [1991, 67-69] for a description of the von Stackelberg game in the duopoly context.

message, R_θ, that can be communicated by taxpayers who hire practitioners. Taxpayers, having observed the tax agency's chosen level of investigation, make their hiring decision in the second stage. In the event that practitioners are hired, taxpayers choose the message that they communicate to practitioners in the third stage. Where a taxpayer's message is accepted, the practitioner resolves the uncertainty about the tax rate, prepares, and files the return on behalf of the taxpayer. Where a taxpayer's message is rejected or where hiring does not occur, taxpayers proceed to the reporting stage. In this final stage, taxpayers file their own return, choosing both the level of income and the tax rate.[2]

The analysis proceeds utilizing backward induction: that is, for each level of ζ_θ chosen by the tax agency, taxpayers' optimal reporting decisions are first derived, followed by their communication and hiring decisions. The analysis concludes with the examination of the tax agency's decision.

Throughout the analysis, the following assumptions regarding the parameters of the problem are adopted:

<u>Assumption 1</u>:

Since H > L and $t_I > t_{CG}$, two orderings of the tax liabilities can occur:

(i) $t_I H > t_{CG} H > t_I L > t_{CG} L$, or,

(ii) $t_I H > t_I L > t_{CG} H > t_{CG} L$.

In this model, it is assumed that ordering (i) prevails. This assumption implies that the amount of tax that can be evaded is large in comparison to the amount that can be minimized. Although either ordering could prevail, it can be demonstrated that, under ordering (ii), some taxpayers may have incentives to incorrectly report a high level of income when their true level of income is low (see Lemma 1, Section 4.2.1 for an example where $R^i_{\hat{H},t_{CG}}$ would dominate $R^i_{\hat{L},t_I}$). This thesis abstracts from such incentives.

<u>Assumption 2</u>:

A restriction on the taxpayer's cost of being audited, A, is imposed such that it is

---

[2]Recall that where a taxpayer's message has been rejected, a practitioner does not provide tax advice and, thus, the taxpayer remains uncertain about the tax rate.

less costly for any high-type taxpayer who believes with probability one that the true tax rate is t_{CG} (i.e., $\beta=0$) to report using this lower rate rather than the higher rate, t_I, even if the taxpayer is audited with certainty; that is, $t_I H > t_{CG} H + A$.

Although Assumption 2 may appear restrictive and eliminates possible equilibria, it is reasonable from a tax policy perspective. Without this assumption, the taxing authority could induce taxpayers to report an amount greater than that required by law. However, under Canada's "Declaration of Taxpayer Rights", it is stated that taxpayers "are entitled to arrange [their] affairs to pay the least amount of tax the law allows".

Furthermore, Assumptions 1 and 2 imply that it is less costly for low-type taxpayers to truthfully report a low level of income and be audited with certainty than to dishonestly report a high level of income and use the tax rate t_I to avoid the cost of being audited; that is, $t_I H > t_I L + A$.

4.2 Taxpayer Decisions

The taxpayer's decision problem consists of optimally choosing a sequence of actions from the following set of actions: ({Hire, No hire},{R_H, R_L}, {R^i_{H,t_I}, $R^i_{H,t_{CG}}$, R^i_{L,t_I}, $R^i_{L,t_{CG}}$}). The derivation of taxpayers' optimal reporting decisions is first considered in Section 4.2.1. The conditions derived therefrom provide a benchmark against which the hiring and communication decisions are analyzed.[3]

4.2.1 Fourth Stage Reporting Decision

A taxpayer files a self-prepared return under two circumstances: either (1) a taxpayer does not seek practitioner assistance or; (2) a taxpayer's message has been

---

[3]For expositional purposes, the term "strategy" will be utilized when referring to taxpayers' complete set of actions, i.e., their hiring, communication, and reporting actions. Otherwise, the term "decision" will be used interchangeably with "action" when referring to these actions separately. Furthermore, the term "filing" decision will be utilized interchangeably with "reporting" decision when referring to situations where taxpayers prepare their own return.

rejected by the practitioner who was hired in the second stage.[4] In either case, taxpayers must decide which level of income, $\hat{\theta} \in \{\hat{H},\hat{L}\}$, to report on their tax returns, as well as which tax rate, $t_j \in \{t_l, t_{CG}\}$, to apply in the calculation of their tax liabilities, given the private information that they possess and the parameters of the model. Taxpayers therefore have four reports from which to choose: $R^i_{\hat{H},t_l}$, $R^i_{\hat{H},t_{CG}}$, $R^i_{\hat{L},t_l}$, $R^i_{\hat{L},t_{CG}}$. A detailed analysis of the no hiring and hiring cases is presented below.

Case 1: No Hiring

a) Low-type taxpayers

A comparison of the expected tax liabilities under the four reporting decisions leads to the following lemma which is important in the subsequent analysis.[5]

Lemma 1: Low-type taxpayers, having beliefs β about the tax rate never report $R^i_{\hat{H},t_l}$ and $R^i_{\hat{H},t_{CG}}$ since these reports are dominated by $R^i_{\hat{L},t_l}$ and $R^i_{\hat{L},t_{CG}}$.

Proof: See Appendix C.

Lemma 1 establishes the result that low-type taxpayers truthfully report their level of income even if the tax agency audits with certainty. This result follows from Assumptions 1 and 2 which imply that taxpayers will not overreport their level of income.

Moreover, the report $R^i_{\hat{L},t_{CG}}$ is preferred to $R^i_{\hat{L},t_l}$ if:

---

[4]Recall that when a taxpayer's message is accepted by the practitioner, the practitioner resolves the taxpayer's uncertainty about the tax rate and files the return on behalf of the taxpayer. Consequently, the taxpayer has no decision to make once the message is accepted.

[5]See Tables B.1 and B.2 in Appendix B for a complete specification of the expected payoffs to the taxpayers and the tax agency, respectively.

$$E(TL \mid R^i_{\hat{L},t_I}, L, \beta) > E(TL \mid R^i_{\hat{L},t_{CG}}, L, \beta), \tag{1}$$

or equivalently, if:

$$\begin{aligned} &\gamma^i[\beta t_I L + (1-\beta) t_{CG} L + A] + (1-\gamma^i) t_I L > \\ &\gamma^i[\beta (t_I L + \pi(t_I L - t_{CG} L)) + (1-\beta) t_{CG} L + A] + (1-\gamma^i) t_{CG} L, \end{aligned} \tag{2}$$

where $E(TL \mid R^i_{\hat{L},t_I}, L, \beta)$ is the expected tax liability incurred by a taxpayer who files a self-prepared return $R^i_{\hat{L},t_I}$ when the true level of income is low and the taxpayer holds beliefs β about the tax rate. Inequality (2) can be simplified and reformulated in terms of the taxpayer's belief that the income rate of tax, t_I, applies:

$$\beta < \frac{(1-\gamma^i)}{\gamma^i \pi} \equiv \beta^*_L. \tag{3}$$

β^*_L is defined as the *cut-off* or *critical* value; the point of intersection between the two expected payments. Low-type taxpayers report $R^i_{\hat{L},t_{CG}}$ ($R^i_{\hat{L},t_I}$) depending upon whether their belief β is lower (higher) than β^*_L. This implies that their reporting decisions are a function of the probability that the tax agency audits a self-prepared return, γ^i, the interest rate charged on underpayments, π, as well as their beliefs β about the tax rate. Note that only one critical value, β^*_L, is obtained since, by Lemma 1, low-type taxpayers have only two reports from which to choose.

It follows from condition (3) that $\beta^*_L = 0$ when $\gamma^i = 1$. In this case, *all* low-type taxpayers report $R^i_{\hat{L},t_I}$, for all $\beta \in [0,1]$. However, since by assumption $\gamma^i < 1$, this case is disregarded. At the other extreme, $\beta^*_L \geq 1$ when $0 < \gamma^i \leq 1/(1+\pi)$. In this case, *all* low-type taxpayers report $R^i_{\hat{L},t_{CG}}$, for all $\beta \in [0,1]$. Finally, when $1/(1+\pi) < \gamma^i < 1$, the cut-off β value occurs at an interior point, $0 < \beta^*_L < 1$, such that some low-type taxpayers report $R^i_{\hat{L},t_{CG}}$ while others report $R^i_{\hat{L},t_I}$. The conditions under which low-type taxpayers make their reporting decisions are summarized in Proposition 1.

Proposition 1: Low-type taxpayers' reporting decisions can be characterized as follows:

(1) If $0 < \gamma^i \leq 1/(1+\pi)$, then *all* low-type taxpayers report $R^i_{\hat{L},t_{CG}}$, for all $\beta \in [0,1]$.[6]

(2) If $1/(1+\pi) < \gamma^i < 1$, there exists a unique β^*_L, $0<\beta^*_L<1$, such that all taxpayers having beliefs $\beta \leq \beta^*_L$ report $R^i_{\hat{L},t_{CG}}$ and taxpayers having beliefs $\beta \geq \beta^*_L$ report $R^i_{\hat{L},t_I}$.

Proof: See Appendix C.

b) High-type taxpayers

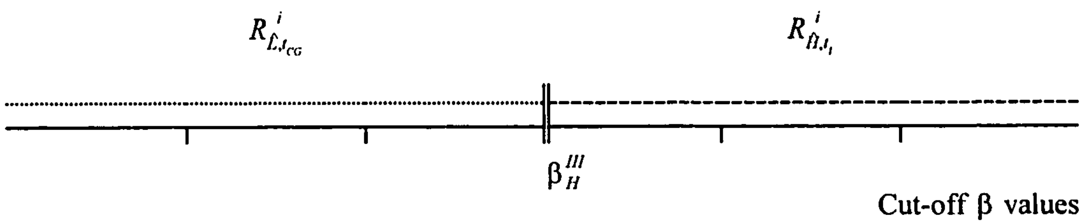
High-type taxpayers follow the same decision-making process as low-type taxpayers. However, unlike in that case, there are no dominated reports. Consequently, high-type taxpayers choose from among all four possible reports. A comparison of the expected tax liabilities associated with the four reporting options $R^i_{\hat{\theta},t_J}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$ and $t_J \in \{t_I, t_{CG}\}$, leads to a set of cut-off β values which are utilized in determining the conditions under which taxpayers choose a particular report. These cut-off values are rank ordered and are then utilized to partition the population of taxpayers into groups based upon their beliefs about the tax rate. Taxpayers' reporting decisions can then be inferred from the partitionings obtained. However, it is demonstrated in Proposition 2 below that the probability that the tax agency audits a taxpayer's return affects the ordering of the cut-off β values; that is, different orderings of the β values and, therefore, different partitionings of the population of taxpayers are obtained depending on the tax agency's audit probability. For a given set of parameter values, three audit probability intervals must be considered in characterizing taxpayers' decisions. The results are presented in

[6]Note that a taxpayer holding belief $\beta=1$ about his or her tax rate is indifferent between the two reports, $R^i_{\hat{L},t_I}$ and $R^i_{\hat{L},t_{CG}}$; however, given that taxpayers' beliefs are continuous over the interval [0,1], any randomizations are probability measure zero and, thus, are ignored.

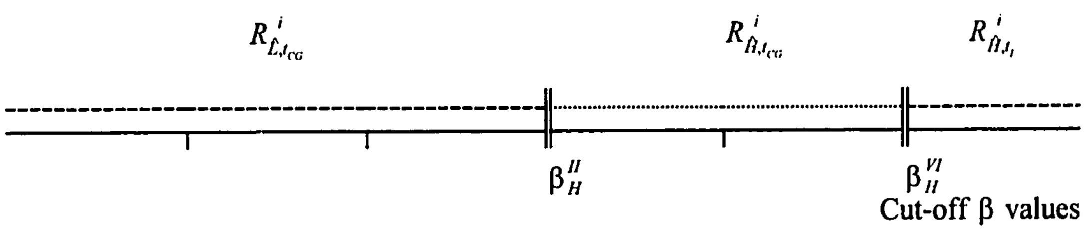
Proposition 2. For a description of the steps followed in obtaining the audit probability intervals, the cut-off β values and their orderings, and taxpayers' reporting decisions, see the proof of Proposition 2 in Appendix C.

Proposition 2: For a given set of parameter values, high-type taxpayers' reporting decisions are characterized as depicted in Figure 4.1 below.[7]

(1) Where $0<\gamma^i\leq\gamma^i_1$,



(2) Where $\gamma^i_1<\gamma^i\leq\gamma^i_2$,



[7]See the proof of this proposition in Appendix C for a specification of the cut-off audit probabilities, γ^i_k, k=1,2, and the cut-off β values, β^h_H, h=II, III, IV, and VI.

(3) *Where* $\gamma_2^i < \gamma^i < 1$,

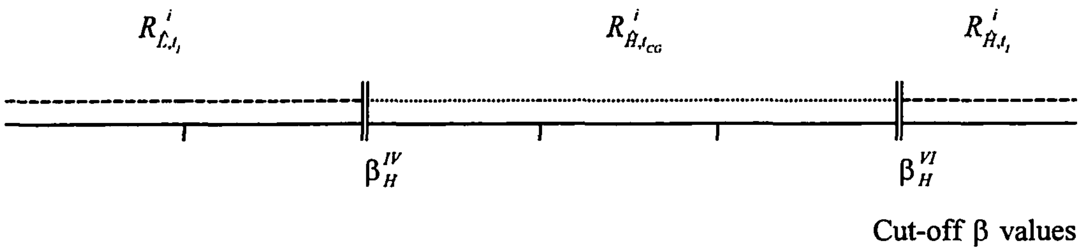


FIGURE 4.1

High-type Taxpayers' Reporting Decisions

Proof: See Appendix C.

The results obtained in Proposition 2 provide intuitive characterizations of high-type taxpayers' reporting decisions and are utilized extensively in the subsequent analysis. For a given set of parameter values and a specified audit probability, high-type taxpayers choose their report according to whether their belief β about the tax rate is lower or higher than the critical value applicable to their situation.

It should be noted that the critical values calculated above may be less than zero or greater than one depending on the set of parameter values and the audit probability interval considered. Given such an occurrence, one or more reports will dominate the other(s) for all $\beta \in [0,1]$. For example, when the audit probability lies in the interval $\gamma_2^i < \gamma^i < 1$, ($\gamma_2^i = 1/(1+\pi)$), as derived in the proof of Proposition 2, Appendix C), the critical value β_H^{IV} is strictly less than zero.[8] Consequently, the report $R^i_{\hat{H},t_{CG}}$ dominates $R^i_{\hat{L},t_l}$

---

[8] β_H^{IV} (defined in the proof of Proposition 2 of Appendix C) is nonnegative if, and only if:

$$\gamma^i \le \frac{(t_{CG}H - t_l L)}{(1+\pi)(t_{CG}H - t_l L) + m(t_l L - t_{CG}L)}.$$

Since the audit probability lies in the interval $1/(1+\pi) < \gamma^i < 1$, and as the condition immediately above is less than $1/(1+\pi)$, β_H^{IV} is strictly less than zero.

since $\beta > \beta_H^{IV}$ for all $\beta \in [0,1]$. As a result, taxpayers' reporting decisions in case (3) are reduced to a choice between $R^i_{\hat{H},t_{CG}}$ and $R^i_{\hat{H},t_l}$. An examination of all the critical values in Figure 4.1 reveals that β_H^{IV} is the only value which is *always* less than zero for any set of parameter values and the audit probability interval considered.

Given the results obtained in Proposition 2, it is interesting to note that, when the audit probability lies in the interval $0 < \gamma^i \leq \gamma^i_1$, taxpayers who file a self-prepared return either report the highest or the lowest tax liability (i.e., $R^i_{\hat{L},t_{CG}}$ or $R^i_{\hat{H},t_l}$), even though they have four possible reports from which to choose. The intuition for this result is that if taxpayers' beliefs that the tax rate t_l applies are lower than β_H^{III}, then the expected penalty and interest charges are sufficiently low that taxpayers evade and report a low level of income (see the expected tax liabilities specified in Table B.1 of Appendix B). Furthermore, since $\gamma^i_1 < 1/(1+\pi)$, all high-type taxpayers who report a low level of income utilize the capital gains rate, t_{CG}; hence, taxpayers file the return $R^i_{\hat{L},t_{CG}}$. However, as taxpayers' beliefs that the tax rate t_l applies increases, the expected costs to those taxpayers of evading increase. When $\beta > \beta_H^{III}$, the expected costs of evading, in absolute terms, exceed the expected benefits, and taxpayers report honestly. Furthermore, taxpayers who truthfully report a high level of income can save not only the expected interest charges but also the expected cost of being audited if they utilize the tax rate t_l, since they will never be audited; therefore, they file the report $R^i_{\hat{H},t_l}$.

When the audit probability lies in the interval $\gamma^i_2 < \gamma^i < 1$, the expected costs of evading (in absolute terms) always exceed the expected benefits, regardless of the beliefs β held by taxpayers; hence, high-type taxpayers never evade and choose the tax rate according to whether their belief β is higher or lower than the critical value β_H^{VI}.

Case 2: Hiring: Taxpayers Rejected by Practitioners

When a taxpayer's message, R_θ, is rejected by the practitioner who was hired in the second stage, the taxpayer must file a self-prepared return. Rejected taxpayers apply the same decision rules in choosing their optimal report as in the no hiring case. The identical result is obtained because, by assumption, the tax agency does not know that taxpayers hired practitioners and were rejected by them and, therefore, it does not obtain new information about taxpayers. Additionally, rejected taxpayers do not resolve their uncertainty about their tax rate. Rejected taxpayers are therefore essentially playing the same game with the tax agency as those who never hired: low-type taxpayers select their optimal report according to the conditions derived in Lemma 1 and Proposition 1 and high-type taxpayers make their reporting decisions according to the conditions derived in Proposition 2.

A Specific Case

As illustrated in Figure 4.1 (Proposition 2) above, three audit probability intervals must be considered in providing a complete characterization of high-type taxpayers' reporting decisions: (1) $0<\gamma^i\leq\gamma_1^i$; (2) $\gamma_1^i<\gamma^i\leq\gamma_2^i$; and (3) $\gamma_2^i<\gamma^i<1$.[9] Similarly, two audit probability intervals must be considered in analyzing low-type taxpayers' decisions: (1) $0<\gamma^i\leq 1/(1+\pi)$; and (2) $1/(1+\pi)\leq\gamma^i<1$ (see Proposition 1). Note that the first two audit probability intervals for high-type taxpayers coincide with the first audit probability interval for low-type taxpayers. Since taxpayers' reporting decisions derived in this section affect their hiring and communication decisions in the second and third stages, respectively, to simplify the analysis, only one case, in which $\gamma_2^i<\gamma^i<1$ $(\gamma_2^i=1/(1+\pi))$,

---

[9]The audit cut-off values γ_1^i and γ_2^i are derived in the proof of Proposition 2 in Appendix C.

is thoroughly analyzed.[10]

Recall from earlier discussion that, when $\gamma_2^i < \gamma^i < 1$, high-type taxpayers' reporting decisions are to file the self-prepared return $R^i_{\hat{H},t_{CG}}$ ($R^i_{\hat{H},t_I}$) depending upon whether their belief β is lower (higher) than β_H^{VI}, where $0<\beta_H^{VI}<1$.[11] Furthermore, low-type taxpayers file the self-prepared return $R^i_{\hat{L},t_{CG}}$ ($R^i_{\hat{L},t_I}$) depending upon whether their belief β is lower (higher) than β_L^* (see Proposition 1).

The audit probability interval selected, $\gamma_2^i < \gamma^i < 1$, may be viewed as applying to a particular class of taxpayers. These taxpayers have a number of relevant characteristics in common which places them in the highest audit class. For example, they may be involved in transactions such as tax shelters or the sale of investments for which the probability of audit and assessment is high. These are the more interesting taxpayer types who have more at stake than, for example, those whose income is entirely subject to withholding at source. Therefore, f(β) and p(H) refer to the distribution of tax rates and income levels within the class, rather than to the distribution of tax rates and income levels within the entire national or regional population of taxpayers.[12]

The audit probability interval is also selected for these additional reasons. First, for low-type taxpayers who self-report, it is the only interval where an interior cut-off value β_L^* exists and no reporting decision strictly dominates another, for all $\beta \in [0,1]$ (see

---

[10]A similar approach can be utilized to analyze the other audit probability intervals. A brief discussion is provided in Section 5.5.

[11]The cut-off value $\beta_H^{VI} \equiv [1 - \gamma^i A/(t_I H - t_{CG} H)]/\gamma^i(1+\pi)$ is derived in the proof of Proposition 2 in Appendix C. This cut-off value is always less than one and is greater than zero if $\gamma^i A < (t_I H - t_{CG} H)$. Since by Assumption 2, $A < (t_I H - t_{CG} H)$, the inequality holds and $0 < \beta_H^{VI} < 1$.

[12]This argument is similar to that made in Erard and Feinstein [1994].

Proposition 1). Second, although certain assumptions maintained in this model differ significantly from those in Beck et al. [1994],[13] an interesting comparison can be made between the results obtained in this model, when $1/(1+\pi)<\gamma^{i}<1$, and the equilibrium characterized in that paper. In the no hiring case, Beck et al. obtain a partially separating equilibrium if the audit probability (determined in equilibrium) is greater than the inverse of one plus the penalty rate. An interior cut-off value is obtained such that some taxpayers report a high tax liability while others report a low tax liability. This result is similar to the result obtained in this thesis with respect to low-type taxpayers. Finally, although high-type taxpayers never evade when they file their own return, they may attempt to evade when they hire practitioners. Consequently, the level of investigation chosen by the tax agency is expected to affect taxpayers' hiring and communication decisions. The audit probability interval selected, therefore, does not preclude the examination of the trade-offs faced by the participants.

Although only one case is thoroughly analyzed, Sections 4.2.2 and 4.2.3 first present taxpayers' communication and hiring options, respectively, for all audit probability intervals. Each section then focuses on taxpayers' decisions when $1/(1+\pi)<\gamma^{i}<1$ (the specific case).

4.2.2 Third Stage Communication Decisions

This section focuses on taxpayers' communication decisions to practitioners, given that hiring occurs in the second stage. Taxpayers choose the message R_{θ}, $\theta \in \{\hat{H},\hat{L}\}$, i.e, the level of income, that they communicate to practitioners, taking into consideration the level of investigation, ζ_{θ}, selected by the tax agency and utilized by practitioners in their

[13]Specifically, Beck et al. model the audit decision as a strategic choice for the tax agency whereas the model in this thesis assumes that the tax agency strategically chooses a level of investigation that practitioners utilize in detecting evasion while assuming that the audit probability is exogenously specified. Furthermore, unlike Beck et al., this thesis explicitly models the transfer of information between the taxpayer and the practitioner and, additionally, distinguishes between taxpayers' evasion and minimization decisions.

examination of the message, and the resulting probability that this message will be accepted or rejected. Where a taxpayer's message is accepted, the practitioner provides advice through resolving the uncertainty about the tax rate, prepares, and files the return on behalf of the taxpayer. When the message is rejected by the practitioner, taxpayers file their own return, according to the conditions specified in the fourth stage (see Section 4.2.1, Propositions 1 and 2).

From the tax agency's perspective, a higher tax revenue will be collected at a minimum cost to the tax agency when taxpayers report a high rather than a low level of income even if the true level of income is low. This result follows from Assumption 1 (i.e., $t_{CG}H > t_I L$). It is therefore optimal for the tax agency to always have the practitioner accept a taxpayer's message R_{fl} without performing an investigation (i.e., $\zeta_{fl}=0$). This leads to the following observation.

Observation 1: Given the message R_{fl}, the tax agency's optimal choice of the level of practitioner investigation is $\zeta_{fl}=0$. In this case, practitioners always accept the message R_{fl} without performing an investigation of taxpayers' financial affairs: $w(\zeta_{fl}=0)=(1-v(\zeta_{fl}=0))=1$. Given that the message is accepted, practitioners resolve the uncertainty about the tax rate and file the return on behalf of the taxpayers.[14]

a) Low-type Taxpayers

The following lemma demonstrates that low-type taxpayers who hire a practitioner never overreport their level of income. This lemma is consistent with Observation 1, where the message R_{fl} is always accepted, the tax agency's chosen level of investigation is $\zeta_{fl}=0$, and practitioners who receive the message R_{fl} know that this message was

[14]Recall that the resolution of uncertainty about the tax rate does not require the practitioner to perform an investigation since it is assumed that taxpayers truthfully provide all rate-relevant information.

communicated by a high-type taxpayer.

Lemma 2: Low-type taxpayers always report their true level of income to practitioners as the message $R_{\hat{H}}$ is dominated by $R_{\hat{L}}$.

Proof: See Appendix C.

b) High-type Taxpayers

High-type taxpayers choose to communicate either $R_{\hat{H}}$ or $R_{\hat{L}}$ to practitioners. Where they select the message $R_{\hat{H}}$, taxpayers know, by Observation 1, that this message will always be accepted. However, where the message $R_{\hat{L}}$ is provided, practitioners investigate the message utilizing the level of investigation $\zeta_{\hat{L}}$, and either accept or reject it. If the message is accepted, taxpayers have no additional decision to make; the practitioner resolves the uncertainty about the tax rate and files the return on behalf of the taxpayer. However, if the message is rejected, taxpayers must file their own return, choosing both the level of income and the tax rate, according to the reporting decision rules specified in the fourth stage (see Proposition 2).

High-type taxpayers choose their message by comparing their expected tax liabilities from communicating $R_{\hat{H}}$ and $R_{\hat{L}}$. Since a message $R_{\hat{L}}$ may be rejected, taxpayers must also consider their fourth stage reporting decisions in solving their optimal communication decisions; that is, the expected tax liability from reporting $R_{\hat{L}}$ is conditioned on the probability that a message may be accepted or rejected and if rejected, on the report R^{i}_{θ,t_j} filed by taxpayers. For ease of presentation, taxpayers' decisions are described as a choice between their message $R_{\hat{H}}$ and $R_{\hat{L}}$ to the practitioner and the report R^{i}_{θ,t_j} to the tax agency if the message $R_{\hat{L}}$ is rejected. The comparisons of the expected tax liabilities under the various choices provide the critical rejection probabilities, $v(\zeta_{\hat{L}})_g$, g=I,II,III, which make taxpayers indifferent between choosing $R_{\hat{H}}$ and $R_{\hat{L}}$ and, additionally, R^{i}_{θ,t_I} if $R_{\hat{L}}$ is rejected.[15] The results are presented in Lemma 3 below.

Lemma 3: For a given level of practitioner investigation, $\zeta_{\hat{L}}$, specified by the tax agency, and a resulting probability that a message $R_{\hat{L}}$ will be correctly rejected by the practitioner, $\nu(\zeta_{\hat{L}})$, the message $R_{\hat{H}}$ is dominated by any one or all of the following message/report combinations:[16]

I. $R_{\hat{L}}$ and $R^{i}_{\hat{L},t_{CG}}$ if rejected, if:

$$\nu(\zeta_{\hat{L}}) < \frac{(1-\gamma^{p}(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_I H-t_I L)]-\gamma^{p}A+(F(\zeta_{\hat{H}})-F(\zeta_{\hat{L}}))}{(\gamma^{i}-\gamma^{p})(1+\pi+m)[(t_{CG}H-t_{CG}L)+\beta(t_I H-t_{CG}H)+A]-\gamma^{i}\beta m(t_I L-t_{CG}L)-(1-\gamma^{p}(1+\pi+m))\beta(t_I L-t_{CG}L)} \qquad \textbf{(4)}$$

or,

II. $R_{\hat{L}}$ and $R^{i}_{\hat{H},t_{CG}}$ if rejected, if:

$$\nu(\zeta_{\hat{L}}) < \frac{(1-\gamma^{p}(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_I H-t_I L)]-\gamma^{p}A+(F(\zeta_{\hat{H}})-F(\zeta_{\hat{L}}))}{(1-\gamma^{p}(1+\pi+m))[(t_{CG}H-t_{CG}L)-\beta(t_I L-t_{CG}L)]+(\gamma^{i}-\gamma^{p})[\beta(1+\pi)(t_I H-t_{CG}H)+A]-\gamma^{p}m\beta(t_I H-t_{CG}H)} \qquad \textbf{(5)}$$

or,

III. $R_{\hat{L}}$ and $R^{i}_{\hat{H},t_I}$ if rejected, if:

$$\nu(\zeta_{\hat{L}}) < \frac{(1-\gamma^{p}(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_I H-t_I L)]-\gamma^{p}A+(F(\zeta_{\hat{H}})-F(\zeta_{\hat{L}}))}{(t_I H-t_{CG}L)-\gamma^{p}(1+\pi+m)[(t_{CG}H-t_{CG}L)+\beta(t_I H-t_{CG}H)]-(1-\gamma^{p}(1+\pi+m))\beta(t_I L-t_{CG}L)-\gamma^{p}A} \qquad \textbf{(6)}$$

Proof: See Appendix C.

---

[15]See Table B.1 in Appendix B for a specification of taxpayers' expected tax liabilities.

[16]Recall that by Proposition 2, high-type taxpayers never report $R^{i}_{\hat{L},t_I}$ as it is always dominated by another report.

Denote the right hand side of inequalities (4), (5), and (6) as $v(\zeta_{\hat{L}})_{I}$, $v(\zeta_{\hat{L}})_{II}$, and $v(\zeta_{\hat{L}})_{III}$, respectively. These critical rejection probabilities can be interpreted as the ratio of the expected net cost (benefit) to taxpayers of communicating $R_{\hat{H}}$ to the expected net cost (benefit) of communicating $R_{\hat{L}}$ and, if $R_{\hat{L}}$ is rejected, of reporting $R^{i}_{\hat{L},t_{CG}}$, $R^{i}_{\hat{H},t_{CG}}$, and $R^{i}_{\hat{H},t_{I}}$, respectively, to the tax agency. High-type taxpayers trade off the net costs associated with correctly communicating a high level of income and resolving their uncertainty about the tax rate (tax minimizing) against the net costs associated with communicating a low level of income and, thus, evading, and facing the possibility that their message will be rejected and that their uncertainty will not be resolved. Remember that taxpayers derive benefits from obtaining advice either through learning with certainty that they can use the lower tax rate, t_{CG} (when a higher tax rate would be used where practitioner assistance is not sought), thus reducing the amount of tax paid to the tax agency, or through learning that the higher rate, t_{I}, is the true tax rate, thereby saving the expected interest charges on the tax deficiency and possibly the expected cost of being audited.

An implication of the above is that taxpayers communicate $R_{\hat{L}}$ (i.e., attempt to evade), or $R_{\hat{H}}$ (i.e., communicate truthfully), depending upon whether the probability that a message $R_{\hat{L}}$ is rejected is lower or higher than the critical value applicable to their situation. Intuitively, the higher is the probability that the lie is detected, the greater are taxpayers' incentives to truthfully communicate their (high) level of income. Only one of the three conditions presented above is relevant to a particular taxpayer's decision; that is, the critical value which must be considered by a particular taxpayer depends on his or her fourth stage reporting decision if rejected by the practitioner (which has already been analyzed, see Section 4.2.1). For example, taxpayers who choose to self-report $R^{i}_{\hat{L},t_{CG}}$ if $R_{\hat{L}}$ is rejected utilize condition (4) above in determining the message that they provide to the practitioner.

The conditions presented in Lemma 3 provide insights about the interaction between taxpayers' communication decisions and the tax agency's choice of $\zeta_{\mathcal{L}}$. As mentioned earlier, taxpayers' communication decisions involve a trade-off between their desire to engage in tax evasion and their opportunity to engage in tax minimization. Taxpayers must consider the tax agency's strategic choice of $\zeta_{\mathcal{L}}$ in choosing their own actions. Moreover, the tax agency knows that it can influence taxpayers' strategies and that it must take taxpayers' responses into consideration in choosing its own strategy. Through its choice of the level of investigation, the tax agency can influence the levels of evasion and minimization activities.

As will be demonstrated below (see specific case), taxpayers' beliefs β about their true tax rate are an important factor in the ordering of the critical values, $v(\zeta_{\mathcal{L}})_g$, g=I,II,III, and, thus, in the determination of taxpayers' communication and reporting decisions.

The critical rejection probabilities computed in Lemma 3, in conjunction with the cut-off β values computed in the fourth stage (see Propositions 1 and 2), are utilized to partition the population of taxpayers who seek practitioner assistance into groups based upon their beliefs about the tax rate. Taxpayers' communication decisions to practitioners and their reporting decisions to the tax agency in the event that their message is rejected can then be inferred from the partitioning obtained. As it has already been demonstrated in Section 4.2.1 that different reporting decisions and, therefore, different partitionings of the population of taxpayers (and ultimately, different equilibria) are obtained depending on the tax agency's audit probability, the ensuing discussion presents only the case in which $\gamma_2^i < \gamma^i < 1$, where $\gamma_2^i = 1/(1+\pi)$ (i.e., the specific case).

Specific Case: $1/(1+\pi) < \gamma^i < 1$

a) Low-type taxpayers

From Lemma 2, all low-type taxpayers who hire a practitioner provide the message $R_{\mathcal{L}}$. This result holds regardless of the tax agency's audit probability. Furthermore, when the audit probability lies in the interval $\gamma_2^i < \gamma^i < 1$, $\gamma_2^i = 1/(1+\pi)$, rejected taxpayers report $R^{i}_{\hat{L},t_{CG}}$ ($R^{i}_{\hat{L},t_l}$) to the tax agency depending upon whether their belief β about the tax rate is lower (higher) than the critical β value, $\beta^{*}_{L} \equiv (1-\gamma^{i})/\gamma^{i}\pi$ (see Proposition 1).

b) High-type taxpayers

As demonstrated in Lemma 3, high-type taxpayers' decisions to communicate the message $R_{\hat{H}}$ or $R_{\hat{L}}$ depend upon whether v($\zeta_{\hat{L}}$), the probability that a message $R_{\hat{L}}$ will be rejected by a practitioner who utilizes the level of investigation $\zeta_{\hat{L}}$, is higher or lower than the critical rejection probability applicable to their particular situation. Which critical value applies depends on taxpayers' reporting choices made in the fourth stage, in the event that their message $R_{\hat{L}}$ is rejected. According to Proposition 2, when the audit probability lies in the interval $1/(1+\pi)<\gamma^{i}<1$, rejected high-type taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$ ($R^{i}_{\hat{H},t_l}$) depending upon whether their belief β about the tax rate is lower (higher) than the cut-off β value, $\beta^{VI}_{H} \equiv [1-\gamma^{i}A/(t_l H - t_{CG}H)]/\gamma^{i}(1+\pi)]$.[17] It follows that taxpayers choose their message according to conditions II and III specified in Lemma 3 and, thus, v($\zeta_{\hat{L}}$)$_{\text{II}}$ and v($\zeta_{\hat{L}}$)$_{\text{III}}$ are the relevant critical rejection probabilities.

These critical rejection probabilities are a function of taxpayers' beliefs about their tax rate; hence, each taxpayer calculates a different critical rejection probability conditional on his or her particular β. These values are denoted by $v(\zeta_{\hat{L}})_{II|\beta}$ and $v(\zeta_{\hat{L}})_{III|\beta}$. Depending on the level of investigation $\zeta_{\hat{L}}$ chosen by the tax agency, the resulting rejection probability v($\zeta_{\hat{L}}$), and the magnitude of the critical values $v(\zeta_{\hat{L}})_{II|\beta}$ and $v(\zeta_{\hat{L}})_{III|\beta}$, one of three situations may arise regarding high-type taxpayers' communication decisions: either (1) *all* taxpayers who hire practitioners communicate the message $R_{\hat{H}}$; (2) *all*

[17]It was shown in Section 4.2.1 that, when $1/(1+\pi)<\gamma^{i}<1$, both reports $R^{i}_{\hat{L},t_{CG}}$ and $R^{i}_{\hat{L},t_l}$ are dominated by $R^{i}_{\hat{H},t_{CG}}$ and $R^{i}_{\hat{H},t_l}$.

taxpayers communicate $R_{\hat{L}}$; or (3) *some* taxpayers communicate $R_{\hat{L}}$ while others provide the message $R_{\hat{H}}$. The conditions under which each case occurs are examined below. Additionally, since the critical rejection probability applicable to a particular taxpayer depends upon whether β is less than or greater than the cut-off value β_H^{VI}, the analysis is further subdivided to consider separately taxpayers' communication decisions when taxpayers have beliefs $\beta \leq \beta_H^{VI}$ and $\beta \geq \beta_H^{VI}$. Much of the subsequent analysis focuses on the more interesting case, where some communicate $R_{\hat{L}}$ while others communicate $R_{\hat{H}}$ and, thus, one message does not dominate the other for all taxpayers.

Consider the case where $\beta \leq \beta_H^{VI}$, that is, where high-type taxpayers report $R^{i}_{\hat{H},t_{(VI)}}$ to the tax agency if rejected by the practitioner. From Lemma 3, the critical rejection probability applicable to taxpayers is $v(\zeta_{\hat{L}})_{II|\beta}$ rewritten below:

$$v(\zeta_{\hat{L}})_{II|\beta} = \frac{(1-\gamma^P(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_IH-t_IL)]-\gamma^PA+(F(\zeta_{\hat{H}})-F(\zeta_{\hat{L}}))}{(1-\gamma^P(1+\pi+m))[(t_{CG}H-t_{CG}L)-\beta(t_IL-t_{CG}L)]+(\gamma^I-\gamma^P)[\beta(1+\pi)(t_IH-t_{CG}H)+A]-\gamma^Pm\beta(t_IH-t_{CG}H)} \qquad \textbf{(7)}$$

It follows from (7) above that *all* high-type taxpayers who hire communicate $R_{\hat{H}}$ when $v(\zeta_{\hat{L}})$ is greater than $v(\zeta_{\hat{L}})_{II|\beta}$ for all $\beta \in [0, \beta_H^{VI}]$. At the other extreme, *all* high-type taxpayers communicate $R_{\hat{L}}$ when $v(\zeta_{\hat{L}})$ is less than $v(\zeta_{\hat{L}})_{II|\beta}$ for all $\beta \in [0, \beta_H^{VI}]$.[18] The conditions under which *some* high-type taxpayers communicate $R_{\hat{L}}$ while others provide the message $R_{\hat{H}}$ are investigated below. Since this case requires that $0 < v(\zeta_{\hat{L}})_{II|\beta} < 1$ for at least some $\beta \in [0, \beta_H^{VI}]$, the conditions under which this relationship holds are now examined.

---

[18]No assumptions are made regarding the form of the critical rejection probability function $v(\zeta_{\hat{L}})_{II|\beta}$ when either all high-type taxpayers communicate $R_{\hat{L}}$ or $R_{\hat{H}}$. There exists, however, some set of parameter values for which either case can occur.

Equation (7) (i.e., $v(\zeta_{\ell})_{II|\beta}$) will be greater than zero whenever the numerator and denominator are either both positive or both negative. However, it can be shown that when they are both negative, $v(\zeta_{\ell})_{II|\beta}$ is always greater than one. Since the case of interest requires that $v(\zeta_{\ell})_{II|\beta} \leq 1$ for some taxpayers, attention is focused on the conditions under which the numerator and denominator are both positive. A set of sufficient conditions under which the numerator is positive is given by $\gamma^{p} < 1/(1+\pi+m)$ and

$$(1-\gamma^{p}(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_{I}H-t_{I}L)] > \gamma^{p}A-(F(\zeta_{h})-(F(\zeta_{\ell})). \quad \textbf{(8)}$$

The condition on γ^{p} implies that the difference between the probability that the tax agency audits a self-prepared and a practitioner-prepared return is relatively significant (recall $\gamma^{i} > 1/(1+\pi)$). When the above conditions hold, it can also be shown that the denominator is always positive and that $v(\zeta_{\ell})_{II|\beta} < 1$. Consequently, when $\gamma^{p} < 1/(1+\pi+m)$, there exists some set of parameter values for which $0 < v(\zeta_{\ell})_{II|\beta} < 1$ for at least some $\beta \in [0, \beta_{H}^{VI}]$.

Finally, $0 < v(\zeta_{\ell})_{II|\beta} < 1$ is a continuous function of β for $\beta \in [0, \beta_{H}^{VI}]$ and may be either monotonically increasing or decreasing in β or invariant with β over the specified interval depending upon whether

$$\begin{aligned}&(1-\gamma^{p}(1+\pi+m))[(1-\gamma^{i}(1+\pi))(t_{I}H-t_{CG}H)(t_{CG}H-t_{CG}L)+(\gamma^{i}-\gamma^{p})A\\ &X\,[(t_{I}H-t_{CG}H)-(t_{I}L-t_{CG}L)]]-[-\gamma^{p}A+F(\zeta_{h})-F(\zeta_{\ell})][-(1-\gamma^{p}(1+\pi+m))(t_{I}L-t_{CG}L)\\ &+(\gamma^{i}-\gamma^{p})(1+\pi)(t_{I}H-t_{CG}H)-\gamma^{p}m(t_{I}H-t_{CG}H)]\end{aligned} \quad \textbf{(9)}$$

is greater or less than, or equal to zero, where (9) is the numerator of $\partial v(\zeta_{\ell})_{II|\beta}/\partial\beta$.[19, 20]

---

[19]Note that the denominator of $\partial v(\zeta_{\ell})_{II|\beta}/\partial\beta$ is squared and, therefore, is always positive.

When $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta$ monotonically increases or decreases in β, there exists a unique cut-off value, say β_H^*, $\beta_H^* \leq \beta_H^{VI}$, such that some taxpayers who hire communicate $R_{\hat{L}}$ while others provide the message $R_{\hat{H}}$, as demonstrated in Theorem 1(a) below. However, when $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta = 0$, a unique cut-off β value does not exist.

Theorem 1(a): When $1/(1+\pi) < \gamma^i < 1$, $\gamma^p < 1/(1+\pi+m)$, and for a given set of parameter values such that inequality (8) holds for at least some $\beta \in [0, \beta_H^{VI}]$:

(i) If $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta > 0$ and if the tax agency chooses a level of investigation, say $\zeta_{\hat{L}}^{\circ} > 0$, such that $v(\zeta_{\hat{L}}^{\circ}) \in [v(\zeta_{\hat{L}})_{H|\beta=0}, v(\zeta_{\hat{L}})_{H|\beta=\beta_H^{VI}}]$, then high-type taxpayers' communication decisions can be characterized by a unique cut-off β_H^*, $\beta_H^* \leq \beta_H^{VI}$, such that:

$$0 < v(\zeta_{\hat{L}}^{\circ}) = v(\zeta_{\hat{L}})_{H|\beta=\beta_H^*} < 1, \tag{10}$$

where $v(\zeta_{\hat{L}})_{H|\beta=\beta_H^*}$ is the critical rejection probability which makes high-type taxpayers having beliefs $\beta = \beta_H^*$ indifferent between communicating $R_{\hat{H}}$ or $R_{\hat{L}}$ to the practitioner.

(ii) Similarly, if $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta < 0$ and if the tax agency chooses a level of investigation $\zeta_{\hat{L}}^{\circ} > 0$ such that $v(\zeta_{\hat{L}}^{\circ}) \in [v(\zeta_{\hat{L}})_{H|\beta=\beta_H^{VI}}, v(\zeta_{\hat{L}})_{H|\beta=0}]$, then taxpayers' communication decisions can again be characterized by a unique cut-off β_H^*, $\beta_H^* \leq \beta_H^{VI}$, such that condition (10) above is satisfied.

(iii) Finally, if $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta = 0$ and if the tax agency's chosen level of investigation

[20]Proof of the monotonicity of $v(\zeta_{\hat{L}})_{H|\beta}$ is provided in Appendix C.

is such that $v(\zeta_{\pounds}^{\circ}) \in [v(\zeta_{\pounds})_{II\,|\,\beta=0},\ v(\zeta_{\pounds})_{II\,|\,\beta=\beta_H^{VI}}]$, then all high-type taxpayers having beliefs $\beta \le \beta_H^{VI}$ are indifferent between communicating $R_{\hat{H}}$ and $R_{\pounds}$ since $v(\zeta_{\pounds}^{\circ}) = v(\zeta_{\pounds})_{II\,|\,\beta}$ for all $\beta \in [0, \beta_H^{VI}]$, and, thus, a unique cut-off β_H^* does not exist.

Proof: See Appendix C.

Condition (10) above implies that, where $\partial v(\zeta_{\pounds})_{II\,|\,\beta} / \partial\beta > 0$, taxpayers having beliefs $\beta \le \beta_H^* \le \beta_H^{VI}$ provide the message $R_{\hat{H}}$ when they hire a practitioner since

$$v(\zeta_{\pounds}^{\circ}) \ge v(\zeta_{\pounds})_{II\,|\,\beta \le \beta_H^*} \quad \forall\ \beta \in [0, \beta_H^*], \tag{11}$$

whereas, those having beliefs $\beta_H^* \le \beta \le \beta_H^{VI}$ provide the message $R_{\pounds}$ when they hire since

$$v(\zeta_{\pounds}^{\circ}) \le v(\zeta_{\pounds})_{II\,|\,\beta \ge \beta_H^*} \quad \forall\ \beta \in [\beta_H^*, \beta_H^{VI}]. \tag{12}$$

Alternatively, where $\partial v(\zeta_{\pounds})_{II\,|\,\beta} / \partial\beta < 0$, taxpayers' communication decisions are reversed; that is, taxpayers having beliefs $\beta \le \beta_H^* \le \beta_H^{VI}$ provide the message $R_{\pounds}$ when they hire a practitioner since

$$v(\zeta_{\pounds}^{\circ}) \le v(\zeta_{\pounds})_{II\,|\,\beta \le \beta_H^*} \quad \forall\ \beta \in [0, \beta_H^*], \tag{13}$$

whereas, those having beliefs $\beta_H^* \le \beta \le \beta_H^{VI}$ provide the message $R_{\hat{H}}$ when they hire since

$$v(\zeta_{\pounds}^{\circ}) \ge v(\zeta_{\pounds})_{II\,|\,\beta \ge \beta_H^*} \quad \forall\ \beta \in [\beta_H^*, \beta_H^{VI}]. \tag{14}$$

Next, consider the case where $\beta \ge \beta_H^{VI}$, that is, where high-type taxpayers report $R_{\hat{H},t_i}^{i}$ to the tax agency if rejected by the practitioner. The intuition is similar to the previous case (where $\beta \le \beta_H^{VI}$). From Lemma 3, the critical rejection probability applicable to taxpayers is $v(\zeta_{\pounds})_{III\,|\,\beta}$ rewritten below:

$$v(\zeta_{\hat{L}})_{III|\beta}=\frac{(1-\gamma^{P}(1+\pi+m))[(1-\beta)(t_{CG}H-t_{CG}L)+\beta(t_{I}H-t_{I}L)]-\gamma^{P}A+(F(\zeta_{\hat{H}})-F(\zeta_{\hat{L}}))}{(t_{I}H-t_{CG}L)-\gamma^{P}(1+\pi+m)[(t_{CG}H-t_{CG}L)+\beta(t_{I}H-t_{CG}H)]-(1-\gamma^{P}(1+\pi+m))\beta(t_{I}L-t_{CG}L)-\gamma^{P}A}$$

(15)

It follows from (15) above that *all* high-type taxpayers who hire communicate $R_{\hat{H}}$ when $v(\zeta_{\hat{L}})$ is greater than $v(\zeta_{\hat{L}})_{III|\beta}$ for all $\beta \in [\beta_{H}^{VI},1]$. At the other extreme *all* high-type taxpayers communicate $R_{\hat{L}}$ when $v(\zeta_{\hat{L}})$ is less than $v(\zeta_{\hat{L}})_{III|\beta}$ for all β in the same interval. The conditions under which *some* taxpayers communicate $R_{\hat{L}}$ while others provide the message $R_{\hat{H}}$ are investigated below. This case requires that $0<v(\zeta_{\hat{L}})_{III|\beta}<1$ for at least some $\beta \in [\beta_{H}^{VI},1]$. The conditions under which this relationship holds are now examined.

As in the previous case (where $\beta \leq \beta_{H}^{VI}$), it can be shown that, when both the numerator and denominator are negative, $v(\zeta_{\hat{L}})_{III|\beta}$ is always greater than one. Since the case of interest is $v(\zeta_{\hat{L}})_{III|\beta}<1$, attention is again focused on the conditions under which the numerator and denominator are both positive. Observe that the numerators of $v(\zeta_{\hat{L}})_{II|\beta}$ and $v(\zeta_{\hat{L}})_{III|\beta}$ are identical and monotonically increasing in β when $\gamma^{P}<1/(1+\pi+m)$. Condition (8) must therefore be satisfied for at least some $\beta \in [\beta_{H}^{VI},1]$ such that $0<v(\zeta_{\hat{L}})_{III|\beta}<1$ for some taxpayers. In fact, since inequality (8) is increasing in β, the relationship must hold for at least β=1 such that:[21]

$$(1-\gamma^{P}(1+\pi+m))(t_{I}H-t_{I}L) > \gamma^{P}A-(F(\zeta_{\hat{H}})-(F(\zeta_{\hat{L}})). \qquad \textbf{(16)}$$

When inequality (16) is satisfied, the denominator is also positive, since the condition for

[21]Furthermore, note that if condition (8) holds for some $\beta \in [0,\beta_{H}^{VI}]$, it must hold for all $\beta \in [\beta_{H}^{VI},1]$.

the numerator to be positive becomes binding before that for the denominator.[22]

Finally, when $\gamma^p < 1/(1+\pi+m)$ and inequality (16) is satisfied, $0<\nu(\zeta_{\hat{L}})_{III|\beta}<1$ is a continuous and monotonically increasing function of β for $\beta \in [\beta_H^{VI},1]$.[23]

The following theorem establishes the existence of a unique cut-off value, say β_H^{**}, $\beta_H^{**}>\beta_H^{VI}$, such that some taxpayers who hire communicate $R_{\hat{L}}$ while others provide the message $R_{\hat{H}}$.

Theorem 1(b): When $1/(1+\pi)<\gamma^i<1$ and $\gamma^p<1/(1+\pi+m)$ and, for a given set of parameter values such that inequality (8) holds for at least some $\beta \in [\beta_H^{VI}, 1]$, if the tax agency chooses a level of investigation, say $\zeta_{\hat{L}}^{\circ}>0$, such that $\nu(\zeta_{\hat{L}}^{\circ}) \in [\nu(\zeta_{\hat{L}})_{III|\beta=\beta_H^{VI}}, \nu(\zeta_{\hat{L}})_{III|\beta=1}]$, then taxpayers' communication decisions can be characterized by a unique cut-off β_H^{**}, $\beta_H^{VI} \le \beta_H^{**} \le 1$ such that:

$$0< \nu(\zeta_{\hat{L}}^{\circ}) = \nu(\zeta_{\hat{L}})_{III|\beta=\beta_H^{**}} < 1, \tag{17}$$

where $\nu(\zeta_{\hat{L}})_{III|\beta=\beta_H^{**}}$ is the critical rejection probability which makes high-type taxpayers having beliefs $\beta=\beta_H^{**}$ indifferent between communicating $R_{\hat{H}}$ or $R_{\hat{L}}$ to the practitioner.

Proof: See Appendix C.

Equation (17) implies that taxpayers having beliefs $\beta_H^{VI} \le \beta \le \beta_H^{**}$ provide the

[22]Evaluating the denominator at β=1 provides the following condition:

$$(1-\gamma^p(1+\pi+m))(t_I H - t_I L) - \gamma^p A > 0.$$

If (16) above is satisfied, this condition must also hold.

[23]Proof of the monotonicity of $\nu(\zeta_{\hat{L}})_{III|\beta}$ is provided in Appendix C.

message R_{fl} when they hire a practitioner since

$$v(\zeta_{\pounds}^{\circ}) \geq v(\zeta_{\pounds})_{III\,|\,\beta \leq \beta_H^{**}} \quad \forall\ \beta \in [\beta_H^{VI}, \beta_H^{**}], \tag{18}$$

whereas, those having beliefs $\beta_H^{**} \leq \beta \leq 1$ provide the message $R_{\pounds}$ when they hire since

$$v(\zeta_{\pounds}^{\circ}) \leq v(\zeta_{\pounds})_{III\,|\,\beta \geq \beta_H^{**}} \quad \forall\ \beta \in [\beta_H^{**}, 1]. \tag{19}$$

An additional result is that the two critical rejection probability functions ((7) and (15)) intersect at the cut-off value $\beta_H^{VI} \equiv [1 - \gamma^{\,i} A/(t_I H - t_{CG} H)]/\gamma^{\,i}(1+\pi)]$, i.e.,

$$v(\zeta_{\pounds})_{II\,|\,\beta = \beta_H^{VI}} = v(\zeta_{\pounds})_{III\,|\,\beta = \beta_H^{VI}}. \tag{20}$$

Therefore, the critical rejection probability function (given by (7) and (15)) is, continuous at $\beta = \beta_H^{VI}$ (although not differentiable at that point). The continuity of the function ensures that, conditional on practitioners being hired, there always exists an optimal communication decision for all high-type taxpayers, for every possible level of investigation which supports the hiring decision. Furthermore, as demonstrated above, depending on the set of parameter values, the critical rejection probability function may be monotonically increasing or decreasing in β or invariant with β when $\beta \leq \beta_H^{VI}$ and is monotonically increasing in β when $\beta \geq \beta_H^{VI}$.

Combining the results from the discussion and Theorems 1(a) and 1(b) presented above, taxpayers' joint communication/reporting decisions can be characterized for all taxpayer beliefs $\beta \in [0,1]$ as summarized in Proposition 3 below.

Proposition 3: Conditional on practitioners being hired, high-type taxpayers' joint communication/reporting decisions can be characterized as follows. When $1/(1+\pi) < \gamma^{\,i} < 1$ and if the tax agency's chosen level of investigation, $\zeta_{\pounds}^{\circ} > 0$, is such that:

(1) $v(\zeta_{\pounds}^{\circ})$ is greater than $v(\zeta_{\pounds})_{II\,|\,\beta}$ for all $\beta \in [0, \beta_H^{VI}]$ and $v(\zeta_{\pounds})_{III\,|\,\beta}$ for all $\beta \in [\beta_H^{VI}, 1]$, then *all* high-type taxpayers communicate R_{fl};

(2) $v(\zeta_{\mathcal{L}}^{\circ})$ is less than $v(\zeta_{\mathcal{L}})_{II|\beta}$ for all $\beta \in [0,\beta_H^{II}]$ and $v(\zeta_{\mathcal{L}})_{III|\beta}$ for all $\beta \in [\beta_H^{II},1]$, then *all* high-type taxpayers communicate $R_{\mathcal{L}}$;

(3.1) $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{III|\beta=1}, v(\zeta_{\mathcal{L}})_{II|\beta=0}]$, and (a) $\partial v(\zeta_{\mathcal{L}})_{II|\beta} / \partial\beta < 0$ and (b) condition (10) in Theorem 1(a) holds, then,

(i) Taxpayers having beliefs $\beta \leq \beta_H^{*}$ communicate $R_{\mathcal{L}}$. If the message is rejected, taxpayers file the self-prepared return $R_{\mathcal{H},t_{cG}}^{i}$;

(ii) Taxpayers having beliefs $\beta_H^{*} \leq \beta$ communicate $R_{\mathcal{H}}$.

(3.2) $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{II|\beta=0}, v(\zeta_{\mathcal{L}})_{III|\beta=1}]$, and (a) $\partial v(\zeta_{\mathcal{L}})_{II|\beta} / \partial\beta \leq 0$ and (b) condition (17) in Theorem 1(b) holds, then,

(i) Taxpayers having beliefs $\beta \leq \beta_H^{**}$ communicate $R_{\mathcal{H}}$;

(ii) Taxpayers having beliefs $\beta_H^{**} \leq \beta$ communicate $R_{\mathcal{L}}$. If the message is rejected, taxpayers file the self-prepared return $R_{\mathcal{H},t_I}^{i}$.

(3.3) $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{II|\beta=0}, v(\zeta_{\mathcal{L}})_{III|\beta=1}]$, and (a) $\partial v(\zeta_{\mathcal{L}})_{II|\beta} / \partial\beta < 0$ and (b) both conditions (10) and (17) in Theorems 1(a) and 1(b), respectively, hold, then,

(i) Taxpayers having beliefs $0 \leq \beta \leq \beta_H^{*}$ communicate $R_{\mathcal{L}}$. If the message is rejected, taxpayers file the self-prepared return $R_{\mathcal{H},t_{cG}}^{i}$;

(ii) Taxpayers having beliefs $\beta_H^{*} \leq \beta \leq \beta_H^{**}$ communicate $R_{\mathcal{H}}$;

(iii) Taxpayers having beliefs $\beta_H^{**} \leq \beta \leq 1$ communicate $R_{\mathcal{L}}$. If the message is rejected, taxpayers file the self-prepared return $R_{\mathcal{H},t_I}^{i}$.

(3.4) $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{II|\beta=0}, v(\zeta_{\mathcal{L}})_{III|\beta=1}]$, and (a) $\partial v(\zeta_{\mathcal{L}})_{II|\beta} / \partial\beta > 0$ and (b) either condition (10) or (17) in Theorems 1(a) and 1(b), respectively, holds, then ,

(i) Taxpayers having beliefs $\beta \leq \beta_H^*$ or $\beta \leq \beta_H^{**}$ communicate $R_{\hat{H}}$;

(ii) Taxpayers having beliefs $\beta_H^* \leq \beta$ or $\beta_H^{**} \leq \beta$ communicate $R_{\hat{L}}$. If the message is rejected, taxpayers file the self-prepared return $R^i_{\hat{H},t_{CG}}$ ($R^i_{\hat{H},t_i}$) depending upon whether their belief β is lower (higher) than β_H^{VI}.

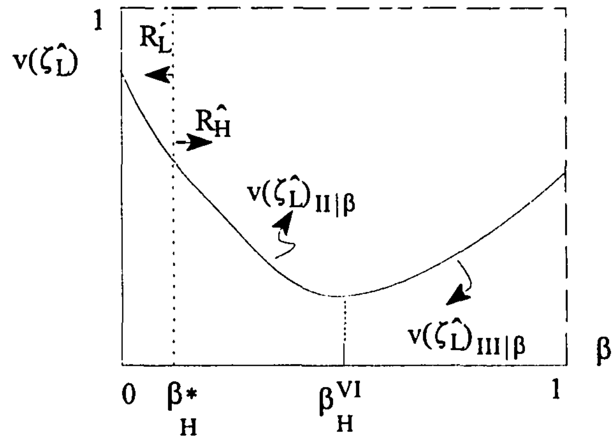
(3.5) $v(\zeta_{\hat{L}}^{\circ}) = v(\zeta_{\hat{L}})_{II|\beta}$ for all $\beta \in [0, \beta_H^{VI}]$ (i.e., since $\partial v(\zeta_{\hat{L}})_{II|\beta} / \partial\beta = 0$), then,

(i) Taxpayers having beliefs $0 \leq \beta \leq \beta_H^{VI}$ are indifferent between communicating $R_{\hat{L}}$ and $R_{\hat{H}}$. Where the message $R_{\hat{L}}$ is rejected, taxpayers file the self-prepared return $R^i_{\hat{H},t_{CG}}$;

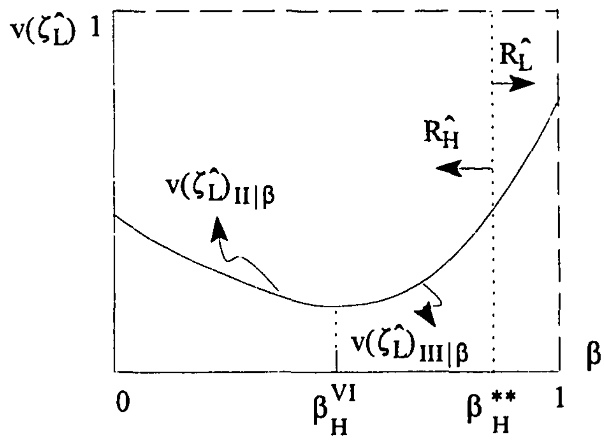
(ii) Taxpayers having beliefs $\beta_H^{VI} \leq \beta \leq 1$ communicate $R_{\hat{L}}$. If the message is rejected, taxpayers file the self-prepared return $R^i_{\hat{H},t_i}$.

Which cut-off value (β_H^* or β_H^{**}) applies in (3.1) to (3.4) above depends upon whether $v(\zeta_{\hat{L}}^{\circ})$, the probability that the practitioner correctly rejects the taxpayer's message given the tax agency's chosen level of investigation $\zeta_{\hat{L}}^{\circ}$, is less than $v(\zeta_{\hat{L}})_{II|\beta=\beta_H^{IV}}$ or greater than $v(\zeta_{\hat{L}})_{III|\beta=\beta_H^{IV}}$. Subcases (3.1) to (3.5) above are depicted in Figure 4.2.

Subcase 3.1



Subcase 3.2



Subcase 3.3

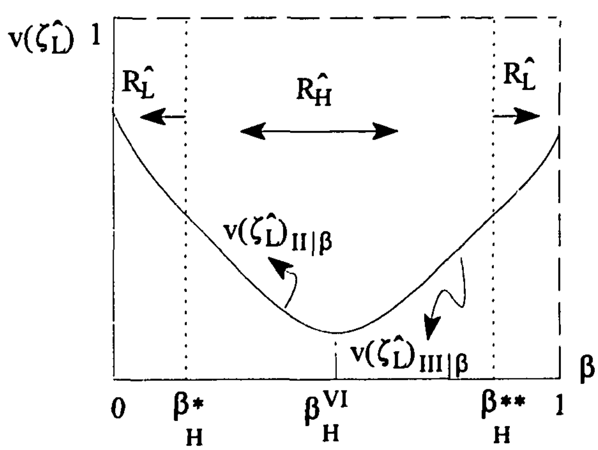
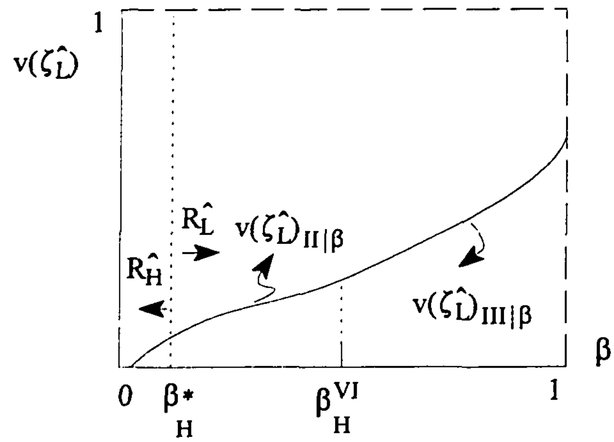
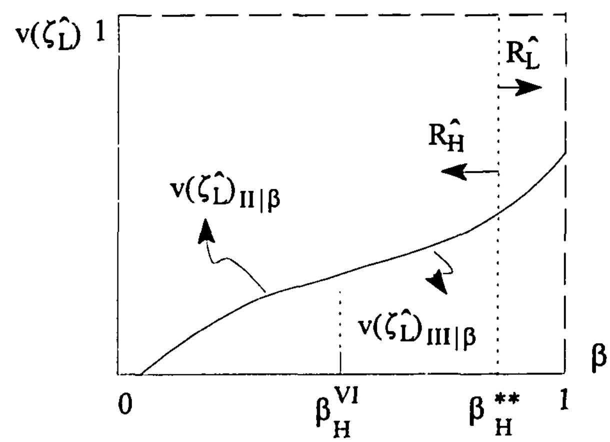


FIGURE 4.2
High-type Taxpayers' Communication Decisions

Subcase 3.4a



Subcase 3.4b



Subcase 3.5

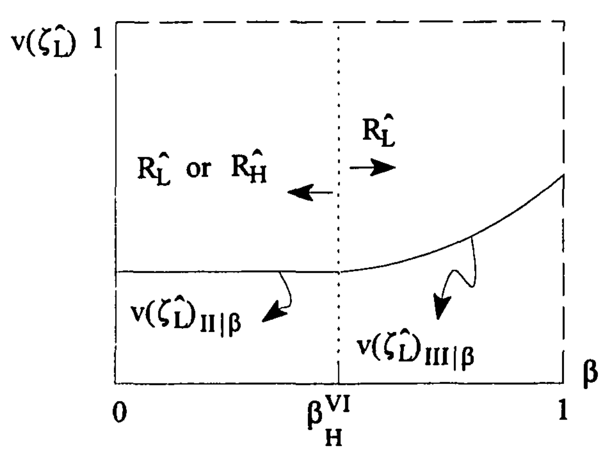


FIGURE 4.2
High-type Taxpayers' Communication Decisions

It is interesting to note that given the audit probability interval selected, taxpayers who file their own return always truthfully report their level of income, even though they may utilize the incorrect tax rate: that is, no tax evasion occurs (see earlier discussion in Section 4.2.1). However, it is demonstrated in Proposition 3 that, under certain conditions, high-type taxpayers who hire practitioners may attempt to evade taxes by communicating $R_{\mathcal{L}}$ to practitioners. This result differs from that obtained in Beck et al. [1994], who derive an equilibrium tax agency audit rate in which tax evasion never occurs whenever tax returns are practitioner-prepared. Taxpayers who seek assistance report consistently with the advice received by practitioners. Furthermore, since it is common knowledge that practitioners resolve all uncertainty and that they do not sign returns that are known to contain error, the tax agency has no incentive to audit tax returns which are signed by advisors. In contrast, the model presented in this thesis includes the possibility that taxpayers who hire practitioners will not truthfully communicate all their information so that they can attempt to evade and that their evasion activities may not be detected by practitioners. As a result, the tax agency may collect additional taxes, penalties, and interest charges when it audits practitioner-prepared returns.

Proposition 3 above presents high-type taxpayers' communication decisions conditional on their hiring practitioners for any given level of investigation that can be chosen by the tax agency and for various sets of parameter values. Taxpayers' decisions to communicate $R_{\mathcal{H}}$ or $R_{\mathcal{L}}$ depend upon whether the ratio of the net cost (benefit) of communicating $R_{\mathcal{H}}$ to the net cost (benefit) of communicating $R_{\mathcal{L}}$, i.e., $v(\zeta_{\mathcal{L}})_{II|\beta}$ or $v(\zeta_{\mathcal{L}})_{III|\beta}$, is greater, less than, or equal to $v(\zeta_{\mathcal{L}}^{\circ})$, the probability that the tax practitioner correctly rejects a message $R_{\mathcal{L}}$ when the tax agency's level of investigation is $\zeta_{\mathcal{L}}^{\circ}$. It has been demonstrated that taxpayers' decisions to communicate a high or a low level of income depend in part on their beliefs β about their true tax rate; that is, the critical rejection probability function (given by (7) and (15)) varies with β. Therefore, this critical rejection probability function captures the trade-offs faced by taxpayers between their incentives to engage in tax evasion and tax minimization activities. It has been demonstrated that this critical rejection probability function is continuous in β, is monotonically increasing or decreasing in β or invariant with β when $\beta \leq \beta_H^{VI}$ and is monotonically increasing in β when $\beta \geq \beta_H^{VI}$. The direction of change of $v(\zeta_{\pounds})_{II|\beta}$ depends in part on A, the cost of being audited by the tax agency. Given the current assumptions on the parameter values of the model, when A is relatively small, $v(\zeta_{\pounds})_{II|\beta}$ is decreasing in β, whereas, when A is "sufficiently" large, $v(\zeta_{\pounds})_{II|\beta}$ is increasing in β. Thus, which case in Proposition 3 applies depends on the parameter values (including A) as well as the tax agency's chosen level of investigation.

Consider the case where the cost of being audited is "sufficiently" low and, thus, the critical rejection probability function is decreasing in β for $\beta \in [0, \beta_H^{VI}]$ (i.e., $\partial v(\zeta_{\pounds})_{II|\beta} / \partial\beta < 0$). When taxpayers believe with a high probability that their true tax rate is t_{CG}, i.e., β close to zero, the expected net benefit to taxpayers from hiring and attempting to evade is high relative to the expected net benefit from hiring and truthfully communicating the level of income. In subcases 3.1 and 3.3, the level of investigation chosen by the tax agency and the resulting probability that an incorrect message $R_{\pounds}$ is rejected by the practitioner are such that it is worthwhile for taxpayers whose beliefs are close to zero to hire and attempt to evade. Taxpayers don't hire to resolve their uncertainty about the tax rate since they already believe with a high probability that it is t_{CG}. However, in subcase 3.2, the probability that the message $R_{\pounds}$ is rejected is greater than the critical rejection probability function for all taxpayers having beliefs $\beta \in [0, \beta_H^{VI}]$; hence, all taxpayers communicate a high level of income when they hire. In this case, hiring occurs even though taxpayers strongly believe that the tax rate is t_{CG} because taxpayers can save the expected cost of being audited and can incur a lower practitioner fee.

When taxpayers' beliefs are less extreme (β closer to ½, $\beta \leq \beta_H^{VI}$), taxpayers also want to resolve their uncertainty about the tax rate, ie., to engage in tax minimization.

Thus, as β increases, the expected net benefit from hiring and communicating $R_{\hat{L}}$ decreases relative to the benefit from communicating $R_{\hat{H}}$. Taxpayers obtain a greater expected net benefit from resolving their uncertainty, saving the cost of being audited, and incurring a lower practitioner fee rather than from attempting to evade. For subcases 3.1 and 3.3, this occurs when $\beta \geq \beta_H^*$.

For taxpayers whose beliefs are $\beta \geq \beta_H^{VI}$, the critical rejection probability function increases in β. It is only in subcase 3.2 that the probability that the message $R_{\hat{L}}$ is accepted is lower that the critical rejection probability function for some taxpayers; that is, those whose beliefs are $\beta \geq \beta_H^{**}$ prefer to evade rather than truthfully communicate their high level of income.

Now, consider the case where the cost of being audited is "sufficiently" high such that the critical rejection probability function $v(\zeta_{\hat{L}})_{H|\beta}$ is increasing in β (i.e., $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta > 0$) (subcase 3.4). The intuition underlying taxpayers' communication decisions is the opposite of that in the previous case (i.e., where $\partial v(\zeta_{\hat{L}})_{H|\beta} / \partial\beta < 0$). When taxpayers believe with a high probability that the true tax rate is t_{CG}, taxpayers have greater incentives to truthfully communicate their level of income. In providing the message $R_{\hat{H}}$, taxpayers face a lower practitioner fee and expected cost from being audited. However, as taxpayers' beliefs that the true tax rate is t_I increase, if the probability that the evasion is detected is sufficiently low, taxpayers prefer to attempt to evade (provide the message $R_{\hat{L}}$) even though they face the possibility that their evasion activities will be detected, their message will be rejected, and their uncertainty will remain unresolved. Taxpayers, therefore, trade off the benefit from evading and from minimizing. When taxpayers' beliefs β are close to one, the only benefit to taxpayers from hiring arises from their opportunity to evade. Therefore, taxpayers provide the message $R_{\hat{L}}$.

The last subcase (subcase 3.5) occurs when the critical rejection probability function $v(\zeta_{\hat{L}})_{H|\beta}$ is invariant with β and when the tax agency chooses the level of investigation $v(\zeta_{\hat{L}}^{\circ})=v(\zeta_{\hat{L}})_{H|\beta}$ for all $\beta \in [0, \beta_{H}^{VI}]$. Taxpayers having beliefs in the interval $\beta \in [0, \beta_{H}^{VI}]$ are indifferent between communicating $R_{\hat{H}}$ and $R_{\hat{L}}$ and, thus, are indifferent between attempting to evade or to minimize.

4.2.3 Second Stage Hiring Decision

In this stage, taxpayers evaluate the benefit of hiring a practitioner versus not hiring conditional on their optimal communication and reporting actions chosen in the third and fourth stages, respectively. It has been demonstrated in these stages that, through dominance, certain actions will be not be chosen. As such, they are not considered in the subsequent analysis.

a) Low-type Taxpayers

Low-type taxpayers have four different pure strategies from which to choose. The first two strategies are to file a self-prepared return $R_{\hat{L},t_l}^{i}$ or $R_{\hat{L},t_{CG}}^{i}$ (as described in Section 4.2.1). The last two strategies are to hire a practitioner and truthfully communicate the level of income to the practitioner who, based on the results of an investigation, either accepts or rejects the taxpayer's message $R_{\hat{L}}$.[24] If the message is accepted, the practitioner provides perfect advice about the tax rate, prepares, and files the return on behalf of the taxpayer. However,if the message is rejected, the taxpayer files a self-prepared return $R_{\hat{L},t_l}^{i}$ in the third strategy and $R_{\hat{L},t_{CG}}^{i}$ in the fourth strategy.Since rejected taxpayers apply the same decision rules when filing their return as in the no hiring case, only two comparisons of taxpayers' expected tax liabilities must be effected in examining taxpayers' hiring

---

[24]Recall that, from Lemmas 1 and 2, low-type taxpayers never misrepresent their level of income.

decisions.[25] The results are presented in Lemma 4 below.

Lemma 4: For a given level of investigation $\zeta_{\pounds}$ and the resulting probability $w(\zeta_{\pounds})$ that a message $R_{\pounds}$ is accepted by the practitioner:

I. Low-type taxpayers follow the strategy {Hire, ($R_{\pounds}$ | Hire), ($R^{i}_{\pounds,t_l}$ | Hire and d=r)} as opposed to {No hire, ($R^{i}_{\pounds,t_l}$ |No hire)}, if, and only if:

$$w(\zeta_{\pounds})[(1-\gamma^{i})(1-\beta)(t_l L - t_{CG} L) + (\gamma^{i} - \gamma^{p})A] \geq F(\zeta_{\pounds}) \tag{21}$$

II. Low-type taxpayers follow the strategy {Hire, ($R_{\pounds}$ | Hire), ($R^{i}_{\pounds,t_{CG}}$ | Hire and d=r)} as opposed to {No hire, ($R^{i}_{\pounds,t_{CG}}$ | No hire)}, if, and only if:

$$w(\zeta_{\pounds})[(\gamma^{i}(1+\pi)-1)\beta(t_l L - t_{CG} L) + (\gamma^{i} - \gamma^{p})A] \geq F(\zeta_{\pounds}). \tag{22}$$

Proof: See Appendix C.

The left hand side of inequality (21) represents the gross expected benefit from hiring which is comprised of two elements: first, the expected tax savings, $(1-\gamma^{i})(1-\beta)(t_l L - t_{CG} L)$, that the practitioner can provide a taxpayer who believes with probability $(1-\beta)$ that the true tax rate is t_{CG} and with probability $(1-\gamma^{i})$ that the tax agency will not audit the taxpayer's return; and, second, the reduction in the expected cost to the taxpayer of being audited, represented by $(\gamma^{i} - \gamma^{p})A$. Both elements are weighted by the probability that the practitioner correctly accepts a low message, $w(\zeta_{\pounds})$. Taxpayers seek assistance if this expected benefit is greater than the practitioner fee, $F(\zeta_{\pounds})$. Inequality (22) can be interpreted in a similar manner. In this case, the first term, $(\gamma^{i}(1+\pi)-1)\beta(t_l L - t_{CG} L)$, represents the saving of the expected interest charges, net of

[25]As noted previously, taxpayers' expected tax liabilities are specified in Table B.1 of Appendix B.

the gain (from reduced taxes) that the taxpayer could have enjoyed if filing a self-prepared return using the lower tax rate t_{CG}. Note that this term is positive only if the audit probability is such that $\gamma^i > 1/(1+\pi)$.

The condition which is relevant to a particular taxpayer's decision depends on his or her fourth stage reporting decision if rejected by the practitioner (as characterized in Section 4.2.1, Proposition 1); that is, taxpayers having beliefs $\beta \leq \beta_L^*$ utilize condition (22) in making their hiring decision since they report $R^i_{\hat{L},t_{CG}}$ to the tax agency if their message is rejected whereas those having beliefs $\beta \geq \beta_L^*$ utilize condition (21) since they will report $R^i_{\hat{L},t_I}$ to the tax agency if their message is rejected.

b) *High-type Taxpayers*

High-type taxpayers have seven different pure strategies from which to choose. The first three strategies are to file a self-prepared return $R^i_{\hat{L},t_{CG}}$, $R^i_{\hat{H},t_{CG}}$, or $R^i_{\hat{H},t_I}$ (as described in Section 4.2.1, Proposition 2).[26] The other four strategies involve hiring a practitioner. In the fourth strategy, a high message is communicated which is always accepted by the practitioner who provides advice about the tax rate, prepares, and files the return on behalf of the taxpayer. In the last three strategies, a low message is communicated followed by a self-prepared return $R^i_{\hat{L},t_{CG}}$, $R^i_{\hat{H},t_{CG}}$, or $R^i_{\hat{H},t_I}$ should the practitioner reject the low message. Since rejected taxpayers apply the same decision rules when filing their return as in the no hiring case and, since taxpayers' communication decisions have already been analyzed, only six comparisons of taxpayers' expected tax liabilities need to be made in examining high-type taxpayers' hiring decisions. They are presented in Lemma 5 below.

---

[26]Recall from the results of Proposition 2 that the report $R^i_{\hat{L},t_I}$ is always dominated by another.

Lemma 5: For given levels of investigation $\zeta_{\mathcal{L}}$ and $\zeta_{\mathcal{H}}$,[27] and the probability $v(\zeta_{\mathcal{L}})$ that a message $R_{\mathcal{L}}$ is correctly rejected by the practitioner:

I. High-type taxpayers follow the strategy {Hire, ($R_{\mathcal{H}}$ | Hire)} as opposed to {No hire, ($R^i_{\mathcal{H},t_l}$ | No hire)}, if, and only if:

$$(1-\beta)(t_l H - t_{CG} H) \geq F(\zeta_{\mathcal{H}}) \tag{23}$$

II. High-type taxpayers follow the strategy {Hire, ($R_{\mathcal{L}}$ | Hire), ($R^i_{\mathcal{H},t_l}$ | Hire and d=r)} as opposed to {No hire, ($R^i_{\mathcal{H},t_l}$ | No hire)}, if, and only if:

$$\begin{aligned}(1-v(\zeta_{\mathcal{L}}))[(t_l H - t_{CG} L) - \beta(t_l L - t_{CG} L) - \gamma^p(1+\pi+m)[\beta(t_l H - t_l L)\\ +(1-\beta)(t_{CG} H - t_{CG} L)] - \gamma^p A] \geq F(\zeta_{\mathcal{L}})\end{aligned} \tag{24}$$

III. High-type taxpayers follow the strategy {Hire, ($R_{\mathcal{H}}$ | Hire)} as opposed to {No hire, ($R^i_{\mathcal{H},t_{CG}}$ | No hire)}, if, and only if:

$$[\gamma^i(1+\pi)-1]\beta(t_l H - t_{CG} H) + \gamma^i A \geq F(\zeta_{\mathcal{H}}) \tag{25}$$

IV. High-type taxpayers follow the strategy {Hire, ($R_{\mathcal{L}}$ | Hire), ($R^i_{\mathcal{H},t_{CG}}$ | Hire and d=r)} as opposed to {No hire, ($R^i_{\mathcal{H},t_{CG}}$ | No hire)}, if, and only if:

$$\begin{aligned}(1-v(\zeta_{\mathcal{L}}))[(1-\gamma^p(1+\pi+m))[(t_{CG} H - t_{CG} L) - \beta(t_l L - t_{CG} L)]\\ +(\gamma^i-\gamma^p)(1+\pi)\beta(t_l H - t_{CG} H) - \gamma^p m \beta(t_l H - t_{CG} H) + (\gamma^i - \gamma^p)A] \geq F(\zeta_{\mathcal{L}})\end{aligned} \tag{26}$$

V. High-type taxpayers follow the strategy {Hire, ($R_{\mathcal{H}}$ | Hire)} as opposed to {No hire, ($R^i_{\mathcal{L},t_{CG}}$ | No hire)}, if, and only if:

[27] Recall from Observation 1 that $\zeta_{\mathcal{H}}=0$.

$$[\gamma^i(1+\pi+m)-1][(t_{CG}H-t_{CG}L)+\beta(t_1H-t_{CG}H)]+\gamma^i\beta\, m(t_1L-t_{CG}L)+\gamma^i A \geq F(\zeta_{\hat{\mathcal{H}}}) \quad \textbf{(27)}$$

VI. High-type taxpayers follow the strategy {Hire, ($R_{\hat{\mathcal{L}}}$ | Hire), ($R^i_{\hat{\mathcal{H}},t_{CG}}$ | Hire and d=r)} as opposed to {No hire, ($R^i_{\hat{\mathcal{L}},t_{CG}}$ | No hire)}, if, and only if:

$$\begin{aligned}(1-v(\zeta_{\hat{\mathcal{L}}}))[-(1-\gamma^p(1+\pi))\beta(t_1L-t_{CG}L)+(\gamma^i-\gamma^p)[(1+\pi+m)(t_{CG}H-t_{CG}L)\\ +\beta(1+\pi+m)(t_1H-t_{CG}H)-\beta\, m(t_1L-t_{CG}L)+A]] \geq F(\zeta_{\hat{\mathcal{L}}})\end{aligned} \quad \textbf{(28)}$$

Proof: See Appendix C.

These conditions have an interpretation similar to those derived for low-type taxpayers. An implication of Lemma 5 is that the condition applicable to a particular taxpayer depends on that taxpayer's optimal communication and reporting decisions made in the subsequent stages (see Sections 4.2.1 and 4.2.2).

The conditions obtained in Lemmas 4 and 5 are utilized in conjunction with those derived in Sections 4.2.1 and 4.2.2 to partition the population of taxpayers into groups based on their beliefs β about the tax rate. Taxpayers' hiring decisions, their message communicated to practitioners, where applicable, and their reporting decisions can then be inferred from the partitioning obtained, for all $\beta \in [0,1]$. As in the third and fourth stages, only the case in which the audit probability lies in the interval $\gamma_2^i < \gamma^i < 1$ ($\gamma_2^i = 1/(1+\pi)$) is presented.

Specific Case: $1/(1+\pi) < \gamma^i < 1$

a) Low-type Taxpayers

An examination of low-type taxpayers' evaluations of the benefit of hiring a practitioner versus not hiring under the strategies presented in Lemma 4 reveals that, for given parameter values and beliefs about the tax rate, the investigation level, via its effect on the probability that the message is accepted and on the practitioner fee, causes all, some, or no taxpayers to hire practitioners. In the no hiring case, taxpayers file a self-prepared return according to the conditions derived in the fourth stage (see Section 4.2.1, Proposition 1). This case occurs when the practitioner fee is greater than the gross expected benefit from hiring for every possible strategy and for all taxpayers. Since taxpayers' reporting decisions have already been investigated, the ensuing analysis focuses on the cases where all or some taxpayers hire.[28]

As mentioned earlier, the condition which is relevant to a particular taxpayer's hiring decision depends on his or her reporting decision made in the fourth stage. Consider the case where $\beta \le \beta_L^* = (1-\gamma^i)/\gamma^i\pi$. From Lemma 4, inequality (22), a low-type taxpayer who without practitioner assistance optimally reports $R^i_{\mathcal{L},t_{CG}}$ obtains an expected net benefit from hiring given by:

$$\begin{aligned}\Delta(TL\,|\,L,\beta,R_{\mathcal{L}},R^i_{\mathcal{L},t_{CG}}) &= E(TL\,|\,No\,Hire,L,\beta,R^i_{\mathcal{L},t_{CG}}) - E(TL\,|\,Hire,L,\beta,R_{\mathcal{L}},R^i_{\mathcal{L},t_{CG}}\; if\, d=r)\\ &= w(\zeta_{\mathcal{L}})[(\gamma^i(1+\pi)-1)\beta\,(t_l L - t_{CG}L) + (\gamma^i - \gamma^p)A] - F(\zeta_{\mathcal{L}}). \qquad \textbf{(29)}\end{aligned}$$

Under the assumption that $1/(1+\pi) < \gamma^i < 1$, the expected savings of interest charges, net of the expected tax savings that the taxpayer would have received if filing a self-prepared return $R^i_{\mathcal{L},t_{CG}}$, i.e., $w(\zeta_{\mathcal{L}})[(\gamma^i(1+\pi)-1)\beta\,(t_l L - t_{CG}L)]$, is positive for all $\beta \in (0,1]$. Furthermore, the expected net benefit from hiring is a continuous monotone increasing function of β. Since taxpayers seek practitioner assistance only where $\Delta(TL\,|\,L,\beta,R_{\mathcal{L}},R^i_{\mathcal{L},t_{CG}}) \ge 0$ and given the monotonicity of $\Delta(TL\,|\cdot)$, an optimal decision to hire for low-type taxpayers having beliefs $\beta \le \beta_L^*$ can be characterized by a unique cut-off value, say, β_L^a, defined such that taxpayers having beliefs $\beta \le \beta_L^a$ do not hire but file a self-prepared return $R^i_{\mathcal{L},t_{CG}}$ and those having beliefs $\beta_L^a \le \beta \le \beta_L^*$ hire practitioners and

[28]The basic structure of the derivation of taxpayers' hiring decisions and the related proofs follow those of Beck et al. [1994].

communicate $R_{\pounds}$. This cut-off value can occur at one of three points: (1) the boundary point $\beta_L^a=0$; (2) $\beta_L^a=\beta_L^*$; or (3) $0<\beta_L^a<\beta_L^*$.

In the first case, the expected net benefit from hiring (29), evaluated at the point β=0, is greater than or equal to zero if, and only if:

$$w(\zeta_{\pounds})(\gamma^i-\gamma^p)A \geq F(\zeta_{\pounds}). \tag{30}$$

When the above condition holds, that is, when the expected cost of being audited is greater than or equal to the practitioner fee, the cut-off value occurs at $\beta_L^a=0$, such that *all* taxpayers having beliefs $0 \leq \beta \leq \beta_L^*$ hire practitioners.

In the second and third cases, the cut-off value β_L^a is the point where

$$\Delta(TL\,|\,L,\beta=\beta_L^a,R_{\pounds},R^i_{\pounds,t_{CG}})=0. \tag{31}$$

The following theorem specifies the condition under which at least some hiring occurs.

Theorem 2:

When the audit probability lies in the interval $1/(1+\pi)<\gamma^i<1$ and for a given $\zeta_{\pounds}^{\circ}$ and a resulting w($\zeta_{\pounds}^{\circ}$), an optimal decision to hire, characterized by the unique cut-off β_L^a, β_L^a $\in[0,\beta_L^*]$ exists if, and only if,

$$w(\zeta_{\pounds}^{\circ})[(\gamma^i(1+\pi)-1)\beta_L^*(t_lL-t_{CG}L)+(\gamma^i-\gamma^p)A] \geq F(\zeta_{\pounds}^{\circ}), \tag{32}$$

where β_L^* is the cut-off value calculated in the no hiring case (see Proposition 1).

Proof: See Appendix C.

The result obtained above and that in Theorem 1 of Beck et al. [1994] are similar in that the left hand side of inequality (32) (inequality (6) in Beck et al.) represents the gross expected benefit from hiring practitioners for taxpayers having beliefs β_L^*. Since the expected benefit is increasing in β (for $\beta \leq \beta_L^*$), the left hand side of inequality (32) represents the maximum potential benefit to any taxpayer, for a given ζ_L^o and $w(\zeta_L^o)$. If the gross expected benefit is greater than the practitioner fee, it is optimal for some or all taxpayers to hire practitioners. If the inequality is reversed, hiring never occurs.[29]

Next, consider the case where $\beta \geq \beta_L^*$. From Lemma 4, inequality (21), a low-type taxpayer who without practitioner assistance optimally reports R_{L,t_i}^i obtains an expected net benefit from hiring given by:

$$\begin{aligned}\Delta(TL \mid L, \beta, R_L, R_{L,t_i}^i) &= E(TL \mid No\ Hire, L, \beta, R_{L,t_i}^i) - E(TL \mid Hire, L, \beta, R_L, R_{L,t_i}^i\ if\ d = r) \\ &= w(\zeta_L)[(1-\gamma^i)(1-\beta)(t_I L - t_{CG} L) + (\gamma^i - \gamma^r)A] - F(\zeta_L). \qquad \textbf{(33)}\end{aligned}$$

This expected net benefit function is a continuous monotone decreasing function of β. Since taxpayers hire practitioners only where $\Delta(TL \mid \cdot) \geq 0$ and given the monotonicity of $\Delta(TL \mid \cdot)$, a cut-off value, denoted by β_L^c, occurs at one of three points: (1) the boundary point $\beta_L^c = 1$; (2) $\beta_L^c = \beta_L^*$; or (3) $\beta_L^* < \beta_L^c < 1$.

In the first case, the expected net benefit from hiring (33), evaluated at the point $\beta=1$, is greater than or equal to zero if, and only if:

$$w(\zeta_L)(\gamma^i - \gamma^r)A \geq F(\zeta_L). \qquad \textbf{(34)}$$

Observe that inequalities (30) and (34) are identical. When the above condition holds, then the cut-off value occurs at $\beta_L^c = 1$, such that *all* taxpayers having beliefs $\beta_L^* \leq \beta \leq 1$ hire

[29] Although the intuition in Theorem 2 is similar to that in Beck et al. [1994], since important differences exist in assumptions between the two models (as discussed in footnote 13), the remainder of the analysis and the equilibrium results differ significantly from those obtained in that paper.

practitioners.

In the second and third cases, the cut-off value β_L^c occurs at the point $\beta_L^c = \beta_L^*$ (case (2)) or $\beta_L^* < \beta_L^c < 1$ (case (3)) such that

$$\Delta(TL \mid L, \beta = \beta_L^c, R_{\hat{L}}, R^i_{\hat{L},t_l}) = 0. \tag{35}$$

Taxpayers having beliefs $\beta_L^* \leq \beta \leq \beta_L^c$ hire practitioners whereas those having beliefs $\beta_L^c \leq \beta \leq 1$ do not hire but file a self-prepared return $R^i_{\hat{L},t_l}$.

Furthermore, it is demonstrated below that, at $\beta = \beta_L^* \equiv (1-\gamma^i)/\gamma^i\pi$,[30] the expected net benefit from hiring and reporting $R^i_{\hat{L},t_{CG}}$ if the low message is rejected equals the expected net benefit from hiring and reporting $R^i_{\hat{L},t_l}$ if the message $R_{\hat{L}}$ is rejected; that is,

$$\begin{aligned}
\Delta(TL \mid L, \beta = \beta_L^*, R_{\hat{L}}, R^i_{\hat{L},t_{CG}}) &= w(\zeta_{\hat{L}})[(\gamma^i(1+\pi)-1)\beta_L^*(t_l L - t_{CG}L) + (\gamma^i - \gamma^p)A] - F(\zeta_{\hat{L}}) \\
&= w(\zeta_{\hat{L}})[(\frac{1}{\beta_L^*} - 1)(1-\gamma^i)\beta_L^*(t_l L - t_{CG}L) + (\gamma^i - \gamma^p)A] - F(\zeta_{\hat{L}}) \\
&= w(\zeta_{\hat{L}})[(1-\beta_L^*)(1-\gamma^i)(t_l L - t_{CG}L) + (\gamma^i - \gamma^p)A] - F(\zeta_{\hat{L}}) \\
&= \Delta(TL \mid L, \beta = \beta_L^*, R_{\hat{L}}, R^i_{\hat{L},t_l}).
\end{aligned} \tag{36}$$

Thus, the expected net benefit function (given by (29) and (33)) is continuous in β, is monotonically increasing in β for $\beta \leq \beta_L^*$ and monotonically decreasing in β for $\beta \geq \beta_L^*$, and is maximal at $\beta = \beta_L^*$. Given the form of the expected net benefit function, condition (32) in Theorem 2 is sufficient for at least some hiring to occur.

Low-type taxpayers' optimal hiring, communication, and reporting decisions are

---

[30]Substitute $\gamma^i\pi = (1-\gamma^i)/\beta_L^*$ into equation (29).

summarized in Proposition 4 below.

Proposition 4: When $1/(1+\pi)<\gamma^i<1$ and for a given level of investigation $\zeta_{\hat{L}}^{\circ}$ chosen by the tax agency and a resulting w($\zeta_{\hat{L}}^{\circ}$), low-type taxpayers' hiring, communication, and reporting decisions are characterized as follows:

(1) When inequalities (30) and (34) hold, *all* low-type taxpayers hire practitioners for all $\beta \in [0,1]$.

(2) When inequality (32) in Theorem 2 holds:

i) Low-type taxpayers having beliefs $\beta \leq \beta_L^a$ do not hire practitioners but file a self-prepared return $R^i_{\hat{L},t_{CG}}$;

ii) Low-type taxpayers having beliefs $\beta \geq \beta_L^c$ do not hire practitioners but file a self-prepared return $R^i_{\hat{L},t_I}$; and

iii) Low-type taxpayers having beliefs $\beta_L^a \leq \beta \leq \beta_L^c$ hire practitioners and communicate the message $R_{\hat{L}}$ (see Lemma 2).

(3) When inequality (32) in Theorem 2 does not hold, *no* taxpayers hire practitioners, for any $\beta \in [0,1]$.

Where the low message is rejected by the practitioner, or where hiring never occurs, taxpayers file a self-prepared return $R^i_{\hat{L},t_{CG}}$ or $R^i_{\hat{L},t_I}$ according to the conditions derived in Proposition 1.

Proposition 4 shows that taxpayers having more extreme beliefs about their tax rate (β closer to zero or one) are less likely to seek practitioner assistance than those whose beliefs are less extreme (β closer to ½). However, where the expected cost of being audited is sufficiently high, all low-type taxpayers may seek practitioner assistance, regardless of their beliefs about the tax rate.

It is interesting to examine the effect that the proposed policy of investigation has on taxpayers' decisions. Where such a policy exists, it is demonstrated in (29) and (33) that the gross expected benefit to taxpayers from hiring practitioners depends on the level of investigation $\zeta_{\mathcal{L}}$ chosen by the tax agency and the resulting probability $w(\zeta_{\mathcal{L}})$ that a message $R_{\mathcal{L}}$ is correctly accepted by a practitioner. Since by assumption $w'(\zeta_{\mathcal{L}})>0$ and $w''(\zeta_{\mathcal{L}})<0$, as $\zeta_{\mathcal{L}}$ increases, the gross expected benefit from hiring increases in $w(\zeta_{\mathcal{L}})$, at a decreasing rate. However, as $\zeta_{\mathcal{L}}$ increases, the practitioner fee, $F(\zeta_{\mathcal{L}})$, also increases but, at an increasing rate (since $F'(\zeta_{\mathcal{L}})>0$ and $F''(\zeta_{\mathcal{L}})>0$), making practitioner advice more costly and reducing the expected net benefit. Figure 4.3 illustrates the relationship between the level of investigation and the expected net benefit from hiring for different beliefs β held by low-type taxpayers. The diagram is obtained from the numerical example described in Section 5.4. As shown in Figure 4.3, the expected net benefit from hiring increases for certain values of $\zeta_{\mathcal{L}}$, when the gross expected benefit increases at a faster rate than the practitioner fee. Beyond some level of investigation, this relationship is reversed. A discussion about the effect of a change in $\zeta_{\mathcal{L}}$ on taxpayers' strategies is provided in the equilibrium analysis in Section 5.3.

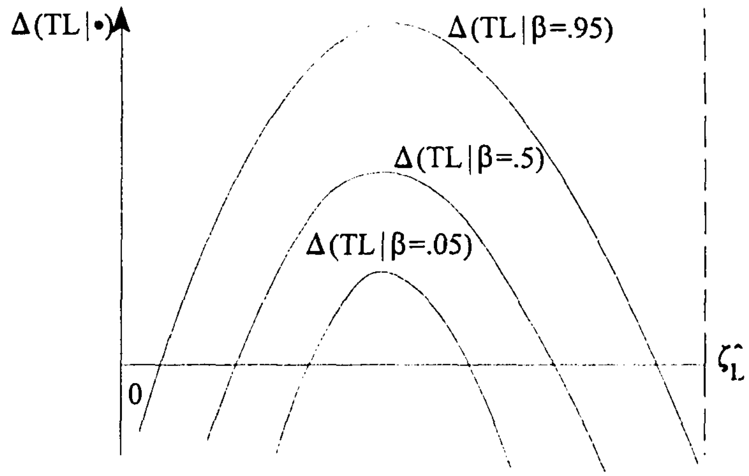


FIGURE 4.3

Relationship Between the Expected Net Benefit of Hiring and ζ_L

Contrasting a low-type taxpayer's optimal strategy where a policy of investigation is present with one where such a policy does not exist provides interesting insights. Where a policy of investigation does not exist, practitioners are not required to perform an investigation of taxpayers' financial affairs; hence, ζ_L=0. Furthermore, unless the practitioner knows that evasion has occurred, there is no reason why a practitioner should refuse to prepare a taxpayer's return. As a result, it is reasonable to assume that w(0)=1. Consequently, from equation (29), taxpayers who without practitioner assistance report $R'_{L,d_{CG}}$ hire if, and only if :

$$1 \cdot [(\gamma'(1+\pi)-1)\beta\,(t_l L - t_{CG} L) + (\gamma' - \gamma^P)A] \geq F, \tag{37}$$

where F represents the fixed cost of providing advice and preparing the return.

Consider a policy of investigation whereby the tax agency chooses a level of investigation $\zeta_{\mathcal{L}}$ >0 such that 0<w($\zeta_{\mathcal{L}}$)<1. Taxpayers hire if, and only if:

$$w(\zeta_{\mathcal{L}})[(\gamma^{i}(1+\pi)-1)\beta(t_{I}L-t_{CG}L)+(\gamma^{i}-\gamma^{P})A] \geq F(\zeta_{\mathcal{L}}). \tag{38}$$

A comparison of the two conditions above indicates that, *ceteris paribus*, hiring is more frequent where no policy of investigation exists since the expected value of the advice is higher whereas the practitioner fee is lower. An implication of this result is that the tax agency, through its choice of the level of investigation $\zeta_{\mathcal{L}}$, can influence low-type taxpayers' hiring decisions.

b) High-type Taxpayers

Lemma 5 summarized high-type taxpayers' evaluations of the benefit from hiring a practitioner versus not hiring under the various strategies. As mentioned earlier, the condition which is relevant to a particular taxpayer's situation depends on his or her communication and reporting decisions made in the third and fourth stages, respectively. It was demonstrated in Section 4.2.1 that, when $1/(1+\pi)<\gamma^{i}<1$, high-type taxpayers who file their own return report either $R^{i}_{\mathcal{H},t_{CG}}$ or $R^{i}_{\mathcal{H},t_{I}}$ according to the conditions specified in Proposition 2.[31] Additionally, it was shown in Section 4.2.2 that, depending on the level of investigation $\zeta_{\mathcal{L}}$ chosen by the tax agency, the resulting rejection probability v($\zeta_{\mathcal{L}}$), and the set of exogenous parameter values, different characterizations of high-type taxpayers' communication decisions are obtained, as presented in Proposition 3. These were derived under the assumption that *all* high-type taxpayers hired practitioners. This section now examines high-type taxpayers' decisions to hire given their communication and reporting decisions. The analysis is segregated to consider separately each case obtained in Proposition 3.

---

[31]Recall that from Proposition 2, where $\gamma^{i}>1/(1+\pi)$, high-type taxpayers who do not hire practitioners never report a low level of income.

Case 1

This section focuses on taxpayers' hiring decisions given that the set of conditions in (1) from Proposition 3 is satisfied. In this case, the tax agency chooses a level of investigation $\zeta_{\hat{L}}^{\circ}$ such that $v(\zeta_{\hat{L}}^{\circ})$ is greater than $v(\zeta_{\hat{L}})_{II|\beta}$ for $\beta \in [0, \beta_H^{VI}]$ and $v(\zeta_{\hat{L}})_{III|\beta}$ for $\beta \in [\beta_H^{VI}, 1]$ and, thus, *all* high-type taxpayers communicate $R_{\hat{H}}$ when they hire.[32] The approach used to characterize high-type taxpayers' hiring decisions parallels that utilized in the case of low-type taxpayers.

From inequality (25) in Lemma 5, when $\beta \leq \beta_H^{VI}$, high-type taxpayers who without practitioner assistance optimally report $R^i_{\hat{H},t_{CG}}$ obtain an expected net benefit from hiring a practitioner given by:

$$\begin{aligned}\Delta(TL \mid H, \beta, R_{\hat{H}}, R^i_{\hat{H},t_{CG}}) &= E(TL \mid No\ Hire, H, \beta, R^i_{\hat{H},t_{CG}}) - E(TL \mid Hire, H, \beta, R_{\hat{H}}) \\ &= [\gamma^i(1+\pi) - 1]\beta\,(t_I H - t_{CG} H) + \gamma^i A - F(\zeta_{\hat{H}}) \qquad \textbf{(39)}\end{aligned}$$

Observe that since a message $R_{\hat{H}}$ is always accepted by the practitioner, the expected net benefit is weighted by the probability of correct acceptance $w(\zeta_{\hat{H}} = 0) = 1$. When $1/(1+\pi) < \gamma^i < 1$, the gross expected benefit, comprised of the expected savings of interest charges net of the expected tax savings that the taxpayer would have received if filing a self-prepared return $R^i_{\hat{H},t_{CG}}$ as well as the expected cost of being audited, is positive for all $\beta \in [0, \beta_H^{VI}]$. This expected net benefit function is a continuous monotone increasing function of β for $\beta \leq \beta_H^{VI}$. Thus, as in the case for low-type taxpayers, an optimal decision to hire for high-type taxpayers having beliefs $\beta \leq \beta_H^{VI}$ can be

[32]Recall from Proposition 2 that $\beta_H^{VI} \equiv [1 - \gamma^i A/(t_I H - t_{CG} H)] / \gamma^i(1+\pi)$.

characterized by a unique cut-off, say β_H^a, defined such that taxpayers having beliefs $\beta \leq \beta_H^a$ do not hire a practitioner but file a self-prepared return $R^i_{\hat{H},t_{CG}}$, whereas those having beliefs $\beta_H^a \leq \beta \leq \beta_H^{VI}$ hire practitioners and communicate $R_{\hat{H}}$. Furthermore, this cut-off value can occur at one of three points: (1) the boundary point $\beta_H^a = 0$; (2) $\beta_H^a = \beta_H^{VI}$; or (3) $0 < \beta_H^a < \beta_H^{VI}$.

The first case occurs when the expected net benefit from hiring (39), evaluated at β=0, is greater than or equal to zero, or equivalently, when:

$$\gamma^i A \geq F(\zeta_{\hat{H}}). \tag{40}$$

In his case, the cut-off value occurs at $\beta_H^a = 0$ such that *all* high-type taxpayers having beliefs $0 \leq \beta_H^a \leq \beta_H^{VI}$ hire practitioners and communicate $R_{\hat{H}}$. Note that when taxpayers strongly believe that the true tax rate is t_{CG} (β close to zero), the only benefit from hiring arises from the saving of the expected cost of being audited, as implied by (40) above.

In the second and third cases, the cut-off value β_H^a is the point where

$$\Delta(TL \mid H, \beta = \beta_H^a, R_{\hat{H}}, R^i_{\hat{H},t_{CG}}) = 0. \tag{41}$$

The following theorem specifies the condition under which an optimal decision to hire exists.

Theorem 3: When the audit probability lies in the interval $1/(1+\pi) < \gamma^i < 1$, an optimal decision to hire, characterized by the unique cut-off β_H^a, $\beta_H^a \in [0, \beta_H^{VI}]$, exists if, and only if,

$$[\gamma^i(1+\pi)-1]\beta_H^{VI}(t_l H - t_{CG}H) + \gamma^i A \geq F(\zeta_{\hat{H}}), \tag{42}$$

where β_H^{VI} is the cut-off value calculated in the no hiring case.

Proof: See Appendix C.

The interpretation of this result is identical to the case for low-type taxpayers. Since the expected benefit is increasing in β for $\beta \leq \beta_H^{VI}$, the LHS of (42) represents the maximum potential benefit to taxpayers from hiring. If this inequality does not hold, hiring never occurs.

Next, consider the case where $\beta \geq \beta_H^{VI}$. From Lemma 5, inequality (23), high-type taxpayers who without practitioner assistance, optimally report $R^i_{\hat{H},t_l}$ obtain an expected net benefit from hiring given by:

$$\begin{aligned}\Delta(TL \mid H, \beta, R_{\hat{H}}, R^i_{\hat{H},t_l}) &= E(TL \mid No\ Hire, H, \beta, R^i_{\hat{H},t_l}) - E(TL \mid Hire, H, \beta, R_{\hat{H}}) \\ &= (1-\beta)(t_l H - t_{CG}H) - F(\zeta_{\hat{H}}).\end{aligned} \tag{43}$$

This expected net benefit function is a continuous monotone decreasing function of β for $\beta \geq \beta_H^{VI}$. Note that, in contrast to the case for low-type taxpayers, hiring does not occur at β=1 since $\Delta(TL \mid \beta=1, \cdot) < 0$. This is because the only benefit to taxpayers from hiring arises from the potential tax savings that the practitioner provides if the true tax rate is t_{CG}. However, when taxpayers strongly believe that the true tax rate is t_l (β=1), this potential tax saving is equal to zero.

Since taxpayers hire practitioners only where $\Delta(TL \mid \cdot) \geq 0$, a cut-off value, denoted by β_H^c, occurs at the point $\beta_H^{VI} \leq \beta_H^c < 1$ such that

$$\Delta(TL \mid H, \beta = \beta_H^c, R_{\hat{H}}, R_{\hat{H},t_I}^i) = 0. \tag{44}$$

Taxpayers having beliefs $\beta_H^{VI} \leq \beta \leq \beta_H^c$ hire practitioners and communicate $R_{\hat{H}}$ whereas those having beliefs $\beta_H^c \leq \beta \leq 1$ do not hire but file a self-prepared return $R_{\hat{H},t_I}^i$.

Substituting $\gamma^i(1+\pi) = [1 - \gamma^i A/(t_I H - t_{CG} H)] / \beta_H^{VI}$ into equation (39), it is demonstrated that the expected net benefit function is continuous at $\beta = \beta_H^{VI}$ (although not differentiable at this point):

$$\begin{aligned}
\Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\hat{H}}, R_{\hat{H},t_{CG}}^i) &= [\gamma^i(1+\pi) - 1]\beta_H^{VI}(t_I H - t_{CG} H) + \gamma^i A - F(\zeta_{\hat{H}}) \\
&= \left[\frac{1}{\beta_H^{VI}} - \frac{\gamma^i A}{\beta_H^{VI}(t_I H - t_{CG} H)} - 1\right] \beta_H^{VI}(t_I H - t_{CG} H) + \gamma^i A - F(\zeta_{\hat{H}}) \\
&= (1 - \beta_H^{VI})(t_I H - t_{CG} H) - F(\zeta_{\hat{H}}) \\
&= \Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\hat{H}}, R_{\hat{H},t_I}^i).
\end{aligned} \tag{45}$$

The expected net benefit function (given by (39) and (43)) is monotone increasing in β for $\beta \leq \beta_H^{VI}$, is maximal at $\beta = \beta_H^{VI}$, and is monotone decreasing in β for $\beta \geq \beta_H^{VI}$. Given this result, condition (42) in Theorem (3) is sufficient for some hiring to occur.

High-type taxpayers' optimal hiring, communication, and reporting decisions are summarized in Proposition 5 below.

Proposition 5: When $1/(1+\pi) < \gamma^i < 1$ and for a given level of investigation $\zeta_{\hat{L}}^{\circ}$ chosen by the tax agency and a resulting $v(\zeta_{\hat{L}}^{\circ})$ such that the conditions in (1) of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) When inequality (42) in Theorem 3 holds:

i) High-type taxpayers having beliefs $\beta \leq \beta_H^a$ do not hire practitioners but file a self-prepared return $R^i_{\hat{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta \geq \beta_H^c$ do not hire practitioners but file a self-prepared return $R^i_{\hat{H},t_1}$; and

iii) High-type taxpayers having beliefs $\beta_H^a \leq \beta \leq \beta_H^c$ hire practitioners and communicate the message $R_{\hat{H}}$.

(2) When inequality (42) in Theorem 3 does not hold, *no* high-type taxpayers hire practitioners. Taxpayers file a self-prepared return $R^i_{\hat{H},t_{CG}}$ or $R^i_{\hat{H},t_1}$ according to the conditions derived in Proposition 2.

The interpretation of the above proposition is similar to that for low-type taxpayers with the exception that full hiring does not occur, as explained earlier (i.e., since hiring does not occur at β=1). Taxpayers' net benefit of practitioner assistance is depicted in Figure 4.4 below. The expected net benefit function is monotonically increasing in β for $\beta \leq \beta_H^{VI}$, is maximal at $\beta = \beta_H^{VI}$ and is decreasing in β for $\beta \geq \beta_H^{VI}$. Two cut-off β values exist such that taxpayers' whose beliefs are $\beta \leq \beta_H^a \leq \beta_H^{VI}$ $(\beta_H^a \geq 0)$ and $\beta_H^{VI} \leq \beta_H^c \leq \beta$ $(\beta_H^c < 1)$ do not hire practitioners but file their own return; those whose beliefs are in the interval $\beta_H^a \leq \beta \leq \beta_H^c$ hire practitioners and communicate the message $R_{\hat{H}}$ as described in Proposition 3 above.

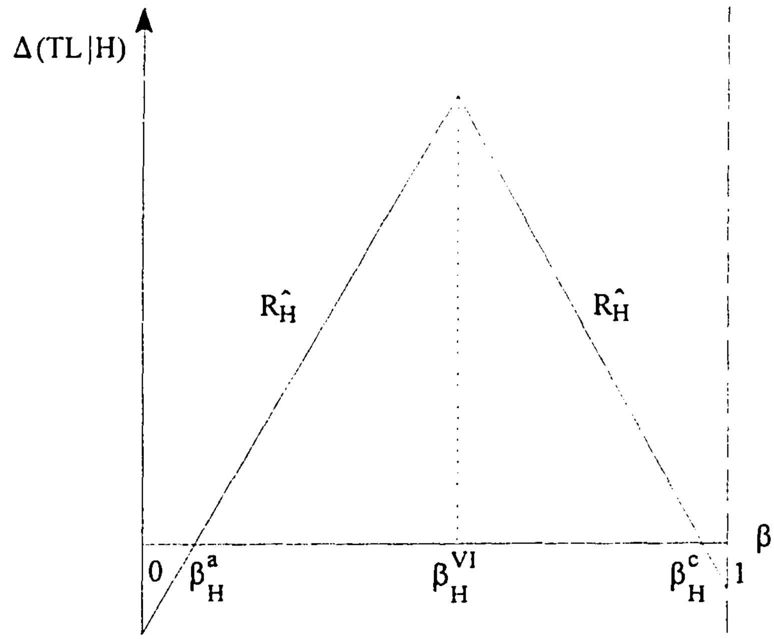


FIGURE 4.4

Net Benefit of Practitioner Assistance (Case 1)

The next case examines taxpayers' hiring decisions given that they always communicate the message R_L when they hire.

Case 2

This section analyzes taxpayers' hiring decisions given that the set of conditions in (2) from Proposition 3 is satisfied. This case occurs when the tax agency chooses a level of investigation ζ_L° such that $v(\zeta_L^\circ)$ is less than both $v(\zeta_L)_{II|\beta}$ for $\beta \in [0, \beta_H^{17}]$ and $v(\zeta_L)_{III|\beta}$ for $\beta \in [\beta_H^{17}, 1]$ and, thus, *all* high-type taxpayers communicate R_L. The approach used in the characterization of high-type taxpayers' decisions is identical to that followed in the previous case with the exception that where $\beta \leq \beta_H^{17}$, the expected benefit function may be monotonically increasing or decreasing in β, or invariant with β, depending on the exogenous parameter values. Depending on the direction of change of $\Delta(TL\,|\,\cdot)$, different characterizations of taxpayers' decisions are obtained. As will be demonstrated below, two subcases must be considered.

From inequality (26) in Lemma 5, when $\beta \le \beta_H^{VI}$, high-type taxpayers, who without practitioner assistance optimally report $R^i_{\hat{H},t_{CG}}$, obtain an expected net benefit from hiring a practitioner given by:

$$\begin{aligned}\Delta(TL\,|\,H,\beta,R_{\hat{L}},R^i_{\hat{H},t_{CG}}) = (1-v(\zeta_{\hat{L}}))\,[(1-\gamma^p(1+\pi+m))[(t_{CG}H-t_{CG}L)\\ -\beta(t_lL-t_{CG}L)]+(\gamma^i-\gamma^p)(1+\pi)\beta(t_lH-t_{CG}H)\\ -\gamma^p m\beta(t_lH-t_{CG}H)+(\gamma^i-\gamma^p)A\,]-F(\zeta_{\hat{L}}).\end{aligned} \qquad \textbf{(46)}$$

This expected net benefit function is monotonically increasing or decreasing in β or invariant with β depending on the sign of

$$\begin{aligned}\frac{\partial\Delta(TL\,|\,\cdot)}{\partial\beta} = (1-v(\zeta_{\hat{L}}))[-(1-\gamma^p(1+\pi+m))(t_lL-t_{CG}L)+(\gamma^i-\gamma^p)(1+\pi)(t_lH-t_{CG}H)\\ -\gamma^p m(t_lH-t_{CG}H)].\end{aligned} \qquad \textbf{(47)}$$

Since by assumption, $\gamma^i > 1/(1+\pi)$, a sufficient condition for $\partial\Delta(TL\,|\,\cdot)/\partial\beta > 0$ is that $\gamma^p < 1/(1+\pi+m)$. However, the expected net benefit function is nonincreasing in β if

$$\gamma^p \ge \frac{\gamma^i(1+\pi)(t_lH-t_{CG}H)-(t_lL-t_{CG}L)}{(1+\pi+m)[(t_lH-t_{CG}H)-(t_lL-t_{CG}L)]} \equiv \gamma^p_\dagger, \qquad \textbf{(48)}$$

where $\gamma^p_\dagger > 1/(1+\pi+m)$. Consequently, when the conditions in (2) of Proposition 3 hold, two subcases must be considered in the specification of taxpayers' hiring decisions: $\gamma^p < \gamma^p_\dagger$ or $\gamma^p \ge \gamma^p_\dagger$.

Subcase 2.1: $\gamma^p < \gamma^p_\dagger$

It is assumed in this case that $\gamma^p < \gamma^p_\dagger$ and, thus, the expected net benefit from hiring (46) is monotonically increasing in β. Since the approach to the derivation of taxpayers' hiring decisions is identical to that of the previous cases (see low-type taxpayers' hiring decisions and Case 1 analyzed in the preceding section), taxpayers' joint hiring, communication, and reporting decisions are presented immediately below. Note that in this case, the two cut-off β values which make taxpayers indifferent between hiring and communicating $R_{\pounds}$ and not hiring are defined as β^x_H, $\beta^x_H \le \beta^{VI}_H$, and $\beta^{\bar{=}}_H$, $\beta^{\bar{=}}_H \ge \beta^{VI}_H$.[33] As in Case 1, the expected benefit from hiring is maximal at $\beta = \beta^{VI}_H$.

Proposition 6: When $1/(1+\pi) < \gamma^i < 1$, $\gamma^p < \gamma^p_\dagger$, and for a given level of investigation $\zeta^\circ_{\pounds}$ chosen by the tax agency and a resulting $v(\zeta^\circ_{\pounds})$ such that the conditions in (2) of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequalities (26) and (24), evaluated at $\beta = 0$ and $\beta = 1$, respectively, hold, or equivalently, when

$$(1 - v(\zeta^\circ_{\pounds}))[(1 - \gamma^p(1 + \pi + m))(t_{CG}H - t_{CG}L) + (\gamma^i - \gamma^p)A] \ge F(\zeta^\circ_{\pounds}) \quad \textbf{(49)}$$

and

$$(1 - v(\zeta^\circ_{\pounds}))[(1 - \gamma^p(1 + \pi + m))(t_I H - t_I L) - \gamma^p A] \ge F(\zeta^\circ_{\pounds}), \quad \textbf{(50)}$$

all high-type taxpayers hire practitioners and communicate $R_{\pounds}$ for all $\beta \in [0,1]$.

(2) From Lemma 5, when inequality (26), evaluated at $\beta = \beta^{VI}_H$, holds such that:

[33] See the proof of Proposition 6 in Appendix C for additional details regarding the derivation of taxpayers' hiring decisions.

$$(1 - v(\zeta_{\pounds}^{\circ}))\,[(1-\gamma^{p}(1+\pi+m))[(t_{CG}H - t_{CG}L) - \beta_{H}^{VI}(t_{I}L - t_{CG}L)]$$
$$+(\gamma^{i}-\gamma^{p})(1+\pi)\,\beta_{H}^{VI}(t_{I}H - t_{CG}H) - \gamma^{p} m \beta_{H}^{VI}(t_{I}H - t_{CG}H) \qquad \textbf{(51)}$$
$$+(\gamma^{i}-\gamma^{p})A] \geq F(\zeta_{\pounds}^{\circ}),$$

i) High-type taxpayers having beliefs $\beta \leq \beta_{H}^{x}$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta_{H}^{x} \leq \beta \leq \beta_{H}^{-}$ hire practitioners and communicate $R_{\pounds}$.

iii) High-type taxpayers having beliefs $\beta \geq \beta_{H}^{-}$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_{I}}$.

(3) When inequality (51) above does not hold, *no* high-type taxpayers hire practitioners.

Where the message $R_{\pounds}$ has been rejected by the practitioner or where hiring does not occur, taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$ or $R^{i}_{\hat{H},t_{I}}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

The intuition for this result is similar to that of Case 1 (where all high-type taxpayers who hire communicate $R_{\hat{H}}$) except that taxpayers attempt to evade when they hire, regardless of their beliefs β about the tax rate.

Subcase 2.2: $\gamma^{p} \geq \gamma^{p}_{\dagger}$

This case assumes that $\gamma^{p} \geq \gamma^{p}_{\dagger}$. Thus, when $\beta \leq \beta_{H}^{VI}$, the expected net benefit from hiring (i.e., equation (46) above) is monotonically decreasing in β (when $\gamma^p > \gamma^p_\dagger$) or invariant with β (when $\gamma^p = \gamma^p_\dagger$). Furthermore, as in previous cases, the expected net benefit function is continuous (although not differentiable) at $\beta = \beta^{VI}_H$ and is monotonically decreasing in β for $\beta \geq \beta^{VI}_H$ (see Lemma 5, inequality (24)). Given the monotonicity and continuity of the expected benefit function, an optimal decision to hire for high-type taxpayers can be characterized by a unique cut-off value, say β^d_H, defined such that taxpayers having beliefs $\beta \leq \beta^d_H$ hire practitioners and communicate $R_{\pounds}$ whereas those having beliefs $\beta \geq \beta^d_H$ do not hire practitioners but file a self-prepared return $R^i_{\hat{H},t_{cG}}$ or $R^i_{\hat{H},t_t}$, according to the conditions specified in Proposition 2. This cut-off value β^d_H occurs at the point where

$$\Delta\,(TL\,|\,H, \beta = \beta^d_H, R_{\pounds}, R^i_{\hat{H},t_{cG}} \text{ or } R^i_{\hat{H},t_t}) = 0, \tag{52}$$

where (52) is the expected net benefit function arising from either inequality (26) or (24) in Lemma 5. Which inequality applies depends upon whether β^d_H is less or greater than β^{VI}_H. The following theorem specifies the condition under which an optimal decision to hire exists.

Theorem 4: When $1/(1+\pi) < \gamma^i < 1$, $\gamma^p \geq \gamma^p_\dagger$, and for a given level of investigation $\zeta^\circ_{\pounds}$ chosen by the tax agency and a resulting $v(\zeta^\circ_{\pounds})$, an optimal decision to hire, characterized by a unique cut-off β^d_H, $\beta^d_H \in [0,1)$, described above exists if, and only if:

$$(1-v(\zeta_{\hat{L}}^{\circ}))[(1-\gamma^{p}(1+\pi+m))(t_{CG}H-t_{CG}L)+(\gamma^{i}-\gamma^{p})A] \geq F(\zeta_{\hat{L}}^{\circ}), \qquad \textbf{(49)}$$

where the LHS represents the gross expected benefit from hiring evaluated at $\beta=0$.

Proof: See Appendix C.

Since the expected benefit function is decreasing (or nonincreasing) in β for all β ∈ [0,1], the LHS of inequality (49) represents the maximal potential benefit to taxpayers from hiring, for a given $\zeta_{\hat{L}}^{\circ}$ and a resulting $v(\zeta_{\hat{L}}^{\circ})$. If the gross expected benefit at $\beta=0$ is greater than the practitioner fee, it is optimal for some taxpayers to hire practitioners. Note that since $\gamma^{p} > 1/(1+\pi+m)$, the first term in the square bracket is negative and, thus, when $\beta=0$, the only positive benefit to hiring arises from the lower expected cost of being audited when the return is practitioner-prepared rather than when it is self-prepared. This benefit is traded off against the net cost of evading, being audited by the tax agency and having to pay the additional taxes, the penalties and interest charges. As β increases, the expected net benefit from hiring (see inequalities (26) and (24)) decreases, since the expected net cost of evading increases while the expected cost of being audited remains constant. For hiring to occur, the cost of being audited, A, must be sufficiently high. Since $\gamma^{p} \geq \gamma_{\dagger}^{p}$, the difference between the probability the tax agency audits a practitioner-prepared return and a self-prepared return is relatively small; hence, the saving of the expected cost of being audited may also be small. As a result, the expected net benefit from hiring is expected to be low when $\gamma^{p} \geq \gamma_{\dagger}^{p}$.

When the expected net benefit function (given by equation (46)) is invariant with β (i.e., when $\gamma^{p}=\gamma_{\dagger}^{p}$), then *all* high-type taxpayers having beliefs $\beta \leq \beta_{H}^{VI}$ hire a practitioner if condition (49) holds and the benefit is maximal for all $\beta \in [0, \beta_{H}^{VI}]$. In this case, the cut-off value β_{H}^{d} occurs at a point such that $\beta_{H}^{VI} \leq \beta_{H}^{d} \leq 1$. If inequality (49) is reversed, taxpayers never hire practitioners but file a self-prepared return according to the conditions derived in Proposition 2.

Observe that the cut-off β_H^d in (52) can occur to the left or to the right of β_H^{VI}, or at $\beta = \beta_H^{VI}$ depending upon whether $\Delta(TL \mid \beta = \beta_H^{VI}, \cdot)$ is greater or less than, or equal to zero. This result is obtained because the expected net benefit function is continuous and monotonically decreasing (or nonincreasing) in β for all $\beta \in [0,1]$. It should also be noted that full hiring does not occur when $\gamma^p \geq \gamma_\dagger^p$ since from Lemma 5, inequality (24) evaluated at $\beta = 1$ cannot hold, that is:

$$(1 - v(\zeta_L^\circ))[(1 - \gamma^p(1 + \pi + m))(t_I H - t_I L) - \gamma^p A] \ngtr F(\zeta_L^\circ). \qquad \textbf{(53)}$$

Given the above conditions, high-type taxpayers' joint hiring, communication, and reporting decisions are summarized below.

Proposition 7: When $1/(1+\pi) < \gamma^i < 1$, $\gamma^p \geq \gamma_\dagger^p$, and for a given level of investigation ζ_L° chosen by the tax agency and a resulting $v(\zeta_L^\circ)$ such that the conditions in (2) of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) When inequality (49) in Theorem 4 holds:

(i) High-type taxpayers having beliefs $\beta \leq \beta_H^d$ hire practitioners and communicate R_L;

(ii) High-type taxpayers having beliefs $\beta \geq \beta_H^d$ do not hire practitioners but file a self-prepared return $R^i_{\hat{H}, t_{CG}}$ or $R^i_{\hat{H}, t_I}$, depending upon whether β_H^d is greater or less than β_H^{VI}.

(2) When inequality (49) in Theorem 4 does not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{t}_l}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^{i}_{\hat{t}_h, t_{CG}}$ or $R^{i}_{\hat{t}_h, t_l}$ according to the conditions derived in Proposition 2.

The intuition resulting from Theorem 4 and Proposition 7 is similar to that in previous cases, except that the potential benefit from hiring is maximal at the boundary $\beta = 0$ (or for $\beta \in [0, \beta_H^{VI}]$ if $\gamma^p = \gamma_\dagger^p$) instead of at the cut-off value β_H^{VI} (where taxpayers are indifferent between providing a self-prepared return $R^{i}_{\hat{t}_h, t_{CG}}$ or $R^{i}_{\hat{t}_h, t_l}$). In subcase 2.1 (i.e., where $\gamma^p < \gamma_\dagger^p$), the intuition is similar to that of previous cases in that taxpayers having less extreme beliefs about the tax rate (closer to ½) are more likely to hire practitioners than those whose beliefs are more extreme (closer to zero or one). Thus, practitioners can help taxpayers minimize their taxes, by resolving their uncertainty about the tax rate and also help them evade taxes, by not discovering the error and accepting the taxpayer's message. However, in subcase 2.2 (where $\gamma^p \geq \gamma_\dagger^p$), taxpayers whose beliefs are closer to zero are more likely to hire practitioners. These taxpayers are essentially hiring practitioners to attempt to evade taxes. When beliefs that the true tax rate is t_l are high (closer to one), the additional expected penalties and interest charges from communicating $R_{\hat{t}_l}$ and being audited by the tax agency are more likely to outweigh the potential savings arising from reporting lower taxes.

Case 3

This section examines high-type taxpayers' hiring decisions given that one of the set of conditions in (3) of Proposition 3 (i.e., subcases 3.1 to 3.5) holds. Under the previous two cases, high-type taxpayers who hired either *all* communicated $R_{\hat{t}_h}$ (case 1) or *all* communicated $R_{\hat{t}_l}$ (case 2). Under the cases analyzed in this section (subcases 3.1 to 3.5), the above two situations may arise and, additionally, *some* taxpayers may communicate $R_{\hat{H}}$, while others communicate $R_{\hat{L}}$. As in Proposition 3, it is assumed that inequality (8) holds for at least some $\beta \in [0,1]$ (i.e., $0 < v(\zeta_{\hat{L}})_{II|\beta} < 1$ for at least some $\beta \in [0, \beta_H^{VI}]$ and/or $0 < v(\zeta_{\hat{L}})_{III|\beta} < 1$ for at least some $\beta \in [\beta_H^{VI}, 1]$). Since the sets of conditions in (3) from Proposition 3 were derived under the assumption that $\gamma^p < 1/(1 + \pi + m)$, this assumption is adopted throughout this section. This implies that $\gamma^p < \gamma_\dagger^p$ and, thus, the expected net benefit from hiring and communicating $R_{\hat{L}}$ in (46) is monotonically increasing in β for $\beta \leq \beta_H^{VI}$.[34] Furthermore, as in prior cases, the expected net benefit function (defined over all $\beta \in [0,1]$) is continuous (although not differentiable at the cut-off values β_H^{VI}, β_H^*, and β_H^{**}),[35] is maximal at $\beta = \beta_H^{VI}$, and is monotonically decreasing in β for $\beta \geq \beta_H^{VI}$. Given the monotonicity over the β intervals (i.e., $\beta \leq \beta_H^{VI}$ and $\beta \geq \beta_H^{VI}$) and the continuity of $\Delta(TL \mid \cdot)$, taxpayers' hiring decisions can be characterized by two cut-off values, say β_H^k, $\beta_H^k \leq \beta_H^{VI}$ and β_H^n, $\beta_H^n \geq \beta_H^{VI}$. The cut-off value β_H^k is defined such that taxpayers having beliefs $\beta \leq \beta_H^k$ do not hire a practitioner but file a self-prepared return $R^i_{\hat{H}, t_{CG}}$, whereas those having beliefs $\beta_H^k \leq \beta \leq \beta_H^{VI}$ hire practitioners and communicate either $R_{\hat{H}}$ or $R_{\hat{L}}$.[36] The cut-off value β_H^n is defined such that taxpayers

---

[34]Recall that (46) may be monotonically increasing or decreasing in β or invariant with β depending upon whether γ^p is less than, greater than, or equal to $\gamma_\dagger^p$.

[35]Proof of continuity at β_H^* and β_H^{**} will be demonstrated in this section. Recall that β_H^* ($\beta_H^* \leq \beta_H^{VI}$) and β_H^{**} ($\beta_H^{**} \geq \beta_H^{VI}$) are the critical values which make taxpayers indifferent between communicating $R_{\hat{L}}$ or $R_{\hat{H}}$ when they hire.

[36]As in the previous cases, the cut-off β_H^k can occur at a point $\beta_H^k = 0$ or at a point $0 < \beta_H^k \leq \beta_H^{VI}$ such that $\Delta(TL \mid \cdot) = 0$.

having beliefs $\beta \geq \beta_H^n$ do not hire a practitioner but file a self-prepared return $R_{\hat{H},t_i}^{i}$, whereas those having beliefs $\beta_H^{VI} \leq \beta \leq \beta_H^n$ hire practitioners and communicate either $R_{\hat{H}}$ or $R_{\hat{L}}$.[37] Consequently, the interval over which hiring occurs is $\beta_H^k \leq \beta \leq \beta_H^n$. Differences in taxpayers' hiring strategies across the five subcases arise because of the different communication decisions which can be adopted in the third stage. As demonstrated in Section 4.2.2, whether taxpayers communicate $R_{\hat{H}}$ or $R_{\hat{L}}$ when they hire depends upon their particular beliefs about the tax rate and the set of conditions in Proposition 3 which applies.

Since the approach used in the characterization of taxpayers' decisions is again similar to that of previous cases and utilizes many of the results (conditions) from the preceding sections, high-type taxpayers' joint hiring, communication, and reporting decisions are presented immediately below, for each subcase 3.1 to 3.5. Furthermore, since the differences in the various subcases result from the different communication decisions, the intuition underlying these subcases is similar to that provided in Section 4.2.2. Accordingly, only a brief discussion of the results is provided.

Subcase 3.1

This case occurs when the critical rejection probability $v(\zeta_{\hat{L}})_{II|\beta}$ is decreasing in β and the tax agency chooses a level of investigation $\zeta_{\hat{L}}^{\circ}$ such that $v(\zeta_{\hat{L}}^{\circ}) \in [v(\zeta_{\hat{L}})_{III|\beta=1}, v(\zeta_{\hat{L}})_{II|\beta=0}]$ and condition (10) in Theorem 1(a) holds. Proposition 8 below summarizes high-type taxpayers' decisions.[38]

---

[37]The cut-off β_H^n can occur at a point $\beta_H^n=1$ or at a point $\beta_H^{VI} \leq \beta_H^k < 1$ such that $\Delta(TL\,|\,\cdot)=0$.

[38]See the proof of Proposition 8 in Appendix C for additional details regarding the derivation of taxpayers' decisions.

Proposition 8: When $1/(1+\pi)<\gamma^i<1$, $\gamma^p<1/(1+\pi+m)$, and for a given level of investigation $\zeta_{\mathcal{L}}^{\circ}$ chosen by the tax agency and a resulting $v(\zeta_{\mathcal{L}}^{\circ})$ such that the conditions in 3.1 of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequality (25), evaluated at $\beta=\beta_H^{VI}$, holds such that:

$$[\gamma^i(1+\pi)-1]\beta_H^{VI}(t_I H-t_{CG}H)+\gamma^i A \geq F(\zeta_{\mathcal{H}}), \tag{42}$$

i) High-type taxpayers having beliefs $\beta \leq \beta_H^k$ do not hire practitioners but file a self-prepared return $R^i_{\mathcal{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^n$ hire practitioners. When inequality (26), evaluated at $\beta=\beta_H^*$,[39] holds such that

$$\begin{aligned}(1-v(\zeta_{\mathcal{L}}^{\circ}))[(1-\gamma^p(1+\pi+m))[(t_{CG}H-t_{CG}L)-\beta_H^*(t_I L-t_{CG}L)]\\ +(\gamma^i-\gamma^p)(1+\pi)\beta_H^*(t_I H-t_{CG}H)-\gamma^p m\beta_H^*(t_I H-t_{CG}H)\\ +(\gamma^i-\gamma^p)A] \geq F(\zeta_{\mathcal{L}}^{\circ}),\end{aligned} \tag{54}$$

then taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^*$ communicate $R_{\mathcal{L}}$ when they hire whereas those having beliefs $\beta_H^* \leq \beta \leq \beta_H^n$ communicate $R_{\mathcal{H}}$. When (54) above does not hold, then all taxpayers who hire communicate $R_{\mathcal{H}}$; and,

iii) High-type taxpayers having beliefs $\beta_H^n \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^i_{\mathcal{H},t_I}$.

---

[39] β_H^*, $\beta_H^* \leq \beta_H^{VI}$ is the critical value calculated in Proposition 3 which makes taxpayers indifferent between communicating $R_{\mathcal{H}}$ and $R_{\mathcal{L}}$.

(2) When inequality (42) above does not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{VI}}$ or $R^{i}_{\hat{H},t_{I}}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

The net benefit of practitioner assistance is depicted in Figure 4.5. When the cut-off β^{k}_{H} occurs at a point $\beta^{k}_{H} \leq \beta^{*}_{H}$ (Figure 4.5a), some high-type taxpayers communicate $R_{\hat{L}}$ when they hire, since condition (54) holds. Note that the expected benefit from hiring is lowest when taxpayers communicate $R_{\hat{L}}$ and is maximal at $\beta = \beta^{VI}_{H}$ where taxpayers communicate $R_{\hat{H}}$. In this case, the probability that the taxpayer's message $R_{\hat{L}}$ is rejected and the practitioner fee $F(\zeta_{\hat{L}})$ are relatively high. Consequently, the expected net benefit from hiring and attempting to evade is low relative to the expected net benefit from hiring and truthfully communicating the level of income and is negative for taxpayers whose beliefs β that the tax rate is t_{I} are high. When condition (54) does not hold, i.e., when the expected net benefit from hiring and communicating $R_{\hat{L}}$ at β^{*}_{H} is negative, the cut-off β^{k}_{H} occurs at a point $\beta^{k}_{H} \geq \beta^{*}_{H}$ such that all high-type taxpayers provide the message $R_{\hat{H}}$ when they hire, as illustrated in Figure 4.5b.

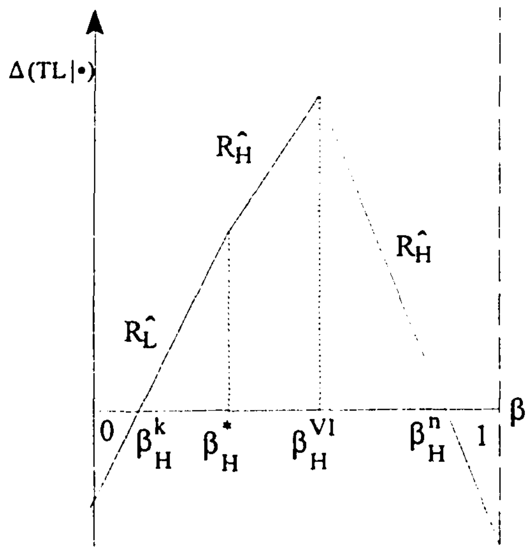


Figure 4.5a

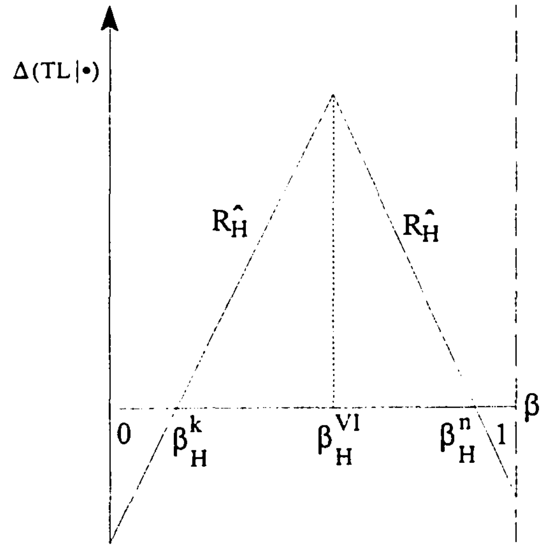


Figure 4.5b

FIGURE 4.5

Net Benefit of Practitioner Assistance (Subcase 3.1)

Subcase 3.2

This case occurs when the critical rejection probability $v(\zeta_L)_{H|\beta}$ is decreasing in β or invariant with β and the tax agency chooses a level of investigation ζ_L° such that $v(\zeta_L^{\circ}) \in [v(\zeta_L)_{H|\beta=0},\ v(\zeta_L)_{HH|\beta=1}]$ and condition (17) in Theorem 1(b) holds. This case is similar to subcase 3.1 except that the relationship between $v(\zeta_L)_{H|\beta=0}$ and $v(\zeta_L)_{HH|\beta=1}$ is reversed; that is, $v(\zeta_L)_{HH|\beta}$ is greater than $v(\zeta_L)_{H|\beta}$ for some β (see Figure 4.2, subcases 3.1 and 3.2). Furthermore, the tax agency chooses a level of investigation ζ_L° such that $v(\zeta_L^{\circ}) > v(\zeta_L)_{H|\beta}$ for all $\beta \in [0,\ \beta_H^{17}]$ but $v(\zeta_L^{\circ}) \leq v(\zeta_L)_{HH|\beta=1}$. Consequently, all high-type taxpayers having beliefs $\beta \in [0,\ \beta_H^{17}]$ communicate R_H when they hire; those whose beliefs are $\beta \in [\beta_H^{VI}, 1]$ communicate $R_{\hat{H}}$ or $R_{\hat{L}}$ when they hire depending on the cut-off values β_H^{**} and β_H^{n} as described in Proposition 9 below.

Proposition 9: When $1/(1+\pi) < \gamma^i < 1$, $\gamma^p < 1/(1+\pi+m)$, and for a given level of investigation $\zeta_{\hat{L}}^{\circ}$ chosen by the tax agency and a resulting $v(\zeta_{\hat{L}}^{\circ})$ such that the conditions in 3.2 of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequalities (25) and (24), evaluated at $\beta = 0$ and $\beta = 1$, respectively, hold, or equivalently, when

$$\gamma^i A \geq F(\zeta_{\hat{H}}) \quad \textbf{(40)}$$

and

$$(1 - v(\zeta_{\hat{L}}^{\circ}))[(1 - \gamma^p(1 + \pi + m))(t_I H - t_I L) - \gamma^p A] \geq F(\zeta_{\hat{L}}^{\circ}), \quad \textbf{(50)}$$

then *all* high-type taxpayers hire practitioners and communicate their level of income according to the conditions specified in Proposition 3, subcase 3.2.

(2) From Lemma 5, when inequality (25), evaluated at $\beta = \beta_H^{VI}$, holds such that:

$$[\gamma^i(1+\pi) - 1]\beta_H^{VI}(t_I H - t_{CG} H) + \gamma^i A \geq F(\zeta_{\hat{H}}), \quad \textbf{(42)}$$

i) High-type taxpayers having beliefs $\beta \leq \beta_H^{k}$ do not hire practitioners but file a self-prepared return $R_{\hat{H},t_{CG}}^{i}$;

ii) High-type taxpayers having beliefs $\beta_H^{k} \leq \beta \leq \beta_H^{n}$ hire practitioners.

When inequality (24), evaluated at $\beta = \beta_H^{**}$,[40] holds such that

$$(1 - v(\zeta_{\hat{L}}))[(t_I H - t_{CG} L) - \beta_H^{**}(t_I L - t_{CG} L) - \gamma^p(1 + \pi + m)[\beta_H^{**}(t_I H - t_I L) + (1 - \beta_H^{**})(t_{CG} H - t_{CG} L)] - \gamma^p A] \geq F(\zeta_{\hat{L}}), \quad \textbf{(55)}$$

then taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^{**}$ communicate $R_{\hat{H}}$ when they hire whereas those having beliefs $\beta_H^{**} \leq \beta \leq \beta_H^n$ communicate $R_{\hat{L}}$. When (55) above does not hold, then all taxpayers who hire communicate $R_{\hat{H}}$; and,

iii) High-type taxpayers having beliefs $\beta_H^n \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^i_{\hat{H}, t_I}$.

(3) When inequality (42) above does not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^i_{\hat{H}, t_{CG}}$ or $R^i_{\hat{H}, t_I}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

Subcase 3.3

This case occurs when the critical rejection probability $v(\zeta_{\hat{L}})_{H|\beta}$ is decreasing in β and the tax agency chooses a level of investigation $\zeta_{\hat{L}}^{\circ}$ such that $v(\zeta_{\hat{L}}^{\circ}) \in [v(\zeta_{\hat{L}})_{H|\beta=0}$,

---

[40] β_H^{**}, $\beta_H^{**} \geq \beta_H^{VI}$ is the critical value calculated in Proposition 3 which makes taxpayers indifferent between communicating $R_{\hat{H}}$ and $R_{\hat{L}}$.

$v(\zeta_{\ell})_{III|\beta=1}$] and both conditions (10) and (17) in Theorems 1(a) and 1(b), respectively, hold. Subcase 3.3 can be viewed as a combination of subcases 3.1 and 3.2 where one of conditions (10) and (17) hold, respectively. In the present case, both conditions are satisfied. Consequently, high-type taxpayers having more extreme beliefs, i.e., β close to zero or one, are more likely to communicate a low level of income (evade) when they hire. Proposition 10 below summarizes high-type taxpayers' decisions.

Proposition 10: When $1/(1+\pi)<\gamma^i<1$, $\gamma^p<1/(1+\pi+m)$, and for a given level of investigation ζ_{ℓ}° chosen by the tax agency and a resulting $v(\zeta_{\ell}^{\circ})$ such that the conditions in 3.3 of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequalities (26) and (24), evaluated at $\beta=0$ and $\beta=1$, respectively, hold, or equivalently, when

$$(1-v(\zeta_{\ell}^{\circ}))[(1-\gamma^p(1+\pi+m))(t_{CG}H-t_{CG}L)+(\gamma^i-\gamma^p)A] \geq F(\zeta_{\ell}^{\circ}) \quad \textbf{(49)}$$

and

$$(1-v(\zeta_{\ell}^{\circ}))[(1-\gamma^p(1+\pi+m))(t_lH-t_lL)-\gamma^pA] \geq F(\zeta_{\ell}^{\circ}), \quad \textbf{(50)}$$

then *all* high-type taxpayers hire practitioners and communicate their level of income according to the conditions specified in Proposition 3, subcase 3.3.

(2) From Lemma 5, when inequality (25), evaluated at $\beta=\beta_H^{VI}$, holds such that:

$$[\gamma^i(1+\pi)-1]\beta_H^{VI}(t_lH-t_{CG}H)+\gamma^iA \geq F(\zeta_{h}), \quad \textbf{(42)}$$

i) High-type taxpayers having beliefs $\beta\leq\beta_H^k$ do not hire practitioners but file a self-prepared return $R_{H,t_{CG}}^i$;

ii) High-type taxpayers having beliefs $\beta_H^k\leq\beta\leq\beta_H^n$ hire practitioners. When inequality (54) in Proposition 8 holds, then taxpayers having beliefs $\beta_H^k\leq\beta\leq\beta_H^*$ communicate R_{ℓ} when they hire whereas those having beliefs

$\beta_H^{*} \leq \beta \leq \beta_H^{VI}$ communicate $R_{\hat{H}}$. When inequality (54) does not hold, then all taxpayers having beliefs $\beta_H^{k} \leq \beta \leq \beta_H^{VI}$ communicate $R_{\hat{H}}$ when they hire. When inequality (55) in Proposition 9 holds, then taxpayers having beliefs $\beta_H^{VI} \leq \beta \leq \beta_H^{**}$ communicate $R_{\hat{H}}$ when they hire whereas those having beliefs $\beta_H^{**} \leq \beta \leq \beta_H^{n}$ communicate $R_{\hat{L}}$. When (55) does not hold, then all taxpayers having beliefs $\beta_H^{VI} \leq \beta \leq \beta_H^{n}$ communicate $R_{\hat{H}}$ when they hire; and,

iii) High-type taxpayers having beliefs $\beta_H^{n} \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_t}$.

(3) When inequality (42) above does not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$ or $R^{i}_{\hat{H},t_t}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

Subcase 3.4

This case occurs when the critical rejection probability $v(\zeta_{\hat{L}})_{II|\beta}$ is increasing in β and the tax agency chooses a level of investigation $\zeta_{\hat{L}}^{\circ}$ such that $v(\zeta_{\hat{L}}^{\circ}) \in [v(\zeta_{\hat{L}})_{II|\beta=0}, v(\zeta_{\hat{L}})_{III|\beta=1}]$ and either condition (10) or (17) in Theorems 1(a) and 1(b), respectively, holds. Subcase 3.4 differs from the previous cases in that the critical rejection probability function for $\beta \leq \beta_H^{VI}$ is increasing rather than decreasing in β (as explained in Section 4.2.2). Proposition 11 below summarizes high-type taxpayers' decisions.

Proposition 11: When $1/(1+\pi)<\gamma^i<1$, $\gamma^p<1/(1+\pi+m)$, and for a given level of investigation $\zeta_{\mathcal{L}}^{\circ}$ chosen by the tax agency and a resulting $v(\zeta_{\mathcal{L}}^{\circ})$ such that the conditions in 3.4 of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequalities (25) and (24), evaluated at $\beta=0$ and $\beta=1$, respectively, hold, or equivalently, when

$$\gamma^i A \geq F(\zeta_{\mathcal{H}}) \tag{40}$$

and

$$(1-v(\zeta_{\mathcal{L}}^{\circ}))[(1-\gamma^p(1+\pi+m))(t_l H - t_l L) - \gamma^p A] \geq F(\zeta_{\mathcal{L}}^{\circ}), \tag{50}$$

then *all* high-type taxpayers hire practitioners and communicate their level of income according to the conditions specified in Proposition 3, subcase 3.4.

(2a) Given condition (10) in Theorem 1(a) holds, when inequality (26) in Lemma 5, evaluated at $\beta=\beta_H^{VI}$, is satisfied such that:

$$\begin{aligned}(1-v(\zeta_{\mathcal{L}}^{\circ}))[(1-\gamma^p(1+\pi+m))[(t_{CG}H - t_{CG}L) - \beta_H^{VI}(t_l L - t_{CG}L)] \\ +(\gamma^i-\gamma^p)(1+\pi)\beta_H^{VI}(t_l H - t_{CG}H) - \gamma^p m \beta_H^{VI}(t_l H - t_{CG}H) \\ +(\gamma^i-\gamma^p)A] \geq F(\zeta_{\mathcal{L}}^{\circ}),\end{aligned} \tag{51}$$

i) High-type taxpayers having beliefs $\beta \leq \beta_H^k$ do not hire practitioners but file a self-prepared return $R^i_{\mathcal{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^n$ hire practitioners.

When inequality (25), evaluated at $\beta=\beta_H^*$, holds such that

$$[\gamma^i(1+\pi)-1]\beta_H^*(t_l H - t_{CG}H) + \gamma^i A \geq F(\zeta_{\mathcal{H}}), \tag{56}$$

then taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^*$ communicate $R_{\mathcal{H}}$ when they hire whereas those having beliefs $\beta_H^{*} \leq \beta \leq \beta_H^{n}$ communicate $R_{\hat{L}}$. When inequality (56) does not hold, then all taxpayers who hire communicate $R_{\hat{L}}$; and,

iii) High-type taxpayers having beliefs $\beta_H^{n} \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_I}$.

(2b) Given condition (17) in Theorem 1(b) holds, when inequality (25) in Lemma 5, evaluated at $\beta = \beta_H^{VI}$, is satisfied such that:

$$[\gamma^{i}(1+\pi)-1]\beta_H^{VI}(t_I H - t_{CG} H) + \gamma^{i} A \geq F(\zeta_{\hat{H}}), \tag{42}$$

i) High-type taxpayers having beliefs $\beta \leq \beta_H^{k}$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta_H^{k} \leq \beta \leq \beta_H^{n}$ hire practitioners. When inequality (24), evaluated at $\beta = \beta_H^{**}$, holds (see inequality (55), Proposition 9), then taxpayers having beliefs $\beta_H^{k} \leq \beta \leq \beta_H^{**}$ communicate $R_{\hat{H}}$ when they hire whereas those having beliefs $\beta_H^{**} \leq \beta \leq \beta_H^{n}$ communicate $R_{\hat{L}}$. When (55) does not hold, then all taxpayers who hire communicate $R_{\hat{H}}$; and,

iii) High-type taxpayers having beliefs $\beta_H^{n} \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_I}$.

(3) When inequalities (51) or (42) above do not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$ or $R^{i}_{\hat{H},t_{I}}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

Subcase 3.5

This case occurs when the critical rejection probability $v(\zeta_{\hat{L}})_{H|\beta}$ is invariant with β and the tax agency chooses a level of investigation $\zeta^{\circ}_{\hat{L}}$ such that $v(\zeta^{\circ}_{\hat{L}}) = v(\zeta_{\hat{L}})_{H|\beta}$ for all $\beta \in [0, \beta^{VI}_{H}]$. Proposition 12 below summarizes high-type taxpayers' decisions.

Proposition 12: When $1/(1+\pi) < \gamma^{i} < 1$, $\gamma^{p} < 1/(1+\pi+m)$, and for a given level of investigation $\zeta^{\circ}_{\hat{L}}$ chosen by the tax agency and a resulting $v(\zeta^{\circ}_{\hat{L}})$ such that the conditions in 3.5 of Proposition 3 hold, high-type taxpayers' joint hiring, communication, and reporting decisions are characterized as follows:

(1) From Lemma 5, when inequalities (25) and (26), evaluated at $\beta = 0$ and inequality (24), evaluated at $\beta = 1$, respectively, hold, or equivalently, when

$$\gamma^{i} A \geq F(\zeta_{\hat{H}}), \tag{40}$$

$$(1 - v(\zeta^{\circ}_{\hat{L}}))[(1 - \gamma^{p}(1+\pi+m))(t_{CG}H - t_{CG}L) + (\gamma^{i} - \gamma^{p})A] \geq F(\zeta^{\circ}_{\hat{L}}), \tag{49}$$

and

$$(1 - v(\zeta^{\circ}_{\hat{L}}))[(1 - \gamma^{p}(1+\pi+m))(t_{I}H - t_{I}L) - \gamma^{p}A] \geq F(\zeta^{\circ}_{\hat{L}}), \tag{50}$$

then *all* high-type taxpayers hire practitioners and communicate their level of income according to the conditions specified in Proposition 3, subcase 3.5.

(2) From Lemma 5, when inequality (25), evaluated at $\beta = \beta^{VI}_{H}$, holds such that:

$$[\gamma^{i}(1+\pi) - 1]\beta^{VI}_{H}(t_{I}H - t_{CG}H) + \gamma^{i}A \geq F(\zeta_{\hat{H}}), \tag{42}$$

or inequality (26), evaluated at $\beta = \beta^{VI}_{H}$, holds such that:

$$(1 - v(\zeta_{\hat{L}}^{\circ}))[(1-\gamma^{p}(1+\pi+m))[(t_{CG}H - t_{CG}L) - \beta_H^{VI}(t_I L - t_{CG}L)] + (\gamma^{i}-\gamma^{p})(1+\pi)\beta_H^{VI}(t_I H - t_{CG}H) - \gamma^{p} m \beta_H^{VI}(t_I H - t_{CG}H) + (\gamma^{i}-\gamma^{p})A] \geq F(\zeta_{\hat{L}}^{\circ}) \quad \textbf{(51)}$$

i) High-type taxpayers having beliefs $\beta \leq \beta_H^k$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$;

ii) High-type taxpayers having beliefs $\beta_H^k \leq \beta \leq \beta_H^{VI}$ hire practitioners and are indifferent between communicating $R_{\hat{H}}$ or $R_{\hat{L}}$;

iii) High-type taxpayers having beliefs $\beta_H^{VI} \leq \beta \leq \beta_H^n$ hire practitioners and communicate $R_{\hat{L}}$;

iv) High-type taxpayers having beliefs $\beta_H^n \leq \beta \leq 1$ do not hire practitioners but file a self-prepared return $R^{i}_{\hat{H},t_I}$.

(3) When inequalities (42) or (51) above do not hold, *no* high-type taxpayers hire practitioners.

Where hiring does not occur or where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^{i}_{\hat{H},t_{CG}}$ or $R^{i}_{\hat{H},t_I}$ according to the conditions derived in Proposition 2.

Proof: See Appendix C.

The intuition underlying cases 3.1 to 3.5 is similar to that of cases 1 and 2.1 in that taxpayers having less extreme beliefs β about the tax rate are more likely to hire practitioners than those whose beliefs are more extreme (closer to zero or one). The implication of this result is that the expected net benefit to taxpayers from hiring practitioners arises primarily from their opportunity to resolve their uncertainty about the tax rate, i.e., to engage in successful tax minimization. However, depending on the tax agency's chosen level of investigation, the probability that the practitioner correctly rejects a low message, as well as the practitioner fee, taxpayers may, under certain circumstances, hire to attempt to evade by communicating R_{ℓ}. In most cases, with the exception of subcases 3.4(a) and 3.5, it would seem that taxpayers having less extreme beliefs are more likely to truthfully communicate their level of income whereas those with more extreme beliefs are more likely to lie about their level of income and communicate R_{ℓ}. Given the form of the expected net benefit functions, the benefit to taxpayers from hiring is lowest when they misreport their level of income. This result reflects the trade-off between taxpayers' incentives to engage in tax minimization and their opportunity to engage in tax evasion. In cases where the level of investigation, ζ_{ℓ}°, and the resulting probability of rejection, $v(\zeta_{\ell}^{\circ})$, are "sufficiently low", i.e., subcase 3.4(a), taxpayers hire practitioners to engage in both tax evasion and tax minimization. In fact, the expected net benefit from hiring is maximal when taxpayers lie about their level of income. Tax practitioners can therefore perform a dual role: as taxpayer advocates, they help taxpayers tax minimize; as tax agency advocates, they are required to perform an investigation of taxpayers' financial affairs and have some level of responsibility for detecting nontruthful reporting. The results derived in this section have interesting implications for the tax agency's choice of strategy, which is analyzed in Section 4.3.

4.2.4 Classes of Potential Equilibria

Up to this point, the analysis has consisted of characterizing taxpayers' decisions, for each possible level of investigation which can be chosen by the tax agency, and for various sets of parameter values. The critical values derived in Sections 4.2.1 and 4.2.2 and the hiring conditions obtained in Lemmas 4 and 5 (Section 4.2.3) were utilized to partition the population of taxpayers into groups based on their beliefs β about the tax rate. Taxpayers' joint hiring decisions, their message communicated to practitioners, where applicable, and their reporting decisions were inferred from the partitionings obtained, for all $\beta \in [0,1]$ and for both high and low-type taxpayers. Note that to simplify the analysis, only one case, in which $1/(1+\pi)<\gamma^{i}<1$, was exhaustively analyzed.

Prior to proceeding with the analysis of the tax agency's decision problem, it is useful to summarize the classes of "potential equilibria"[41] which may exist. Since high and low-type taxpayers' hiring and communication decisions are interdependent, these classes are characterized by both high and low-type taxpayers strategies. Table 4.1 below provides a summary of the potential equilibrium classes (or subclasses) in terms of taxpayers' hiring and communication decisions and under the assumption that $1/(1+\pi)<\gamma^{i}<1$. It has already been demonstrated in the various stages that, through dominance, certain actions will be not be chosen. As such, they are not included the summary of the classes of potential equilibria.

[41]Since the tax agency's strategy has not yet been analyzed, the term "potential equilibria" is used.

TABLE 4.1

Classes of Potential Equilibria

	Low-type Taxpayers		
High-type Taxpayers	All Hire (Prop. 4)	Some Hire (Prop. 4)	None Hire (Prop. 4)
All Hire; All communicate R_{ℓ} (Prop. 6 and 11)	1*	2	3‡
All Hire; All communicate R_{h}†	–	–	–
All Hire; Some communicate R_{ℓ}, others, R_{h} (Prop. 9, 10, 11 and 12)	4	5	6‡
Some Hire; All communicate R_{ℓ} (Prop. 6, 7, and 11)	7	8	9‡
Some Hire; All communicate R_{h} (Prop. 5, 8, 9, 10, and 11)	10	11	12
Some Hire; Some communicate R_{ℓ}, others, R_{h} (Prop. 8, 9, 10, 11, 12)	13	14	15‡
None Hire (Prop. 5 to 12)	16	17	18

*Note that different parameter combinations lead to the same class of potential equilibrium strategies as characterized in the various propositions.

†Any potential equilibrium in which all high-type taxpayers hire and communicate R_{h} cannot exist. This result follows from Case 1, Proposition 5, in which it was demonstrated that at $\beta=1$, the expected net benefit from hiring is negative.

‡Equilibria in classes 3, 6, 9, and 15 do not exist (see Proposition 13).

Equilibria do not exist in many of these classes; hence, they are eliminated prior to examining the tax agency's problem.

Proposition 13: Equilibria in Classes 3,6, 9, and 15 do not exist. Any potential equilibrium in which low-type taxpayers never hire and high-type taxpayers (either all or some) hire and communicate $R_{\hat{L}}$ cannot exist.

Proof:

Assume that an equilibrium in one of classes 3, 6, 9, or 15 exists. In this equilibrium, low-type taxpayers never hire but file a self-prepared return $R^{i}_{\hat{L},t_i}$ or $R^{i}_{\hat{L},t_{CG}}$. Whenever a message $R_{\hat{L}}$ is communicated to practitioners, practitioners know that this message comes from a high-type taxpayer. Since in equilibrium, the tax agency's conjectures about taxpayers' optimal actions are identical to the strategies followed by taxpayers, the tax agency also knows that this message can only be communicated by a high-type taxpayer. Therefore, the tax agency selects the level of investigation $\zeta_{\hat{L}}=0$ and a resulting $v(\zeta_{\hat{L}}=0) = (1-w(\zeta_{\hat{L}}=0)) = 1$ such that practitioners always reject a message $R_{\hat{L}}$ without performing an investigation. High-type taxpayers, knowing that the message $R_{\hat{L}}$ will be rejected, will never choose this strategy. Hence, this class of equilibria cannot exist.

Q.E.D.

Whether an equilibrium exists in the remaining classes as well as which proposition applies depends on the set of parameter values, the level of investigation chosen by the tax agency, and the resulting probability of a type I and/or a type II error. However, before proceeding with the equilibrium analysis, the tax agency's decision problem must first be examined.

4.3 First Stage Tax Agency Decision

The tax agency's decision problem consists of choosing a level of investigation $\zeta_{\hat{\theta}}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$ (and the resulting levels of $v(\zeta_{\hat{\theta}})$ and $w(\zeta_{\hat{\theta}})$) associated with each message $R_{\hat{\theta}}$ communicated by taxpayers who hire practitioners such that it maximizes its expected tax revenue[42]. This level of investigation is selected before taxpayers choose their optimal strategy and is observed by all agents. The tax agency knows that, for each ζ_θ selected, taxpayers choose the strategy that minimizes their expected tax liability. Therefore, the tax agency must anticipate the effect that its strategy has on taxpayers' hiring, communication, and reporting decisions. In determining its own strategy, the tax agency calculates taxpayers' best responses to different levels of ζ_θ. Given these best responses, it selects the level of ζ_θ and, thus, the resulting levels of $v(\zeta_\theta)$ and $w(\zeta_\theta)$ such that it achieves its objective.

As explained in Observation 1 (see Section 4.2.2), it is optimal for the tax agency to have a practitioner always accept a taxpayer's message $R_{\mathcal{H}}$ without performing an investigation. Thus, $\zeta_{\mathcal{H}}=0$ and $w(\zeta_{\mathcal{H}}=0) = (1-v(\zeta_{\mathcal{H}}=0))=1$. The ensuing analysis therefore focuses on the tax agency's strategic choice variable, $\zeta_{\mathcal{L}}$, the level of investigation utilized by practitioners whenever taxpayers communicate $R_{\mathcal{L}}$.

Section 4.2 consisted of calculating taxpayers' best responses for different levels of $\zeta_{\mathcal{L}}$ and resulting levels of $v(\zeta_{\mathcal{L}})$ and $w(\zeta_{\mathcal{L}})$. As explained earlier, critical values were computed such that the population of taxpayers could be partitioned into groups based on their beliefs about the tax rate. The partitionings obtained were then utilized to infer taxpayers' hiring, communication, and reporting decisions. These partitionings can be interpreted as the reaction functions (best responses) calculated by the tax agency and used in the determination of its optimal level of investigation. Under the assumption that $1/(1+\pi)<\gamma^i<1$, various classes of potential equilibrium taxpayer strategies were identified (see Table 4.1 in Section 4.2.4) although it was also demonstrated that classes 3, 6, 9, and 15 could not constitute equilibrium strategies (see Proposition 13). Whether and which of the remaining classes of equilibria exist depends on the set of parameter

[42]See Table B.2 of Appendix B for a specification of the tax agency's expected tax revenue under the various strategies which may be chosen by a particular taxpayer.

values and/or the tax agency's choice of $\zeta_{\mathcal{L}}$; that is, for a given set of parameter values, certain classes of equilibria do not exist, and the existence of the remaining classes depends on the level of investigation chosen by the tax agency and the consequent levels of $v(\zeta_{\mathcal{L}})$ and $w(\zeta_{\mathcal{L}})$.

For example, assume that, for a given set of parameter values, there exists a level of $\zeta_{\mathcal{L}}$ such that Class 1 represents the strategies adopted by high and low-type taxpayers, where all taxpayers seek practitioner assistance and communicate $R_{\mathcal{L}}$. The tax agency may be able to increase its expected tax revenue by choosing another level of $\zeta_{\mathcal{L}}$ such that only a proportion of taxpayers hire practitioners. The tax agency therefore induces taxpayers to follow a different strategy.

The analysis to date has derived taxpayers' strategies for various sets of parameter values. However, whenever a particular game is played, a specific set of parameter values exists and both the tax agency and the taxpayers know these values (e.g., γ^{i}, γ^{p}, π, m, A, ...). Thus, the set of possible equilibrium strategies is smaller than that presented in Table 4.1 (Section 4.2.4).

The subsequent analysis imposes additional assumptions on some of the parameter values in order to focus on the solution to a particular game. First, it is assumed that $\gamma^{p} < 1/(1+\pi+m)$. This implies that the difference between the probability that the tax agency audits a self-prepared return and a practitioner-prepared return is relatively significant. Taxpayers can obtain a greater benefit from hiring through facing a lower probability of being audited by the tax agency when the return is practitioner-prepared as well as through facing a lower expected cost of being audited. Second, it is assumed that the numerator of the critical rejection probability function $v(\zeta_{\mathcal{L}})_{II|\beta}$ (inequality (7)) is greater than zero for at least some $\beta \in [0,\beta_{H}^{VI}]$ (i.e., condition (8) holds for some $\beta \in [0,\beta_{H}^{VI}]$). This assumption implies that $0<v(\zeta_{\mathcal{L}})_{II|\beta}<1$ for at least some $\beta \in [0,\beta_{H}^{VI}]$ and $0<v(\zeta_{\mathcal{L}})_{III|\beta}<1$ for all $\beta \in [\beta_{H}^{VI},1]$ (see the discussion in Section 4.2.2). Finally, it is assumed that the cost of being audited, A, is "sufficiently high" such that $\partial v(\zeta_L)_{II|\beta} / \partial\beta$ is always greater than zero. Given these assumptions, the critical rejection probability functions, $v(\zeta_L)_{II|\beta}$ and $v(\zeta_L)_{III|\beta}$ (inequalities (7) and (15)), take a form similar to that depicted below:

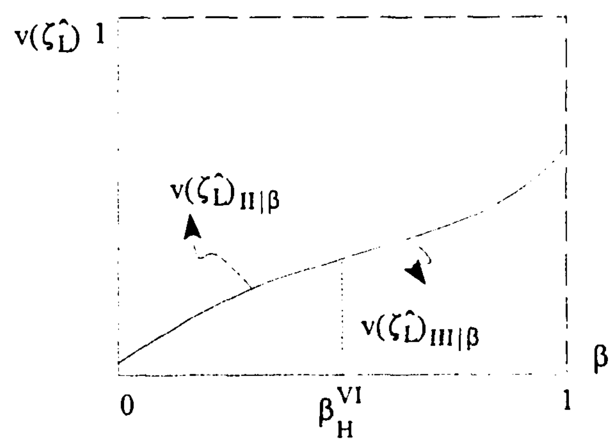


FIGURE 4.6

Critical Rejection Probability Function

The assumptions made above are expected to be satisfied for a wide range of parameter values. Furthermore these assumptions ensure that, for a given set of parameter values, the largest number of classes constitute potential equilibrium strategies, including some of the more interesting cases where *some* high-type taxpayers communicate R_H when they hire, while others communicate R_L.[43] It should be noted that these additional assumptions do not preclude the analysis of the trade-offs faced by both the tax agency

[43]Recall that from Section 4.2.3, if $\gamma^p > 1/(1 + \pi + m)$, then either *all* high-type taxpayers communicate R_H or *all* communicate R_L.

and the taxpayers. Table 4.2 below presents the revised classes of potential equilibrium strategies given the additional assumptions on the parameter values.

TABLE 4.2

Revised Classes of Potential Equilibria

	Low-type Taxpayers		
High-type Taxpayers	All Hire (Prop. 4)	Some Hire (Prop. 4)	None Hire (Prop. 4)
All Hire; All communicate $R_{\pounds}$ (Prop. 6)	1	2	–[†]
All Hire; Some communicate $R_{\pounds}$, others, $R_{\hbar}$ (Prop. 11)	3a,b*	4a,b	–[†]
Some Hire; All communicate $R_{\pounds}$ (Prop. 6 or 11)	5	6	–[†]
Some Hire; All communicate $R_{\hbar}$ (Prop. 5 or 11)	7	8	9
Some Hire; Some communicate $R_{\pounds}$, others, $R_{\hbar}$ (Prop. 11)	10a,b	11a,b	–[†]
None Hire (Prop. 5, 6, or 11)	12	13	14

*Each subclass (a,b) corresponds to a particular hiring, communication, and reporting strategy.
[†]Equilibria do not exist (as demonstrated in Proposition 13).

Before proceeding with the discussion of the tax agency's decision problem, the following definitions are provided:

(1) Let $\bar{\beta}(i,j) \equiv \int_i^j \frac{\beta f(\beta) d\beta}{F(j) - F(i)}$ be defined as the partial mean of β over the interval [i,j], where $0 \leq i < j \leq 1$.

(2) $F(\beta(i,j)) \equiv \int_i^j f(\beta)\,d\beta$ is the probability that the taxpayer's belief β lies within the interval [i,j].

As mentioned earlier, the tax agency's objective is to choose the level of investigation which maximizes its expected tax revenue, conditional on high and low-type taxpayers following the strategy which is their best response to the chosen level of investigation. The approach to the solution of the tax agency's decision problem is as follows. First, the tax agency identifies, for a given set of parameter values, the classes of taxpayer strategies for which an equilibrium may exist: these classes are presented in Table 4.2. Second, the tax agency's expected tax revenue function is specified assuming that high and low-type taxpayers adopt strategies in a particular class.[44] The tax agency then calculates the interval $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]$ over which taxpayers adopt their respective strategies; that is, it calculates high and low-type taxpayers' reaction functions for different levels of $\zeta_{\pounds}$ in the interval $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]$. Given these reaction functions, the tax agency then chooses the level of $\zeta_{\pounds}$ which maximizes its expected tax revenue. This procedure is repeated for every class or subclass (hereafter, class) -- for all high and low-type taxpayer strategies identified as possible equilibrium strategies. For each class ci, ci = c1, c2, c3a,...c14, the interval $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]_{ci}$ over which taxpayers adopt their respective strategies is calculated and an optimal level of investigation is selected. Finally, the tax agency compares the expected tax revenue obtained under the various classes and chooses the level of investigation which provides the tax agency the highest expected tax revenue -- $\zeta_{\pounds}^{*}$ is the level of investigation which solves the tax agency's global maximization problem. Through its choice of $\zeta_{\pounds}^{*}$, the tax agency essentially induces taxpayers to follow a particular strategy. As will be demonstrated in Chapter 5, given the

---

[44]Table D.1 of Appendix D provides, for each class, a specification of the tax agency's expected tax revenue function.

optimal level of investigation $\zeta_{\pounds}^{*}$, only one of the 18 classes constitutes an equilibrium pair of taxpayer strategies.

The tax agency's decision problem can be summarized as:

$$\underset{\zeta_{\pounds}}{Max} \quad E(TR(\zeta_{\pounds}) \mid r_H(\zeta_{\pounds}), r_L(\zeta_{\pounds})), \tag{57}$$

where TR is the tax agency's expected tax revenue and $r_H(\zeta_{\pounds})$ and $r_L(\zeta_{\pounds})$ are the reaction functions of high and low-type taxpayers, respectively.

CHAPTER 5

EQUILIBRIUM ANALYSIS

5.1 Introduction

Chapter 4 focused on identifying and characterizing taxpayers' strategies (best responses) for various sets of parameter values and for each possible level of $\zeta_{\mathcal{L}}$ which can be chosen by the tax agency, and the resulting levels of $v(\zeta_{\mathcal{L}})$ and $w(\zeta_{\mathcal{L}})$. Furthermore, a discussion of the tax agency's decision problem and approach to the solution was also provided. The results obtained in that chapter are now utilized in the equilibrium analysis of the game.

As mentioned in Chapter 4, players move sequentially, with the tax agency (Stackelberg Leader) moving first, followed by the taxpayers (Followers). The equilibrium concept used is the Stackelberg equilibrium which is consistent with backward induction. In this equilibrium, taxpayers' strategies are to choose, for each possible level of $\zeta_{\mathcal{L}}$, the hiring, communication, and reporting actions that minimize their expected tax liability. The tax agency's strategy is to choose the level of investigation $\zeta_{\mathcal{L}}$ and resulting $v(\zeta_{\mathcal{L}})$ and $w(\zeta_{\mathcal{L}})$ which maximize its expected tax revenue given that taxpayers react optimally to the chosen level of $\zeta_{\mathcal{L}}$. In equilibrium, no player can gain by switching to a different strategy.

From the analysis in Chapter 4 and given the assumptions on the parameter values (summarized below), 18 classes or subclasses (hereafter, classes) of potential equilibrium taxpayer strategies were identified (see Table 4.2, Section 4.3). The following section examines the equilibrium configuration for each class and demonstrates the existence of an equilibrium.

5.2 Equilibrium of the Model

Before proceeding, a summary of the basic assumptions is provided.

Basic Assumptions

(a) $1/(1+\pi)<\gamma^{i}<1$;

(b) $\gamma^{p}<1/(1+\pi+m)$;

(c) Condition (8) holds for at least some $\beta \in [0,\beta_H^{VI}]$; hence, $0<v(\zeta_{\mathcal{L}})_{II|\beta}<1$ for some $\beta \in [0,\beta_H^{VI}]$ and $0<v(\zeta_{\mathcal{L}})_{III|\beta}<1$ for all $\beta \in [\beta_H^{VI},1]$;

(d) A is "sufficiently high" such that $\partial v(\zeta_{\mathcal{L}})_{II|\beta}/\partial\beta>0$;

(d) From Section 4.1:

(i) $t_IH > t_{CG}H > t_IL > t_{CG}L$ (Assumption 1); and

(ii) $t_IH > t_{CG}H + A$ (Assumption 2).

Given these assumptions, the critical rejection probability functions, $v(\zeta_{\mathcal{L}})_{II|\beta}$ and $v(\zeta_{\mathcal{L}})_{III|\beta}$, take the form described in Section 4.3 (see Figure 4.6).

Proposition 14:

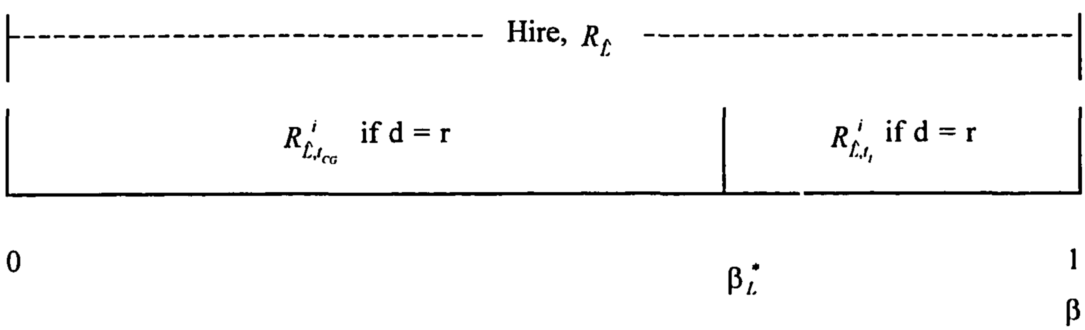
Given the basic assumptions, there exists an equilibrium characterized by the level of investigation, $\zeta_{\mathcal{L}}^*$, the resulting $v(\zeta_{\mathcal{L}}^*)$ and $w(\zeta_{\mathcal{L}}^*)$, and a strategy for high and low-type taxpayers from among those described in Table 4.2 which is the best response to the chosen level of investigation $\zeta_{\mathcal{L}}^*$. The equilibrium takes the form described in one of the classes below. For ease of presentation, the classes in Table 4.2 are grouped into 3 categories, according to the hiring decisions of low-type taxpayers.

Category 1

Suppose that the tax agency's optimal level of investigation $\zeta_{\mathcal{L}}^*$ is in one of the intervals $[\zeta_{\pounds}^{Min},\zeta_{\pounds}^{Max}]_{ci}$, where $[\zeta_{\pounds}^{Min},\zeta_{\pounds}^{Max}]_{ci}$ is the interval over which high and low-type taxpayers' respective strategies in class ci are adopted, ci=c1, c3a, c3b, c5, c7, c10a, c10b, and c12 (see Table 4.2). The equilibrium strategies are as follows.

(1) Low-type taxpayers

The set of classes in category 1 involves *all* low-type taxpayers hiring a practitioner and communicating $R_{\pounds}$. Their strategies are described in Proposition 4 and are depicted below as a function of their beliefs β about the tax rate:



By Proposition 4, *all* low-type taxpayers hire a practitioner and communicate $R_{\pounds}$ if, and only if inequality (30) holds; that is, if

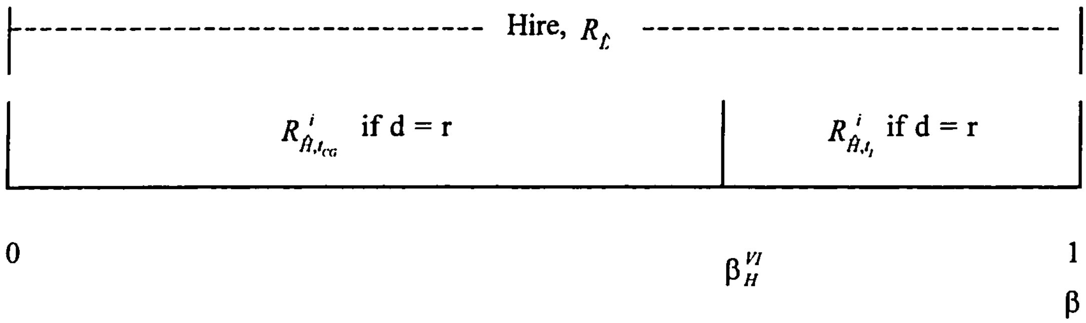
$$w(\zeta_{\pounds}^{*})(\gamma^{i}-\gamma^{p})A \geq F(\zeta_{\pounds}^{*}) \qquad \forall\ \beta \in [0,1]. \tag{30}$$

In the event that the message $R_{\pounds}$ is rejected, taxpayers file their own return according to the conditions in Proposition 1.

(2) High type taxpayers

Class 1:

High-type taxpayers' strategies are described in Proposition 6 and are depicted below:



All high-type taxpayers hire and communicate $R_{\pounds}$ if, and only if the following conditions are satisfied:

(1) Inequalities (49) and (50) in Proposition 6 hold; that is

$$(1 - v(\zeta_{\pounds}^{*}))[(1 - \gamma^{p}(1 + \pi + m))(t_{CG}H - t_{CG}L) + (\gamma^{i} - \gamma^{p})A] \geq F(\zeta_{\pounds}^{*}), \qquad \textbf{(49)}$$

and

$$(1 - v(\zeta_{\pounds}^{*}))[(1 - \gamma^{p}(1 + \pi + m))(t_{I}H - t_{I}L) - \gamma^{p}A] \geq F(\zeta_{\pounds}^{*}); \qquad \textbf{(50)}$$

(2) By Proposition 3, case 2, and given the *basic* assumptions,

$$v(\zeta_{\pounds}^{*}) \leq v(\zeta_{\pounds})_{II\,|\,\beta} \qquad \forall \;\; \beta \in [0, \beta_H^{VI}], \qquad \textbf{(58)}$$

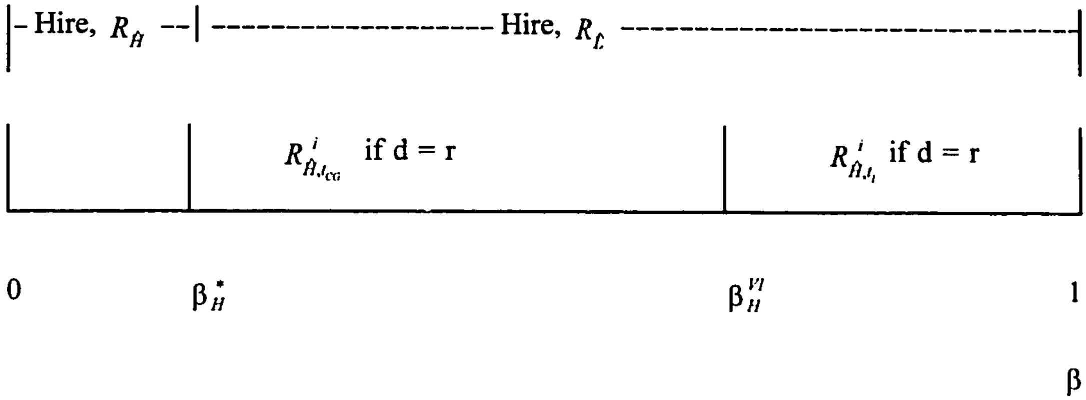
and

$$v(\zeta_{\pounds}^{*}) \leq v(\zeta_{\pounds})_{III\,|\,\beta} \qquad \forall \;\; \beta \in [\beta_H^{VI}, 1]. \qquad \textbf{(59)}$$

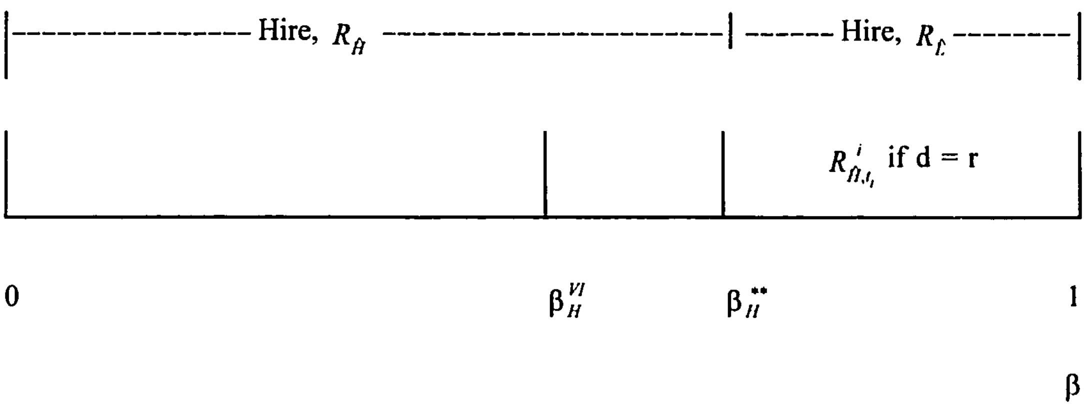
In the event that the message $R_{\pounds}$ is rejected, taxpayers file their own return according to the conditions in Proposition 2.

Class 3:

In *Class 3a*, high-type taxpayers adopt the strategies characterized in Proposition 11 and depicted below:



whereas in *Class 3b*, high type taxpayers' strategies are as follows:



All high-type taxpayers hire practitioners and *some* communicate $R_{\hat{L}}$ while others $R_{\hat{H}}$ if, and only if the following conditions are satisfied:

(1) Inequalities (40) and (50) in Proposition 11 hold; that is

$$\gamma^i A \geq F(\zeta^*_{\hat{H}}) \tag{40}$$

and,

$$(1 - v(\zeta^*_{\hat{L}}))[(1 - \gamma^p(1 + \pi + m))(t_l H - t_l L) - \gamma^p A] \geq F(\zeta^*_{\hat{L}}). \tag{50}$$

(2a) In *Class 3a*, from Proposition 3, case 3.4, $v(\zeta^*_{\hat{L}}) \in [v(\zeta_{\hat{L}})_{H|\beta=0}, v(\zeta_{\hat{L}})_{H|\beta=\beta^{VI}_H}]$ such that condition (10) in Theorem 1(a) holds. In this case, taxpayers having beliefs $\beta \leq \beta^*_H$

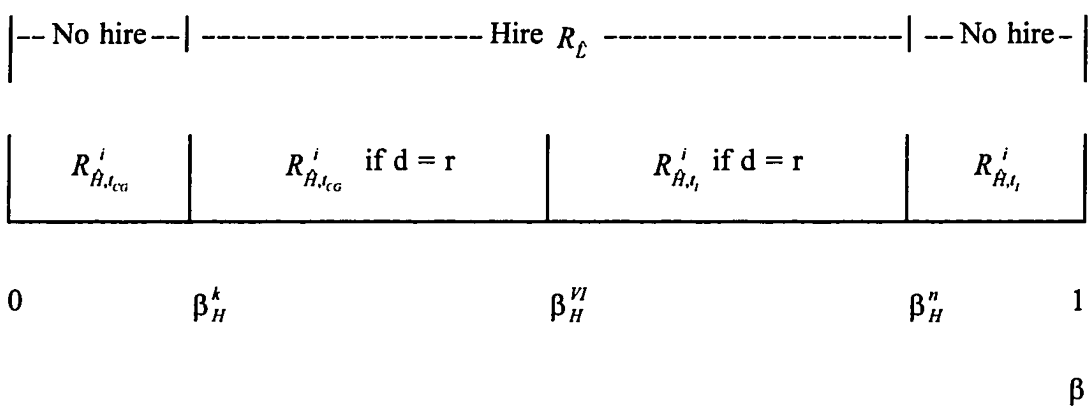
communicate $R_{\hat{H}}$ whereas those having beliefs $\beta \geq \beta_H^*$ communicate $R_{\hat{L}}$.

(2b) In *Class 3b*, from Proposition 3, case 3.4, $v(\zeta_{\hat{L}}^*) \in [v(\zeta_{\hat{L}})_{III \mid \beta = \beta_H^{17}}, v(\zeta_{\hat{L}})_{III \mid \beta = 1}]$ such that condition (17) in Theorem 1(b) holds. In this case, taxpayers having beliefs $\beta \leq \beta_H^{**}$ communicate $R_{\hat{H}}$ whereas those having beliefs $\beta \geq \beta_H^{**}$ communicate $R_{\hat{L}}$.

If the message $R_{\hat{L}}$ is rejected, taxpayers file a self-prepared return according to conditions specified in Proposition 2.

Class 5:

High-type taxpayers follow the strategy depicted below:



Some high-type taxpayers hire practitioners and communicate $R_{\hat{L}}$ if, and only if the following conditions are satisfied:[1]

(1) Inequality (51) in Propositions 6 or 11 holds; that is

[1]Since the analysis is performed for a specific set of parameter values, the characterization of high-type taxpayers' strategies in this class is identical under both Propositions 6 and 11; the hiring interval defined in Proposition 6 $\beta_H^x \leq \beta \leq \beta_H^z$ is equivalent to that defined in Proposition 11 ($\beta_H^k \leq \beta \leq \beta_H^n$).

$$(1 - v(\zeta_{\pounds}^{*}))[(1 - \gamma^{p}(1 + \pi + m))[(t_{CG}H - t_{CG}L) - \beta_{H}^{VI}(t_{I}L - t_{CG}L)]$$
$$+ (\gamma^{i} - \gamma^{p})(1 + \pi)\beta_{H}^{VI}(t_{I}H - t_{CG}H) - \gamma^{p}m\beta_{H}^{VI}(t_{I}H - t_{CG}H) \qquad \textbf{(51)}$$
$$+ (\gamma^{i} - \gamma^{p})A] \geq F(\zeta_{\pounds}^{*});$$

(2) By Proposition 3, case 2 or 3.4, and given the *basic* assumptions,

$$v(\zeta_{\pounds}^{*}) \leq v(\zeta_{\pounds})_{II\,|\,\beta} \qquad \forall \;\; \beta \in [\beta_{H}^{k}, \beta_{H}^{VI}], \qquad \textbf{(60)}$$

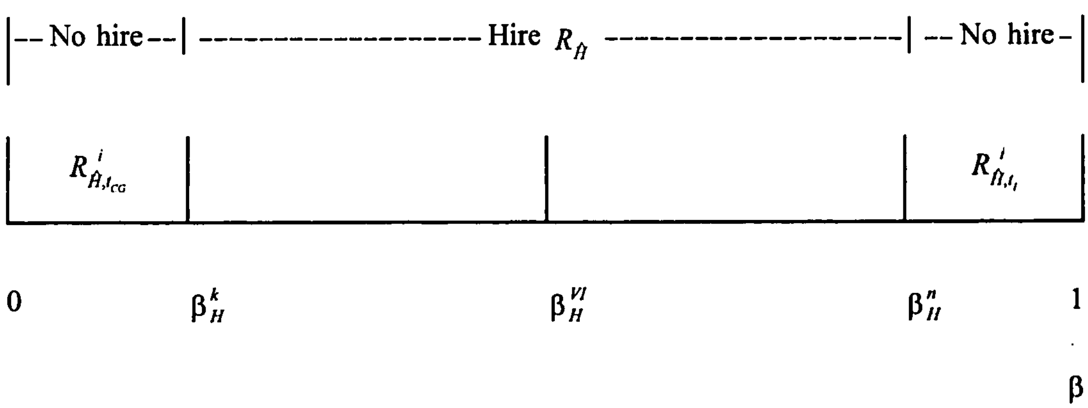
and

$$v(\zeta_{\pounds}^{*}) \leq v(\zeta_{\pounds})_{III\,|\,\beta} \qquad \forall \;\; \beta \in [\beta_{H}^{VI}, \beta_{H}^{n}]. \qquad \textbf{(61)}$$

In the event that the message $R_{\pounds}$ is rejected, taxpayers file their own return according to the conditions in Proposition 2.

Class 7:

High-type taxpayers's strategies are characterized as follows:[2]



Some high-type taxpayers hire practitioners and communicate $R_{\hbar}$ if, and only if the following conditions are satisfied:

---

[2]See footnote 2.

(1) Inequality (42) in Propositions 5 or 11 holds; that is

$$[\gamma^i(1+\pi)-1]\beta_H^{VI}(t_l H - t_{CG}H) + \gamma^i A \geq F(\zeta_{\mathcal{H}}^*); \tag{42}$$

(2) By Proposition 3, case 1 or 3.4, and given the *basic* assumptions,

$$v(\zeta_{\mathcal{L}}^*) \geq v(\zeta_{\mathcal{L}})_{II\,|\,\beta} \qquad \forall \;\; \beta \in [\beta_H^k, \beta_H^{VI}], \tag{62}$$

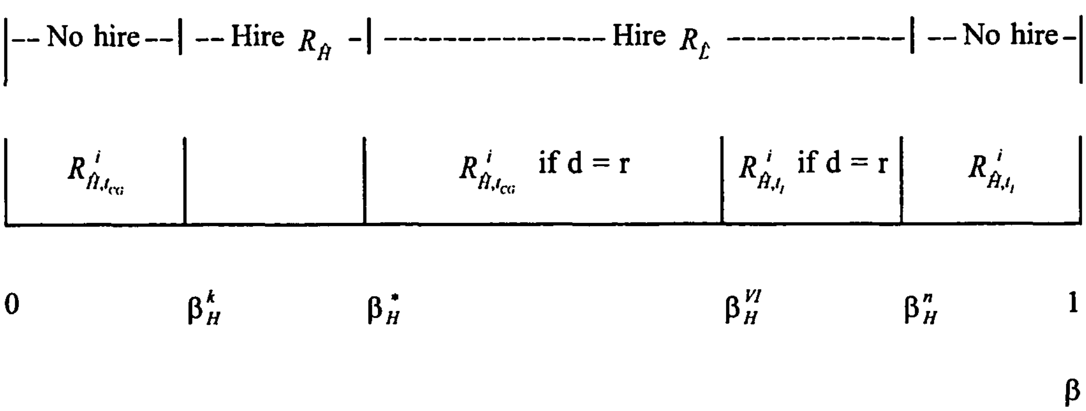
and

$$v(\zeta_{\mathcal{L}}^*) \geq v(\zeta_{\mathcal{L}})_{III\,|\,\beta} \qquad \forall \;\; \beta \in [\beta_H^{VI}, \beta_H^n]. \tag{63}$$

Class 10:

In this class, *some* high-type taxpayers hire, *some* communicate $R_{\mathcal{L}}$ while others $R_{\mathcal{H}}$.

In *Class 10a*, high-type taxpayers follow the strategy described in Proposition 11, case 2(a), depicted below:

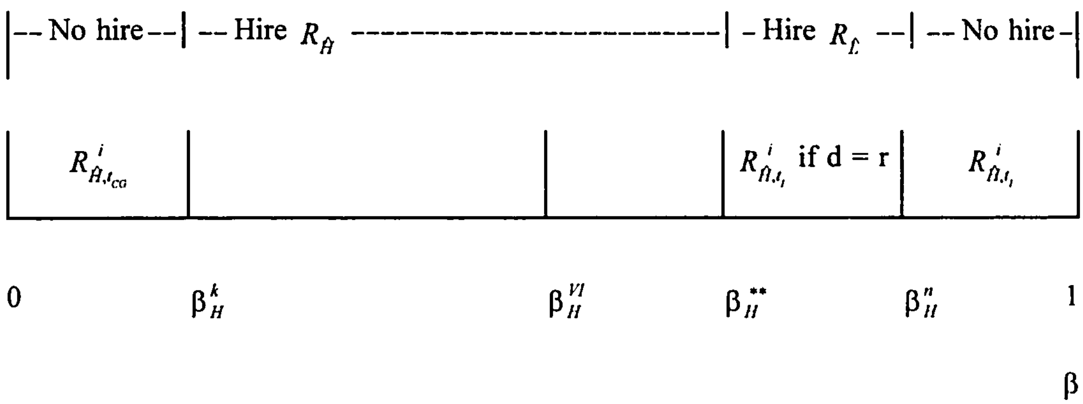


Taxpayers adopt this strategy if, and only if the following conditions are satisfied:

(1) Inequalities (51) and (56) in Proposition 11 holds;

(2) By Proposition 3, case 3.4, $v(\zeta_{\mathcal{L}}^*) \in [v(\zeta_{\mathcal{L}})_{II\,|\,\beta=0}, v(\zeta_{\mathcal{L}})_{II}|_{\beta=\beta_H^n}]$ such that condition (10) in Theorem 1(a) holds.

In *Class 10b*, high-type taxpayers follow the strategy described in Proposition 11, case 2(b), depicted below:



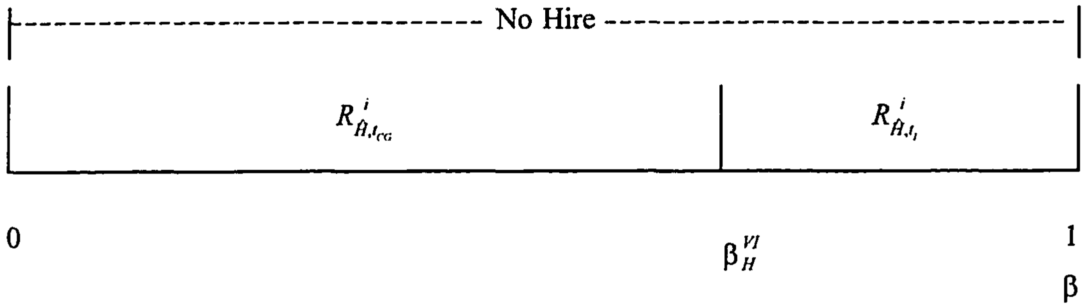
Taxpayers adopt this strategy if, and only if the following conditions are satisfied:

(1) Inequalities (42) and (55) in Proposition 11 holds;

(2) By Proposition 3, case 3.4, $v(\zeta^{*}_{\hat{\ell}}) \in [v(\zeta_{\hat{\ell}})_{III\,|\,\beta=\beta''_{H}},\ v(\zeta_{\hat{\ell}})_{III\,|\,\beta=1}]$ such that condition (17) in Theorem 1(b) holds.

Class 12:

High-type taxpayers never hire practitioners if the expected net benefit from hiring is negative; that is, if inequalities (26) and (25), evaluated at $\beta = \beta^{VI}_{H}$ do not hold (or equivalently, conditions (51) and (42)). In such a case, high-type taxpayers file their own return according to the conditions specified in Proposition 2 and depicted below.



(3) Tax Agency

The tax agency chooses the level of investigation $\zeta_{\pounds}^{*} \in [\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]_{ci}$ and $\zeta_{\pounds}^{*} > 0$ such that $0 < v(\zeta_{\pounds}^{*}), w(\zeta_{\pounds}^{*}) < 1$ and

$$\zeta_{\pounds}^{*} = \underset{\zeta_{\pounds}}{argmax}\ E(TR(\zeta_{\pounds}, r_H^{ci}(\zeta_{\pounds}), r_L^{ci}(\zeta_{\pounds})) \tag{64}$$

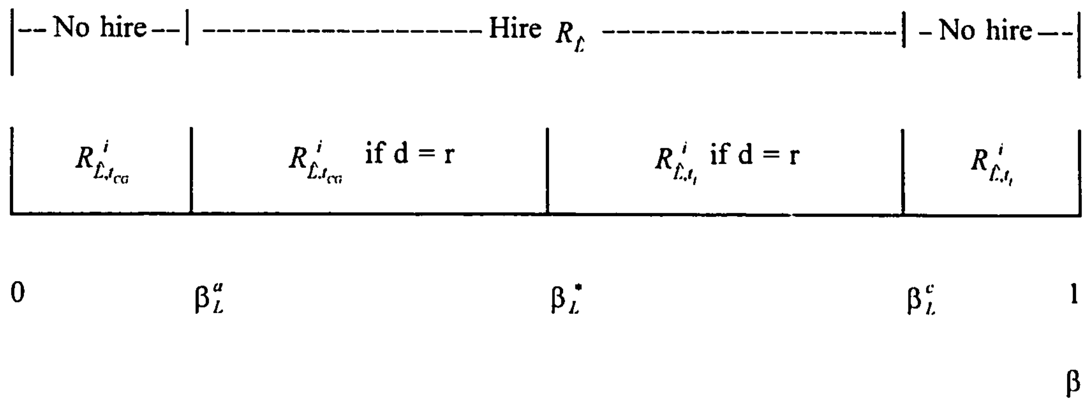
where $r_H^{ci}(\zeta_{\pounds})$ and $r_L^{ci}(\zeta_{\pounds})$ are the reaction functions of high and low-type taxpayers in Class ci, ci=c1, c3a, c3b, c5. c7, c10a, c10b, and c12.

Category 2

Suppose that the tax agency's optimal level of investigation $\zeta_{\pounds}^{*}$ is in one of the intervals $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]_{ci}$, ci=c2, c4a, c4b, c6, c8, c11a, c11b, and c13. The equilibrium strategies are as follows.

(1) Low-type taxpayers

In category 2, *some* low-type taxpayers hire a practitioner and communicate $R_{\pounds}$. Their strategies are described in Proposition 4 and are depicted below:



By Proposition 4, this strategy is adopted if, and only if inequality (32) holds; that is, if

$$w(\zeta^{*}_{\hat{L}})[(\gamma^{i}(1+\pi)-1)\beta^{*}_{L}(t_{I}L-t_{CG}L)+(\gamma^{i}-\gamma^{p})A] \geq F(\zeta^{*}_{\hat{L}}). \qquad \textbf{(32)}$$

In the event that the message $R_{\hat{L}}$ is rejected, taxpayers file their own return according to the conditions in Proposition 1.

(2) High type taxpayers

Class 2: High-type taxpayers' strategies are identical to those in Class 1.

Classes 4a and 4b: See Classes 3a and 3b, respectively.

Class 6: See Class 5.

Class 8: See Class 7.

Classes 11a and 11b: See Classes 10a and 10b, respectively.

Class 13: See Class 12.

(3) Tax Agency

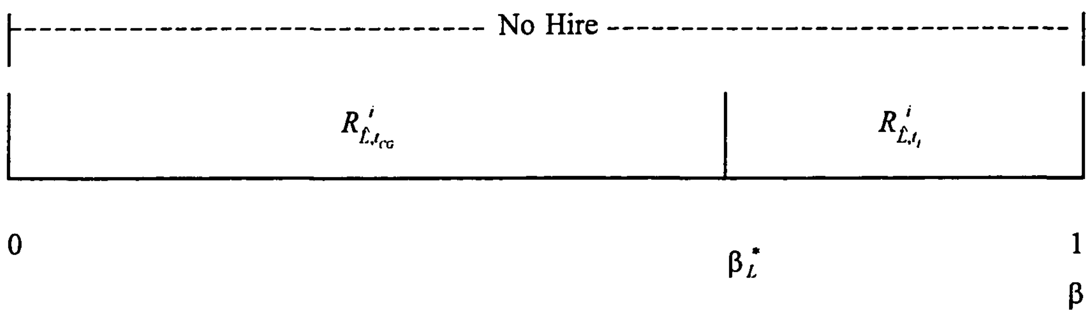
The characterization of the equilibrium strategy is similar to that in Category 1 except that classes ci=c2, c4a, c4b, c6, c8, c11a, c11b, and c13 represent the possible equilibrium strategies.

Category 3

Suppose that the tax agency's optimal level of investigation $\zeta_{\mathcal{L}}^{*}$ is in one of the intervals $[\zeta_{\mathcal{L}}^{Min}, \zeta_{\mathcal{L}}^{Max}]_{ci}$, ci=c9 or c14. The equilibrium strategies are as follows.

(1) Low-type taxpayers

In classes 9 or 14, low-type taxpayers *never* hire a practitioner but file their own return according to the conditions specified in Proposition 1 and depicted below.



This case occurs when inequality (32) does not hold.

(2) High type taxpayers

Class 9: See Class 7.

Class 14: See Class 12.

(3) Tax Agency

The characterization of the equilibrium strategy is similar to that in Category 1 except that classes c9 and c14 are the potential equilibrium classes. Furthermore, the tax agency can choose either $\zeta_{\mathcal{L}}^{*}=0$ such $v(\zeta_{\mathcal{L}}^{*}=0)=w(\zeta_{\mathcal{L}}^{*}=0)=0$ or $\zeta_{\mathcal{L}}^{*}>0$ and $0<v(\zeta_{\mathcal{L}}^{*}),\ w(\zeta_{\mathcal{L}}^{*})<1$ such that taxpayers adopt the strategies in either Class 9 or 14. Either level of investigation will induce one of the classes of equilibrium strategies and will provide the tax agency the identical expected tax revenue.

Proof: See Appendix E.

5.3 Discussion of the Equilibrium Results

Given the *basic* assumptions specified earlier, it is demonstrated in Proposition 14 that an equilibrium exists and takes the form described in one of the 18 potential equilibrium classes. The equilibrium is characterized by the tax agency's optimal level of investigation $\zeta_{\pounds}^{*} \in [\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]_{ci}$. and resulting levels of w($\zeta_{\pounds}^{*}$) and v($\zeta_{\pounds}^{*}$), and high and low-type taxpayers' optimal responses in class ci*. Through its choice of $\zeta_{\pounds}^{*}$, the tax agency essentially induces high and low-type taxpayers to adopt their respective strategies. Although there may exist more than one optimal level of investigation, the tax agency selects only one such level which is observed by all agents (see discussion in proof). Conditional on this level of investigation and given the form of taxpayers' reaction functions, only one class of taxpayer strategies is adopted in equilibrium.

With the exception of classes 9 and 14, the tax agency's optimal level of investigation $\zeta_{\pounds}^{*}$ is always greater than zero and, thus, 0<v($\zeta_{\pounds}^{*}$), w($\zeta_{\pounds}^{*}$)<1. It should be noted, however, that in classes 7 and 8, since both high and low-type taxpayers truthfully communicate their level of income, the tax agency may consider selecting the level of investigation $\zeta_{\pounds}^{*}=0$ and w($\zeta_{\pounds}^{*}=0$)=(1-v($\zeta_{\pounds}^{*}=0$))=1. In this case, practitioners would always accept the message $R_{\pounds}$ without performing an investigation of taxpayers' financial affairs. However, conditional on (1-v($\zeta_{\pounds}^{*}=0$))=1, high-type taxpayers may have an incentive to alter their strategy and communicate $R_{\pounds}$. This situation would arise if

$$E(TL \mid Hire, H, \beta, R_{fl}) > E(TL \mid Hire, H, \beta, R_{\pounds}, (1-v(\zeta_{\pounds}))=1), \qquad \textbf{(65)}$$

or equivalently, if

$$(1-\gamma^{p}(1+\pi+m))\beta\,[(t_{I}H-t_{CG}H)-(t_{I}L-t_{CG}L)]+(1-\gamma^{p}(1+\pi+m))(t_{CG}H-t_{CG}L)>\gamma^{p}A. \qquad \textbf{(66)}$$

Since by assumption, $\gamma^{p}<1/(1+\pi+m)$, inequality (66) always holds if

$$(1-\gamma^{p}(1+\pi+m))(t_{CG}H-t_{CG}L) > \gamma^{p}A, \qquad \textbf{(67)}$$

or, solving in terms of γ^{p}, if

$$\gamma^{p} < \frac{1}{(1+\pi+m+\frac{A}{(t_{CG}H-t_{CG}L)})} < \frac{1}{(1+\pi+m)}. \qquad \textbf{(68)}$$

Since inequality (68) is satisfied, high-type taxpayers would prefer to communicate $R_{\pounds}$ when $(1\text{-}v(\zeta_{\pounds}^{*}=0))=1$. Thus, an equilibrium in Class 7 or 8 requires that $\zeta_{\pounds}^{*}$ be greater than zero such that $0<v(\zeta_{\pounds}^{*})<1$.

As explained earlier (see Section 4.3), the tax agency calculates an interval $[\zeta_{\pounds}^{Min},\zeta_{\pounds}^{Max}]_{ci}$ for each class ci, ci=1,2,3a,...,14. However, such an interval may not exist in a particular class if the set of conditions necessary to have both high and low-type taxpayers adopt their respective strategies in that class cannot be satisfied simultaneously. For example, assume that the tax agency would like to induce the strategies in Class 12 (see Table 4.2, Section 4.3). This class involves *all* low-type taxpayers hiring practitioners and *no* high-type taxpayers hiring. The tax agency may not be able to induce this pair of strategies; that is, the level of investigation which must be selected such that high-type taxpayers never hire may be so high that the condition necessary for all low-type taxpayers to hire may not be satisfied simultaneously. Thus, the ability of the tax agency to induce a particular pair of strategies may depend on which condition(s) becomes binding first. However, an equilibrium always exists in at least one of the classes (for any set of parameter values), as proved in Proposition 14.

In choosing its strategy, the tax agency computes, for each class, the optimal level of investigation and the conditional expected tax revenue function obtained therefrom. It compares the expected tax revenue obtained under each class and chooses the $\zeta_{\pounds}^{*}$ which induces high and low-type taxpayers to adopt their respective equilibrium strategies in the class which provides the tax agency the highest expected tax revenue. An examination of the conditional expected tax revenue function obtained under each class (see Appendix D, Table D.1) reveals that no one class strictly dominates the other. Whether the tax agency receives a higher expected tax revenue under one class than another depends on a number of factors, including the proportion of taxpayers who adopt a specific strategy, $F(\beta\,(i,j))$ (or, equivalently, the probability that taxpayers' beliefs are in the interval (i,j)), and the conditional mean over their beliefs, $\bar{\beta}\,(i,j)$, as well as the probability, v($\zeta_{\pounds}^{*}$) or w($\zeta_{\pounds}^{*}$), that the practitioner accepts the low message $R_{\pounds}$. These factors vary with the level of investigation and are determined in equilibrium.

Suppose, for example, that an equilibrium can exist in either Class 13 or 14. A comparison of the "optimal" conditional expected tax revenue[3] in these two classes indicates that the agency would prefer that the equilibrium occur in Class 13 as opposed to Class 14 if

$$E(TR(\zeta_{\pounds}^{cl3}, r_{H}^{cl3}(\zeta_{\pounds}), r_{L}^{cl3}(\zeta_{\pounds})) > E(TR(\zeta_{\pounds}^{cl4}, r_{H}^{cl4}(\zeta_{\pounds}), r_{L}^{cl4}(\zeta_{\pounds})), \qquad \textbf{(69)}$$

where $\zeta_{\pounds}^{ci}$ is the tax agency's optimal level of investigation in class ci, or, equivalently, if

[3]The "optimal" expected tax revenue is defined as the expected tax revenue given that the tax agency selects the optimal level of investigation in that class and that taxpayers adopt their best responses. For a specification of the conditional expected tax revenue functions, see Appendix D, Table D.1.

$$F(\beta(a,c))\, w(\zeta_{\mathcal{L}}^{cl3})(\gamma^{i}-\gamma^{p})C > F(\beta(a,*))w(\zeta_{\mathcal{L}}^{cl3})[\gamma^{i}(1+\pi)-1]\bar{\beta}(a,*)(t_{l}L-t_{CG}L) \quad \textbf{(70)}$$
$$+F(\beta(*,c))w(\zeta_{\mathcal{L}}^{cl3})[(1-\gamma^{i})(1-\bar{\beta}(*,c))(t_{l}L-t_{CG}L)],$$

where $F(\beta(a,*))$ is the proportion of low-type taxpayers who hire, communicate $R_{\mathcal{L}}$, and report $R^{i}_{\mathcal{L},t_{CG}}$ if rejected; $F(\beta(*,c))$ is the proportion who also hire and communicate $R_{\mathcal{L}}$, but who report $R^{i}_{\mathcal{L},t_{l}}$ if rejected; and $F(\beta(a,c))$ represents the overall proportion of taxpayers who hire. Inequality (70) implies that the tax agency would prefer to induce an equilibrium in Class 13 as opposed to Class 14 if the expected savings of the cost of auditing taxpayers whose beliefs are in the interval (a,c) (i.e., the LHS) are greater than the expected net loss in tax revenue (in absolute terms) resulting from low-type taxpayers' attempts to successfully minimize through hiring practitioners and possibly resolving their uncertainty about the tax rate (i.e., the RHS).[4] Through its choice of $\zeta_{\mathcal{L}}$, the tax agency affects the proportion of taxpayers who hire $F(\beta(a,*))$ and $F(\beta(*,c))$ and, thus, affects the level of tax minimization.

Consider for example the condition necessary for low-type taxpayers to hire and report $R^{i}_{\mathcal{L},t_{CG}}$ if rejected (i.e., inequality (22)):

$$w(\zeta_{\mathcal{L}})[(\gamma^{i}(1+\pi)-1)\beta^{a}_{L}(t_{l}L-t_{CG}L)+(\gamma^{i}-\gamma^{p})A] \geq F(\zeta_{\mathcal{L}}). \qquad \textbf{(71)}$$

When (71) above is not binding (i.e., when (71), evaluated at $\beta^{a}_{L}=0$ is strictly greater than zero), an increase in $\zeta_{\mathcal{L}}$ increases the expected net benefit from hiring since the LHS increases at a faster rate than the RHS. However, when (71) is binding, any increase in $\zeta_{\mathcal{L}}$ results in a decrease in the expected net benefit. Consequently, the critical value which

---

[4]A similar interpretation applies to the comparison of the expected tax agency revenue in Class 7, where *some* high-type taxpayers hire and communicate $R_{\mathcal{H}}$, versus Class 12, where *no* high-type taxpayers hire.

makes low-type taxpayers indifferent between hiring and not hiring, β_L^a, increases. Accordingly, a smaller proportion of taxpayers seek practitioner advice and resolve their uncertainty about the tax rate (i.e., $F(\beta(a,*))$ decreases). Similarly, as $\zeta_{\mathcal{L}}$ increases, the expected net benefit from hiring and reporting $R_{\mathcal{L},t_l}^{i}$ if rejected decreases and, thus, β_L^c decreases, i.e., $F(\beta(*,c))$ decreases (see equation (33)). The hiring interval $F(\beta(a,c))$ therefore decreases.

Interesting insights regarding the trade-offs faced by the tax agency in its choice of strategy can be gained by further examining the expected tax revenue obtained under different potential equilibrium classes. For example, suppose that an equilibrium can exist in either Class 10a, where *some* high-type taxpayers hire and communicate either $R_{\mathcal{H}}$ or $R_{\mathcal{L}}$ and *all* low-type taxpayers hire, or Class 12, where *no* high-type taxpayers hire and *all* low-type taxpayers continue to hire. The tax agency would prefer that the equilibrium occur in Class 10a as opposed to Class 12 if

$$E(TR(\zeta_{\mathcal{L}}^{c10a}, r_H^{c10a}(\zeta_{\mathcal{L}}), r_L^{c10a}(\zeta_{\mathcal{L}})) > E(TR(\zeta_{\mathcal{L}}^{c12}, r_H^{c12}(\zeta_{\mathcal{L}}), r_L^{c12}(\zeta_{\mathcal{L}})). \qquad \textbf{(72)}$$

Comparing the conditional expected tax revenue obtained under each class (see Appendix D, Table D.1) and simplifying gives

$$(1 - v(\zeta_{\mathcal{L}}))F(\beta(*,n))[t_{CG}L + \bar{\beta}(*,n)(t_{l}L - t_{CG}L) + (1 - \bar{\beta}(*,n))\gamma^{p}(1 + \pi + m)(t_{CG}H - t_{CG}L)$$
$$+ \gamma^{p}\bar{\beta}(*,n)(1 + \pi + m)(t_{l}H - t_{l}L) - \gamma^{p}C]$$
$$+ v(\zeta_{\mathcal{L}}))[F(\beta(VI,n))t_{l}H + F(\beta(*,VI))[t_{CG}H + \gamma^{i}\bar{\beta}(*,VI)(1 + \pi)(t_{l}H - t_{CG}H) - \gamma^{i}C]]$$
$$- F(\beta(k,*))[(\gamma^{i}(1 + \pi) - 1)\bar{\beta}(k,*)(t_{l}H - t_{CG}H) - \gamma^{i}C] >$$
$$F(\beta(VI,n))t_{l}H + F(\beta(*,VI))[t_{CG}H + \gamma^{i}\bar{\beta}(*,VI)(1 + \pi)(t_{l}H - t_{CG}H) - \gamma^{i}C]. \quad \textbf{(73)}$$

Inequality (73) implies that the tax agency would prefer to induce an equilibrium in Class 10a as opposed to Class 12 if the expected net revenue obtained from high-type taxpayers who hire and possibly engage in one or both of tax evasion or minimization activities (i.e., the LHS) is greater than the expected net revenue obtained if hiring never occurs over the same interval (i.e., the RHS). The expression in the first square bracket of the LHS of (73) represents the expected revenue obtained from high-type taxpayers whose beliefs are in the interval (*,n), who hire, who evade by communicating $R_{\mathcal{L}}$, and who are accepted by the practitioner with probability (1-v($\zeta_{\mathcal{L}}$)) (i.e., the practitioner fails to detect the understatement). This term includes the expected additional taxes, penalties, and interest charges collected from those taxpayers if the tax agency audits a practitioner-prepared return, net of the cost of auditing. The expression in the second bracket represents the expected revenue from taxpayers whose beliefs are in the same interval but who are rejected by the practitioner and, thus, file their own return. Recall that, given the assumed tax agency audit probability, rejected taxpayers do not evade. The third bracketed expression is the expected net loss in revenue, net of the expected audit cost, resulting from high-type taxpayers' decisions to seek practitioner assistance solely to engage in tax minimization. This term may be positive or negative, depending on the expected cost of auditing. Where inequality (73) holds, the tax agency obtains a higher expected tax revenue when some high-type taxpayers hire and some level of evasion and minimization occurs rather than when high-type taxpayers never hire.

To obtain a better understanding of the trade-offs faced by both the tax agency and taxpayers, consider the effect of a small increase in the level of investigation in Class 10a such that $v(\zeta'_{\pounds})) \in [v(\zeta_{\pounds})_{H|\beta=0}, v(\zeta_{\pounds})_{H|\beta=\beta''_H}]$, where the prime denotes the increased level of investigation. This increase is expected to have the following effects on high-type taxpayers' strategies.[5] For ease of discussion, high-type taxpayers' strategies are depicted below.

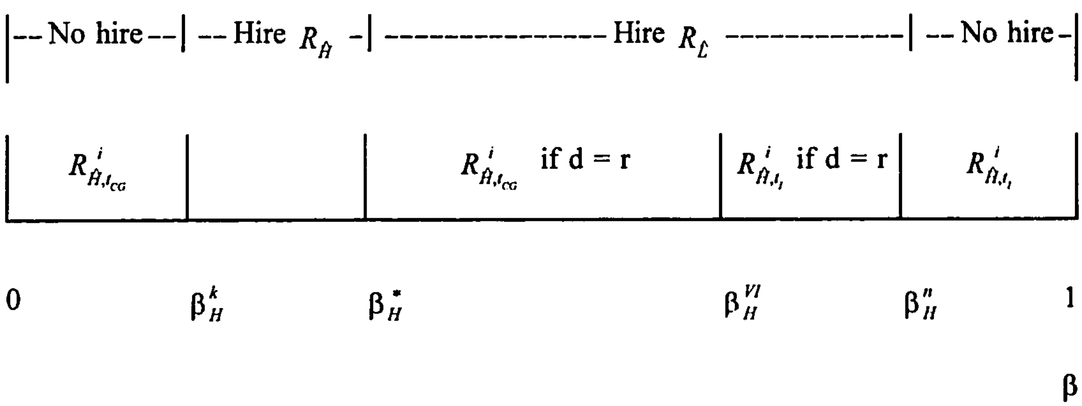


FIGURE 5.1

High-type Taxpayers' Strategies -- Class 10a

As $\zeta_{\pounds}$ increases, the probability that the practitioner detects a false message increases (i.e., the probability of a type II error decreases). Consequently, taxpayers react optimally by altering their communication and hiring decisions. From Theorem 1(a), condition (10), the critical rejection probability, $v(\zeta_{\pounds})_{H|\beta=\beta^*_H}$, which makes taxpayers indifferent between communicating $R_{\hat{H}}$ and $R_{\pounds}$ increases and, thus, β^*_H increases to $\beta^{*\prime}_H$. As a result, a greater proportion of taxpayers having beliefs $\beta \leq \beta^{VI}_H$ truthfully

[5]It is assumed that the increase does not affect low-type taxpayers' strategies; all low-type taxpayers continue to hire.

communicate their level of income when they hire; hence, the level of evasion decreases, i.e., $F(\beta(*, VI))$ decreases while $F(\beta(k, *))$ increases. Note that since the expected benefit from hiring and communicating $R_{\hat{H}}$ does not depend on $\zeta_{\hat{L}}$, the critical value β_H^k does not change.[6] Furthermore, although the proportion who attempt to minimize through hiring does not change, the level of successful minimization increases for taxpayers having beliefs $\beta \leq \beta_H^{VI}$ since taxpayers who communicate $R_{\hat{H}}$ always have their message accepted and their uncertainty resolved whereas those who communicate $R_{\hat{L}}$ face the possibility that their message will be rejected and that their uncertainty remains unresolved. Thus, when taxpayers' beliefs are $\beta \leq \beta_H^{VI}$, their choice of strategies involve a trade-off between their desire to engage in tax evasion and their opportunity to engage in (successful) tax minimization. For taxpayers whose beliefs are $\beta \geq \beta_H^{VI}$, the expected net benefit from hiring (see inequality (24)) decreases as $\zeta_{\hat{L}}$ increases since the probability of a type II error, (1-v($\zeta_{\hat{L}}$)), decreases whereas the practitioner fee, F($\zeta_{\hat{L}}$), increases. Consequently, the cut-off β_H^n decreases (i.e., $F(\beta(VI, n))$ decreases) and both levels of evasion and minimization decrease.[7] The overall effect is a net decrease in evasion activities and an ambiguous effect on minimization since some taxpayers continue to hire even though $\zeta_{\hat{L}}$ increases but communicate $R_{\hat{H}}$ instead of $R_{\hat{L}}$.

From the tax agency's perspective, the net effect of an increase in $\zeta_{\hat{L}}$ on its expected revenue in Class 10a is ambiguous. To analyze the potential effects, the components of the tax agency's expected revenue obtained from high-type taxpayers in

---

[6]Recall that β_H^k is the critical value which makes taxpayers indifferent between hiring and communicating $R_{\hat{H}}$ and not hiring.

[7]This result is obtained in part because taxpayers never misreport their level of income when they file their own return and $1/(1+\pi) < \gamma^i < 1$.

Class 10a are reproduced in Table 5.1 below. Arrows indicating the direction of the change are placed above the variables which vary with $\zeta_{\pounds}$. The net effect on the tax agency's revenue is presented in column 4. Note that the effect of an increase in $\zeta_{\pounds}$ on the proportion $F(\beta(i,j))$ who adopt a particular strategy has already been discussed above. However, in order to determine the direction of the change on the conditional mean $\bar{\beta}(i,j)$, it is necessary to impose some assumptions on the distribution of taxpayers' beliefs β. For simplification purposes, it is assumed that beliefs are uniformly distributed over the interval [0,1]. This assumption implies that the proportion $F(\beta(i,j))$ and the conditional mean $\bar{\beta}(i,j)$ move in the same direction.

TABLE 5.1

Tax Agency's Expected Tax Revenue

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue	Net Change
H: No hire, $R^{i}_{\hat{H},t_l}$	$\beta^{n}_{H}\leq\beta\leq 1$	$p(H)\,F(\overset{\uparrow}{\beta}\,(n,1))t_l H$	↑
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0\leq\beta\leq\beta^{k}_{H}$	$p(H)\,F(\overset{-}{\beta}\,(0,k))[t_{CG}H+\overset{-}{\gamma}{}^{i}\bar{\beta}(0,k)(1+\pi)(t_l H -t_{CG}H)-\gamma^{i}C]$	–
H: Hire, $R_{\hat{H}}$ d=a	$\beta^{k}_{H}\leq\beta\leq\beta^{*}_{H}$	$p(H)\,F(\overset{\uparrow}{\beta}\,(k,*))[t_{CG}H+\overset{\uparrow}{\bar{\beta}}(k,*)(t_l H-t_{CG}H)]$	↑
H: Hire, $R_{\hat{L}}$, d=a	$\beta^{*}_{H}\leq\beta\leq\beta^{n}_{H}$	$p(H)F(\overset{\downarrow}{\beta}\,(*,n))[\overset{\uparrow}{(1-v(\zeta_{\hat{L}}))}[t_{CG}L+\overset{\downarrow}{\bar{\beta}}(*,n)(t_l L -t_{CG}L)+\gamma^{p}\overset{\downarrow}{(1-\bar{\beta}(*,n))}(1+\pi+m)(t_{CG}H-t_{CG}L)+\gamma^{p}\overset{\downarrow}{\bar{\beta}}(*,n)(1+\pi+m)(t_l H-t_l L)-\gamma^{p}C]]$	↓
H: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_l}$ if d=r	$\beta^{VI}_{H}\leq\beta\leq\beta^{n}_{H}$	$p(H)\,F(\overset{\downarrow}{\beta}\,(VI,n))\overset{\uparrow}{v}(\zeta_{\hat{L}})t_l H$	?
H:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_{CG}}$ if d=r	$\beta^{*}_{H}\leq\beta\leq\beta^{VI}_{H}$	$p(H)\,F(\overset{\downarrow}{\beta}\,(*,VI))\overset{\uparrow}{v}(\zeta_{\hat{L}})[t_{CG}H+\gamma^{i}\overset{\downarrow}{\bar{\beta}}(*,VI)(1+\pi)(t_l H-t_{CG}H)-\gamma^{i}C]$	?

Since an increase in the level of investigation increases the probability that a message is correctly rejected, a greater proportion of taxpayers who hire truthfully communicate their level of income; hence, the expected revenue from those who evade decreases. The effect on the expected revenue from minimization is ambiguous since, although a smaller proportion of taxpayers hire practitioners, a greater proportion of those who hire communicate honestly and can therefore resolve their uncertainty about the tax rate. Consequently, the tax agency must consider these effects in its optimal choice of the level of investigation.

5.4 Numerical Example

A numerical example is presented below to provide additional insights about the equilibrium. Assumptions about the parameter values and functional forms adopted are specified as follows:

Investigation technology

$$w(\zeta_L) = 1 - \exp(-\lambda \cdot \zeta_L)$$

$$v(\zeta_L) = r \cdot w(\zeta_L)$$

r=0.88
λ=9

$$\zeta_L \in [0,1]$$

Practitioner fee

$$F(\zeta_H) = F$$

$$F(\zeta_L) = F(\zeta_H) + \exp(g \cdot \zeta_L)$$

F=225
g=10

Beliefs about the tax rate (*β*)

$$f(\beta) = \frac{1}{(b-a)} \qquad \forall \ a \leq \beta \leq b,$$

$$= 0 \qquad \textit{elsewhere.}$$

$$\bar{\beta}(i,j) = \frac{(a+b)}{2}$$

Parameter Values
A = 500
C= 500
m= 0.8
$\pi = 0.07$
$\gamma^{i} = 0.94$
$\gamma^{p} = 0.40$
$t_{I} = 0.5$
$t_{CG} = 0.20$
L = 10,000.
H=26,000.
p(H)=0.50

The parameter values are chosen such that the assumptions specified earlier regarding the relationships between the various parameters are maintained (see assumptions made in the description of the model in Chapter 3 and the *basic* assumptions adopted at the beginning of Section 5.2). Furthermore, it is assumed that the investigation technology has an exponential form such that $0 \leq v(\zeta_{\mathcal{L}})$, $w(\zeta_{\mathcal{L}}) < 1$, $v'(\zeta_{\mathcal{L}})$ and $w'(\zeta_{\mathcal{L}}) > 0$, and $v''(\zeta_{\mathcal{L}})$ and $w''(\zeta_{\mathcal{L}}) < 0$. The relationship between $v(\zeta_{\mathcal{L}})$ and $w(\zeta_{\mathcal{L}})$ is assumed to be proportional such that $v(\zeta_{\mathcal{L}}) = .88w(\zeta_{\mathcal{L}})$; that is, for the same level of investigation, it is assumed that the probability of correctly accepting a true message is somewhat higher than the probability of correctly rejecting a false message. The practitioner fee, $F(\zeta_{\mathcal{L}})$, is comprised of a fixed component which is equal to $F(\zeta_{\mathcal{H}} = 0)$ and a variable component which also has an exponential form such that $F'(\zeta_{\mathcal{L}}) > 0$ and $F''(\zeta_{\mathcal{L}}) > 0$. Consequently, $v(\zeta_{\mathcal{L}})$, $w(\zeta_{\mathcal{L}})$, and $F(\zeta_{\mathcal{L}})$ are admissible functional forms. Finally, although the parameter values are chosen primarily to ensure that the relationships are consistent with the assumptions, they are also selected to provide for the possibility that the tax agency can induce an equilibrium in a class where either *all* or *some* taxpayers hire practitioners.

Beliefs β about the tax rate are assumed to be uniformly distributed over the interval [0,1]; hence, all possible values for β are equally probable.

Numerical results are presented in Table 5.2 below.

TABLE 5.2. -- Numerical Example[8]

	Class 3a	Class 3b	Class 4a
$\zeta_{\hat{L}}^{Min}$ $\zeta_{\hat{L}}^{Max}$	0.2255608 0.2288694	0.2288694 0.3513677	0.1840057 0.2255608
$\zeta_{\hat{L}}^{ci}$	0.2288694	0.3513677	0.2255608
$E(TR(\zeta_{\hat{L}}^{ci}, r_H, r_L))$	6,173.16	6,190.31	6,159.27
Critical Values:			
Low-type taxpayers:			
β_L^a	0.00	0.00	0.00
β_L^*	0.9118541	0.9118541	0.9118541
β_L^c	1.00	1.00	1.00
High-type taxpayers:			
β_H^k	0.00	0.00	0.00
β_H^*	0.9343245	N/A	0.9025870
β_H^{VI}	0.9343245	0.9343245	0.9343245
β_H^{**}	N/A	0.9627433	N/A
β_H^n	1.00	1.00	1.00
Practitioner fee:			
$F(\zeta_{\hat{L}}^{ci})$	234.86	258.57	234.54
$F(\zeta_{\hat{H}})$	225.00	225.00	225.00
Probability of correct inference:			
$w(\zeta_{\hat{L}}^{ci})$	0.8725237	0.9576721	0.8686707
$v(\zeta_{\hat{L}}^{ci})$	0.7678209	0.8427514	0.7644302

[8]Note that the shaded column represents the equilibrium class. Although the strategies in Classes 3b and 4b are identical, since Class 4b is defined as the class where only *some* low-type taxpayers hire, it is not referred to as the equilibrium class.

TABLE 5.2 (continued). -- Numerical Example

	Class 4b	Class 9	Class 11b
ζ_{fL}^{Min}	0.3513677	0.3966869	0.3805405
ζ_{fL}^{Max}	0.3805405		0.3966869
ζ_{fL}^{ci}	0.3513677	0.3966869	0.3805405
$E(TR(\zeta_{fL}^{ci}, r_H, r_L))$	6,190.31	6,070.58	6,119.09
Critical Values:			
Low-type taxpayers:			
β_L^a	0.00	N/A	0.5187810
β_L^*	0.9118541	0.9118541	0.9118541
β_L^c	1.00	N/A	0.9498512
High-type taxpayers:			
β_H^k	0.00	0.00	0.00
β_H^*	N/A	N/A	N/A
β_H^{VI}	0.9343245	0.9343245	0.9343245
β_H^{**}	0.9627433	N/A	0.9670105
β_H^n	1.00	0.9711538	1.00
Practitioner fee:			
$F(\zeta_{fL}^{ci})$	258.57	277.82	269.94
$F(\zeta_{fl})$	225.00	225.00	225.00
Probability of correct inference:			
$w(\zeta_{fL}^{ci})$	0.9576721	0.9718493	0.9674463
$v(\zeta_{fL}^{ci})$	0.8427514	0.8552274	0.8513527

It should be noted that, for the given set of parameter values, an equilibrium in Classes 1, 2, 5, 6, 7, 8, 10a, 10b, 11a, 12, 13, and 14 cannot exist since the necessary conditions for high and low-type taxpayers to adopt their respective strategies cannot be satisfied simultaneously. However, the tax agency, through its choice of the level of investigation, can induce an equilibrium in any one of Classes 3a, 3b, 4a, 4b, 9, and 11b. The level of investigation which can be chosen by the tax agency belongs to the "global" interval $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]$= [0.1840057, 0.4094773], where the "global" interval is the interval over which high and low-type taxpayers adopt any one of the strategies among the potential equilibrium classes mentioned above. Figure 5.2 depicts the tax agency's expected tax revenue over this interval given that taxpayers choose their best response for each possible level of investigation in the global interval.

An examination of the expected tax revenue obtained under each of the potential classes described in Table 5.2 and depicted in Figure 5.2 reveals that the equilibrium occurs in Class 3b. Note, however, that the strategies in Classes 3b and 4b are identical. This situation occurs because the tax agency's expected tax revenue is monotonically increasing in Class 3b and monotonically decreasing in Class 4b. Consequently, the optimal level of investigation occurs at the boundary. Since Class 4b is defined as the class where only *some* low-type taxpayers hire, it is not referred to as the equilibrium class.

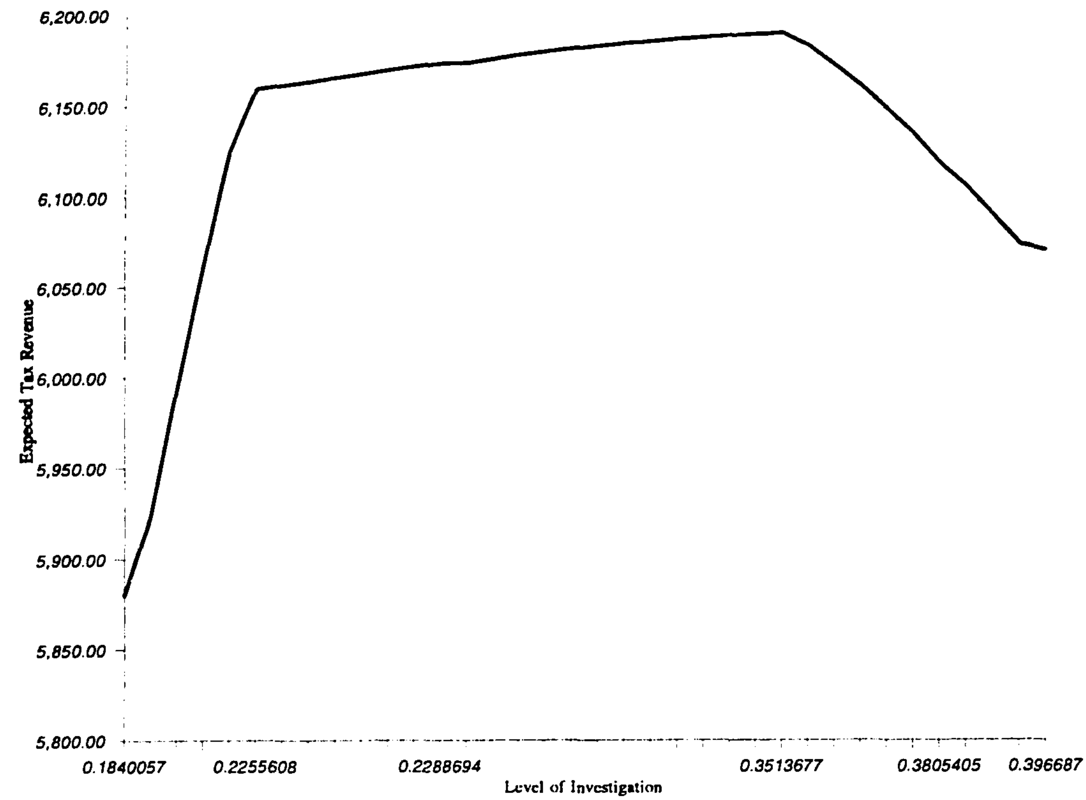


FIGURE 5.2

Tax Agency's Expected Tax Revenue Function

The tax agency's strategy is to choose the level of investigation $\zeta_{\hat{L}}^{*}=0.3513677$ such that it maximizes its expected tax revenue at 6,190.31. Taxpayers react optimally by adopting the following strategies: *all* low-type taxpayers seek practitioner assistance and truthfully communicate their level of income; hence, $\beta_L^a=0$ and $\beta_L^c=1$. Where the message $R_{\hat{L}}$ is rejected, taxpayers file the self-prepared return $R^{i}_{\hat{L},t_G}$ ($R^{i}_{\hat{L},t_I}$) depending upon whether their belief β about the tax rate is lower (higher) than the critical value $\beta_L^*=0.9118541$.

The probability that a message is correctly accepted is 0.9576721. *All* high-type taxpayers also hire a practitioner and, thus, $\beta_H^k=0$ and $\beta_H^n=1$. Furthermore, taxpayers having beliefs $\beta_H^k \le \beta \le \beta_H^{**}$, β_H^{**}=0.9627433, communicate $R_{\hat{H}}$ when they hire whereas those having beliefs $\beta_H^{**} \le \beta \le \beta_H^n$ communicate $R_{\hat{L}}$. Where the message $R_{\hat{L}}$ has been rejected by the practitioner, taxpayers file a self-prepared return $R^i_{\hat{H},t_i}$. The probability that a low message is correctly rejected is 0.8427514. Thus, conditional on this set of parameter values, the tax agency prefers to induce an equilibrium where all taxpayers (high and low) hire and where most taxpayers truthfully communicate their level of income to the practitioner. In the example provided, the saving of the expected cost of being audited is an important component of most taxpayers' expected benefit functions and, thus, some taxpayers, high and low-type taxpayers whose beliefs are closer to zero and low-type taxpayers whose beliefs are closer to one, hire solely to save this expected cost, while others, whose beliefs are less certain, i.e., closer to 0.5, obtain an additional expected benefit from hiring, that of resolving their uncertainty about the tax rate (i.e., engaging in tax minimization activities). In contrast, high-type taxpayers whose beliefs are closer to one derive a greater expected benefit from hiring by attempting to evade through communicating a low level of income. This situation occurs since, without practitioner assistance, these taxpayers file a self-prepared return $R^i_{\hat{H},t_i}$ and, thus, are never audited by the tax agency. Furthermore, note that since the probability that a low message is correctly rejected is relatively high, only a small proportion of taxpayers evade when they hire. In fact, only 3.73% (i.e., $[1-F(\beta(**,n))]$) of high-type taxpayers attempt to evade when they hire. Given that the probability that the practitioner makes a type II error is low, $(1\text{-}v(\zeta^*_{\hat{L}}))$=.1572486, only 0.59% of high-type taxpayers hire, evade, and have their message accepted by the practitioner.

5.5 Varying the Basic Assumptions

Up to this point, the equilibrium analysis has focused on a specific set of parameter values (see the basic assumptions at the beginning of Section 5.2). However, as was demonstrated in Chapter 4 (see Table 4.1, Section 4.2.4), various classes of potential equilibrium strategies and, thus, various equilibria, may exist depending upon the assumptions regarding the parameter values. For example, consider a change in the basic assumptions such that $\gamma^{p} > 1/(1+\pi+m)$. Under this assumption, the situation where *some* high-type taxpayers communicate $R_{\hat{L}}$ while others $R_{\hat{H}}$ never occurs since $v(\zeta_{\hat{L}})_{II\,|\,\beta}$ and $v(\zeta_{\hat{L}})_{III\,|\,\beta}$ are either greater than one or less than zero. Assuming that $v(\zeta_{\hat{L}})_{II\,|\,\beta}<0$ for all $\beta \in [0,\beta_{H}^{VI}]$ and $v(\zeta_{\hat{L}})_{III\,|\,\beta}<0$ for all $\beta \in [\beta_{H}^{VI},1]$, the classes of potential equilibrium strategies are restricted to the following:

TABLE 5.3

Classes of Potential Equilibrium Strategies

	Low-type Taxpayers		
High-type Taxpayers	All Hire (Prop. 4)	Some Hire (Prop. 4)	None Hire (Prop. 4)
Some Hire; All communicate $R_{\hat{H}}$ (Prop. 5)	1	2	3
None Hire (Prop. 5)	4	5	6

Following from the proof in Proposition 14, it can be demonstrated that an equilibrium exists and takes the form described in one of the 6 classes above. In this equilibrium, taxpayers hire practitioners solely to resolve their uncertainty about the tax rate and have no opportunity or incentive to engage in tax evasion activities: for any level of investigation $\zeta_{\hat{L}}\geq 0$, the net expected cost of evading is high relative to the net expected cost of being truthful. Therefore, high-type taxpayers always prefer to communicate $R_{\hat{H}}$

as opposed to $R_{\mathcal{L}}$. Consequently, the tax agency's choice of the optimal level of investigation depends solely on the expected tax revenue obtained from low-type taxpayers and, thus, on low-type taxpayers' incentives to engage in tax minimization.

Note that under this set of assumptions, the tax agency may consider selecting the level of investigation $\zeta^*_{\mathcal{L}}=0$ such that the resulting probability of acceptance $w(\zeta^*_{\mathcal{L}}=0)=(1-v(\zeta^*_{\mathcal{L}}=0))=1$. In this case, practitioners would always accept the message $R_{\mathcal{L}}$ without performing an investigation and high-type taxpayers would not have an incentive to alter their strategy. Given the tax agency's objective of revenue maximization, it may, however, prefer to select a level of investigation $\zeta^*_{\mathcal{L}}>0$ depending upon which class of equilibrium taxpayer strategies provides the highest expected tax revenue. Whether an equilibrium in which $\zeta^*_{\mathcal{L}}>0$ is reasonable depends upon whether such a level of investigation can be implemented and enforced given that both high and low-type taxpayers are always truthful.

5.6 Alternative Tax Agency Audit Probability Intervals

Recall from Section 4.2.1, Proposition 2, that three audit probability intervals must be considered in providing a complete characterization of high-type taxpayers' reporting, communication, and hiring decisions: (1) $0<\gamma^i\leq\gamma^i_1$; (2) $\gamma^i_1<\gamma^i\leq\gamma^i_2$; and (3) $\gamma^i_2<\gamma^i<1$, where $\gamma^i_2=1/(1+\pi)$.[9] Similarly, two audit probability intervals must be considered in analyzing low-type taxpayers' decisions: (1) $0<\gamma^i\leq 1/(1+\pi)$; and (2) $1/(1+\pi)<\gamma^i<1$ (see Proposition 1). Note that the first two audit probability intervals for high-type taxpayers coincide with the first audit probability interval for low-type taxpayers. Since the approach for deriving the characterizations of taxpayers' decisions is identical for all audit probability intervals, to simplify the analysis, the specific case, in which $\gamma^i_2<\gamma^i<1$,

[9]See the proof of Proposition 2 in Appendix B for a definition of γ^i_1.

(i.e., the third case for high-type taxpayers and the second case for low-type taxpayers), was exhaustively analyzed, although general conditions were also presented for all possible cases (see Propositions 1 and 2, and Lemmas 3, 4, and 5). As explained earlier, it was assumed that the audit probability interval selected could apply to a particular class of taxpayers. Critical values were computed in each stage and were utilized to partition the population of taxpayers into groups based upon their beliefs about the tax rate. Taxpayers' hiring, communication, and reporting decisions were then inferred from the partitionings obtained. Finally, the equilibrium analysis in this chapter was performed for the specific case, where the existence of an equilibrium was demonstrated.

However, different classes of taxpayers may face different audit probabilities. Consequently, a brief discussion of the some of the potential equilibrium strategies in the other audit probability intervals is provided in this section, although a detailed characterization of taxpayers' decisions is not included since the framework used in the specific case applies to all audit probability intervals. Attention is focused on certain important differences in the choices faced by taxpayers.

When the audit probability lies in the interval $0<\gamma^i\leq 1/(1+\pi)$, an examination of low-type taxpayers' reporting decisions (see Proposition 1) reveals that, for taxpayers who file their own return, the report $R^i_{\mathcal{L},t_{CG}}$ always dominates the report $R^i_{\mathcal{L},t_l}$, for all $\beta \in [0,1]$. Accordingly, low-type taxpayers only consider inequality (22) (see Lemma 4) in making their hiring decisions;[10] that is, low-type taxpayers follow the strategy {Hire, ($R_{\mathcal{L}}$ | Hire), ($R^i_{\mathcal{L},t_{CG}}$ | Hire and d=r)} as opposed to {No hire, ($R^i_{\mathcal{L},t_{CG}}$ | No hire)}, if, and only if:

$$w(\zeta_{\mathcal{L}})[-(1-\gamma^i(1+\pi))\beta\,(t_l L - t_{CG}L) + (\gamma^i - \gamma^p)A] \geq F(\zeta_{\mathcal{L}}). \qquad \textbf{(74)}$$

Since $(1-\gamma^i(1+\pi))>0$, the first term in the square bracket is negative and, thus, low-type

---

[10]Recall that where $1/(1+\pi)<\gamma^i\leq 1$, low-type taxpayers had two reports from which to choose when filing their own return, $R_{\mathcal{L},t_{CG}}$ and $R_{\mathcal{L},t_l}$, and, thus, two expected net benefit functions to consider when making their hiring decisions (see Lemma 4).

taxpayers seek practitioner assistance only if the expected cost of being audited by the tax agency net of the expected additional taxes to be paid if the practitioner confirms that the true tax rate is t_l is greater than the practitioner fee. In contrast with the specific case previously analyzed, where the expected benefit from hiring was increasing in β, the expected benefit in (74) above is decreasing in β. Consequently, hiring will occur only when the expected cost of being audited is an important component in taxpayers' decisions.

In anaiyzing the strategies of high-type taxpayers, consider the case where the audit probability lies in the intermediate interval $\gamma_1^i < \gamma^i \leq \gamma_2^i$ (i.e., case (2) for hi[illegible] type taxpayers). From Proposition 2, high-type taxpayers now face three reporting choices: $R^i_{\hat{L},t_{CG}}$, $R^i_{\hat{H},t_{CG}}$, or $R^i_{\hat{H},t_l}$ (see Section 4.2.1). In contrast with case (3), the specific case, tax evasion may therefore occur when taxpayers file their own return. Furthermore, this additional reporting choice further expands the set of conditions which determine taxpayers' communication and hiring decisions: high-type taxpayers whose beliefs are in the interval $0 \leq \beta \leq \beta_H^{II}$ make their hiring and communication choices conditional on their decision to report $R^i_{\hat{L},t_{CG}}$ if rejected by the practitioner. Although the set of conditions has expanded, the approach to the characterizations of taxpayers' decisions is similar to that utilized previously.

From the tax agency's perspective, it must consider these differences, among others, in calculating its conditional expected tax revenue and, therefore, in its optimal choice of the level of investigation. The existence of an equilibrium follows from the proof provided for the specific case.

CHAPTER 6

CONCLUSION

6.1 Concluding Remarks

The main purpose of this thesis has been to develop and analyze a tax agency strategy, not previously considered in the compliance literature, which focuses on an expanded role for tax practitioners. This role is to elicit more truthful reporting from taxpayers. The proposed tax agency strategy consists of establishing standards and specifying the responsibilities of practitioners concerning their investigation of taxpayers' financial affairs. The enforcement mechanism is operationalized by having the tax agency strategically choose a new policy variable, referred to and modelled as the required *level* of practitioner investigation. A one-period game-theoretic model is used to study the effects of the proposed policy on taxpayers' compliance strategies and on the tax agency's expected tax revenue.

Previous studies have assumed (implicitly or explicitly) that taxpayers and practitioners have the same information regarding taxpayers' financial affairs (e.g., Beck, Davis, and Jung [1994], Reinganum and Wilde [1991], and Thoman [1992]) or that practitioners detect the understatement with some exogenous probability (Melumad et al. [1991]). These studies have ignored the information asymmetry between taxpayers and practitioners. However, as stated in the introductory chapter, taxpayers are not always honest with practitioners. It therefore seems important to formally model this information asymmetry.

In the model, taxpayers have private information about the facts and transactions underlying their particular situation which is relevant in determining both their levels of income and their tax rates. A major characteristic of the model is that taxpayers' compliance strategies involve a trade-off between their desire to engage in tax evasion and in tax minimization. This thesis distinguishes between these two types of activities and the differential costs (e.g., penalties and/or interest charges, and cost of being audited) associated with them. It is assumed that taxpayers know their true level of income. Therefore, any misreporting of the level of income is intentional noncompliance, i.e., an attempt to evade. However, taxpayers are uncertain about their tax rate (the category to which their income belongs). In this case, any misreporting of their tax rate is treated as unintentional noncompliance, i.e., an attempt to tax minimize. This distinction recognizes that there are certain sources or types of income or deductions for which there is a low probability that the tax agency can impose a penalty for evasion. Consequently, even though taxpayers may have a high probability that their tax rate is the income rate, they may use the lower capital gains rate, claim ignorance if audited by the tax agency, and face the lower expected costs of minimization.

Having observed their private information and the level of practitioner investigation, taxpayers decide whether to submit their own tax return or to hire a practitioner. Taxpayers may have incentives to seek practitioner advice to resolve their uncertainty about their tax rate and, therefore, to engage in tax minimization, which benefits the taxpayer either through reducing the amount of tax paid to the tax agency or through saving the expected costs associated with filing an incorrect return. Taxpayers are assumed to truthfully provide all the information required by practitioners in determining the correct tax rate as they (weakly) do not have incentives to withhold rate-relevant information.

However, taxpayers who hire a practitioner must also communicate their level of income. Taxpayers may have incentives to withhold information regarding their level of income as they may want to evade. Under the proposed policy, the practitioner must investigate the accuracy of the taxpayer's message. An important feature of the model is that practitioners may make either type I or type II errors during their investigation; that is, they may incorrectly conclude that taxpayers have misrepresented their level of income, or may fail to detect a misrepresentation when one exists. If a taxpayer's message is accepted, the practitioner provides advice and completes and files the return. If the taxpayer's message is rejected, that is, if the practitioner concludes that the level of income has been misrepresented, the taxpayer must file his or her own return.

Note that taxpayers may still consult the practitioner despite the possibility that any evasion may be discovered by the practitioner, due to the offsetting gains from minimization and/or savings of the expected cost of being audited by the tax agency.

The tax agency, based on its exogenously specified audit policy, decides whether to accept the taxpayer's return or to perform an audit. The probability of a tax agency audit is lower for practitioner-prepared returns. If the tax agency detects errors, it collects the additional tax liability, penalties, and/or interest charges.

Although the modelling of differential penalties dependent on the type of income is somewhat similar to that in Klepper and Nagin [1989] and Klepper et al. [1991], a different setting and a different definition of noncompliance have been used here to analyze the dual role of practitioners in the compliance and enforcement process. In Klepper and Nagin and Klepper et al., practitioners appear to contribute to noncompliance by exploiting ambiguous aspects of the tax law, but contribute to compliance by enforcing legally unambiguous features of the tax law; practitioners are viewed as enforcers/ ambiguity exploiters. In this thesis, practitioners contribute to compliance in two ways: as tax advisors, they resolve taxpayers' uncertainty about their tax rate, thus eliminating unintentional misreporting whenever returns are practitioner-prepared. As tax agency advocates, practitioners reduce taxpayers' incentives to evade by investigating the level of income communicated to them.

This thesis has contributed to the theoretical literature on taxpayer compliance by providing an analytical framework for studying and comparing the impact of different levels of practitioner investigation which may be selected by the tax agency on taxpayers' incentives to engage in tax evasion and tax minimization activities and, hence, on its own expected tax revenue. This framework captures the trade-offs faced by the participants (the tax agency and the taxpayers) in their choice of strategy as well as the strategic interrelationships which exist between them. In determining its own strategy, the tax agency (the Stackelberg Leader) must anticipate the effect that its choice of the level of investigation has on taxpayers' (the Followers) hiring, communication, and reporting decisions. It therefore calculates taxpayers' best responses to different levels of investigation. Given these best responses, the tax agency selects the level of investigation that maximizes its expected tax revenue, thus inducing taxpayers to adopt a particular strategy in equilibrium.

An interesting aspect of the model relates to taxpayers' communication decisions. The analysis demonstrates that taxpayers' decisions to communicate a high or a low level of income to practitioners varies directly with taxpayers' beliefs about their tax rate; that is, taxpayers' beliefs about their tax rate affect the ratio of the net cost (benefit) of providing a high message to the net cost (benefit) of communicating a low message (i.e., the critical rejection probability function). This relationship captures the trade-offs faced by taxpayers between their incentives to evade and to minimize. For a given level of investigation and for certain parameter values, it is demonstrated that high-type taxpayers who know their true tax rate may hire to evade. However, as they become less certain about their tax rate, high-type taxpayers are less likely to lie about their level of income; that is, they hire to resolve their uncertainty.

The analysis has shown that an equilibrium in pure strategies exists. For a given set of parameter values, the tax agency, through its choice of the level of investigation, can affect the equilibrium proportion of high and low-type taxpayers who seek practitioner assistance as well as the proportion of high-type taxpayers who either communicate a high or a low level of income to the practitioner. Consequently, the tax agency essentially chooses the optimal levels of evasion and minimization which, in turn, determine its expected tax revenue in equilibrium. An exception to this result occurs if high-type taxpayers always truthfully communicate their level of income when they hire, regardless of the tax agency's chosen level of investigation. In this case, the tax agency cannot affect the equilibrium proportion of high-type taxpayers who seek practitioner advice and, thus, it cannot affect their minimization activities. In order to possibly influence these high-type taxpayers' decisions, the tax agency would have to utilize a different policy instrument such as the audit probability and/or the interest rate.

Furthermore, under the basic assumptions specified for the equilibrium analysis (see Section 5.2 for a summary of these assumptions), this thesis has shown that in most cases, it is not optimal for the tax agency to require practitioners to use a level of investigation which eliminates tax evasion. Eliminating evasion may not be desirable for three reasons. First, when the expected penalties and interest charges that can be collected from high-type taxpayers who evade are greater than the expected cost of auditing these taxpayers, the tax agency prefers to induce an equilibrium in which at least some evasion occurs. Second, the level of practitioner investigation not only affects the level of evasion but also affects the level of minimization via its effect on the probability that a low message is accepted or rejected. Third, the level of investigation affects the practitioner fee which, in turn, affects the demand for practitioner services. When fewer taxpayers seek practitioner advice, successful tax minimization decreases since fewer taxpayers resolve their uncertainty about their tax rate.

When the tax agency's expected cost of auditing taxpayers is high relative to the net loss in tax revenue resulting from taxpayers hiring practitioners and resolving their uncertainty about the tax rate (as was shown in Section 5.3 (see condition (70)), the tax agency must trade off the levels of evasion and minimization which occur. Hence, as already stated, eliminating evasion may not necessarily be optimal. For instance, the optimal level of investigation calculated in a numerical example (see Section 5.4) induces taxpayers to adopt equilibrium strategies in which a proportion, albeit small, of high-type taxpayers communicate a low level of income when they hire. In this example, the tax agency prefers to induce an equilibrium whereby some rather than no evasion occurs; that is, it prefers to induce an equilibrium where *all* taxpayers hire and almost *all* high-type taxpayers truthfully communicate their level of income (Class 3b) rather than where *no* low-type taxpayers hire but *all* high-type taxpayers truthfully communicate their level of income and evasion never occurs (Class 9). This result also serves to illustrate the interrelationships which exist between high and low-type taxpayers' strategies: the proportion of high-type taxpayers who hire and who communicate either a high or a low message depends in part on the proportion of low-type taxpayers who hire (and *vice versa*). Furthermore, the tax agency's choice of strategy must take into account the expected tax revenue obtained from both high and low-type taxpayers. The model thus implies that there exists an optimal shifting of the burden of tax enforcement to the private sector.

The analysis further demonstrates that unless the tax agency prefers to induce an equilibrium where low-type taxpayers never hire, the optimal level of investigation is always greater than zero and less than one. Finally, although there may be more than one level of investigation which maximizes the tax agency's expected tax revenue, only one such level is selected and taxpayers adopt only one class of equilibrium strategies. Different sets of parameter values will provide for different classes of potential equilibrium strategies and, consequently, different optimal levels of investigation.

A number of interesting issues and extensions for future research emerge from this thesis. These are briefly addressed below.

6.2 Directions for Future Research

A natural extension to this work would be to incorporate the tax practitioner as a strategic participant in the revenue collection process and to examine how the practitioner's incentives may influence the actions of either the taxpayers or the taxing authority as well as the strategic interactions between the various agents. The tax agency would not necessarily "choose" the level of investigation *per se* but would design a mechanism, which would include a monitoring and a disciplining component, to induce practitioners to adopt a certain level of investigation. The tax agency would also have to consider the practitioner's optimal trade-off between type I and type II errors. This level of investigation could be motivated by a penalty structure optimally chosen by the tax agency. An equilibrium analysis which includes the strategic practitioner in this setting may further contribute to the understanding of the duai role of practitioners as they face the conflicts between their obligations to clients and to the taxing authority. Additionally, since taxpayers may seek assistance from different types of tax practitioners and preparers, an interesting extension would also distinguish among practitioner (and preparer) types.

This thesis has examined one specific mechanism which might be utilized by the tax agency as part of its enforcement activities. However, a number of other policy instruments are available to the tax agency including the audit probability, the interest and penalty schedules, and the tax rate schedules. The tax agency may also affect the level of uncertainty in the tax liability. While most game-theoretic models do not attempt to derive optimal tax and penalty schedules, they usually focus on the audit probability as a central choice variable. This thesis has abstracted from these considerations in order to focus specifically on the effects of the proposed policy on the trade-offs faced by both taxpayers and the agency. An extension to this work could incorporate the tax agency's optimal choice of other policy variables, in particular, the tax agency's audit probability. For example, the tax agency may want to adjust the audit probabilities to take into account the level of investigation exerted by practitioners in their examination of taxpayers' financial affairs. In doing so, the tax agency may be able to reduce its enforcement costs and increase its expected tax revenue.

Future research might also evaluate the social desirability of the proposed policy. To the extent that taxpayers continue to hire practitioners, this policy has the effect of shifting the auditor/enforcer role from the tax agency to the practitioner and of transferring a portion of the enforcement costs from the tax agency to the taxpayers. From a social welfare perspective, this policy may have important implications for tax equity and tax efficiency.

APPENDIX A

NOTATION

A - cost to the taxpayer of being audited

C - cost to the tax agency of auditing the taxpayer's return

$F(\zeta_\theta)$ - fee charged by practitioners for services rendered when the level of investigation ζ_θ is undertaken

$p(\theta)$ - prior distribution over taxpayer true income levels, where $\theta \in \{H,L\}$ denotes the taxpayer's true income level which may take one of two values, high (H) or low (L).

m - penalty rate applied to the amount of tax evaded

$R^n_{\hat{\theta},t_j}$ - taxpayer's report submitted to the tax agency, where the superscript n=i, p denotes whether the return is self-prepared or practitioner-prepared, respectively; $\hat{\theta} \in \{\hat{H},\hat{L}\}$ is the taxpayer's reported level of income and $t_J \in \{t_I,t_{CG}\}$ is the tax rate; t_I is the rate at which ordinary income is taxed and t_{CG} is the rate at which capital gains are taxed

$R_{\hat{\theta}}$ - taxpayer's message communicated to the practitioner, where $\hat{\theta} \in \{\hat{H},\hat{L}\}$

$v(\zeta_\theta)$ - probability that the tax practitioner detects a lie when the level of investigation ζ_θ is utilized; $(1-v(\zeta_\theta))$ is the probability that the practitioner makes a Type II error

$w(\zeta_\theta)$ - probability that the tax practitioner correctly accepts the taxpayer's message when the level of investigation ζ_θ is utilized; $(1-w(\zeta_\theta))$ is the probability that the practitioner makes a Type I error

β - taxpayer's unbiased beliefs about the true tax rate; β is the belief that the income is taxed at the *income* rate and $1-\beta$ is the taxpayer's belief that the income is taxed at the *capital gains* rate

$f(\beta)$ - prior distribution over the population of taxpayers holding beliefs β about the tax rate

$g(\theta,\beta)$ - joint distribution over taxpayer income levels and tax rates

π - interest rate applied to amount of tax underpaid

γ^i, γ^p - probability that the tax agency audits a self-prepared or practitioner-prepared return, respectively

d=a,r - tax practitioner's decision to accept (d=a) or reject (d=r) a taxpayer's message

APPENDIX B

EXPECTED PAYOFFS

This appendix provides the specification of the expected payoffs to the taxpayers and to the tax agency under the various strategies.

i) Taxpayers' Expected Tax Liabilities

Table B.1 presents taxpayers' expected tax liabilities given their level of income $\theta \in \{H,L\}$ and their beliefs β about the tax rate, for each possible strategy. A strategy is comprised of a hiring decision, a communication decision (where a practitioner is hired), and a reporting decision (where a tax return is self-prepared).

Table B.1

Taxpayers' Expected Payoffs

Strategy of taxpayer/ Terminal Node (see Figures 3.1a to 3.1e)	Expected tax liability
L, β: No hire, $R^{i}_{\mathcal{L},t_l}$ {z33…z36}	$\gamma^{i}[\beta t_l L + (1-\beta) t_{CG} L + A] + (1-\gamma^{i}) t_l L$
L, β: No hire, $R^{i}_{\mathcal{L},t_{CG}}$ {z37…z40}	$\gamma^{i}[\beta (t_l L + \pi(t_l L - t_{CG} L)) + (1-\beta) t_{CG} L + A] + (1-\gamma^{i}) t_{CG} L$
L, β: Hire, $R_{\mathcal{L}}$, d=a {z41…z44}	$w(\zeta_{\mathcal{L}})[\gamma^{p}[\beta t_l L + (1-\beta) t_{CG} L + A] + (1-\gamma^{p})(\beta t_l L + (1-\beta) t_{CG} L)] + F(\zeta_{\mathcal{L}})$
L, β: Hire, $R_{\mathcal{L}}$, $R^{i}_{\mathcal{L},t_l}$ if d=r {z45…z48}	$(1-w(\zeta_{\mathcal{L}}))[\gamma^{i}[\beta t_l L + (1-\beta) t_{CG} L + A] + (1-\gamma^{i}) t_l L] + F(\zeta_{\mathcal{L}})$

L, β: Hire, $R_{\mathcal{L}}$, $R^{i}_{\mathcal{L},t_{CG}}$ if d=r {z49…z52}	$(1-w(\zeta_{\mathcal{L}}))[\gamma^{i}[\beta(t_I L+\pi(t_I L-t_{CG}L)) +(1-\beta)t_{CG}L+A]+(1-\gamma^{i})t_{CG}L]+F(\zeta_{\mathcal{L}})$
H, β: No hire, $R^{i}_{\mathcal{H},t_I}$ {z1}	$t_I H$
H, β: No hire, $R^{i}_{\mathcal{H},t_{CG}}$ {z2…z5}	$\gamma^{i}[\beta(t_I H+\pi(t_I H-t_{CG}H))+(1-\beta)t_{CG}H+A] +(1-\gamma^{i})t_{CG}H$
H, β: No hire, $R^{i}_{\mathcal{L},t_I}$ {z6…z9}	$\gamma^{i}[\beta(t_I H+(\pi+m)(t_I H-t_I L)+(1-\beta)(t_{CG}H+m(t_{CG}H -t_{CG}L)+\pi(t_{CG}H-t_I L))+A]+(1-\gamma^{i})t_I L$
H, β: No hire, $R^{i}_{\mathcal{L},t_{CG}}$ {z10…z13}	$\gamma^{i}[\beta(t_I H+\pi(t_I H-t_{CG}L)+m(t_I H-t_I L)) +(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))+A] +(1-\gamma^{i})t_{CG}L$
H, β: Hire, $R_{\mathcal{H}}$, d=a {z14…z15}	$\beta t_I H+(1-\beta)t_{CG}H+F(\zeta_{\mathcal{H}})$
H, β: Hire, $R_{\mathcal{L}}$, d=a {z16…z19}	$(1-v(\zeta_{\mathcal{L}}))[\gamma^{p}[\beta(t_I H+(\pi+m)(t_I H-t_I L)) +(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))+A] +(1-\gamma^{p})[t_{CG}L+\beta(t_I L-t_{CG}L)]+F(\zeta_{\mathcal{L}})]$
H, β: Hire, $R_{\mathcal{L}}$, $R^{i}_{\mathcal{H},t_I}$ if d=r {z20}	$v(\zeta_{\mathcal{L}})[t_I H+F(\zeta_{\mathcal{L}})]$
H, β: Hire, $R_{\mathcal{L}}$, $R^{i}_{\mathcal{H},t_{CG}}$ if d=r {z21…z24}	$v(\zeta_{\mathcal{L}})[\gamma^{i}[\beta(t_I H+\pi(t_I H-t_{CG}H))+(1-\beta)t_{CG}H+A] +(1-\gamma^{i})t_{CG}H+F(\zeta_{\mathcal{L}})]$
H, β: Hire, $R_{\mathcal{L}}$ $R^{i}_{\mathcal{L},t_I}$ if d=r {z25…z28}	$v(\zeta_{\mathcal{L}})[\gamma^{i}[\beta(t_I H+(\pi+m)(t_I H-t_I L)+(1-\beta)(t_{CG}H+m(t_{CG}H -t_{CG}L)+\pi(t_{CG}H-t_I L)+A]+(1-\gamma^{i})t_I L+F(\zeta_{\mathcal{L}})]$
H, β: Hire, $R_{\mathcal{L}}$, $R^{i}_{\mathcal{L},t_{CG}}$ if d=r {z29…z32}	$v(\zeta_{\mathcal{L}})[\gamma^{i}[\beta(t_I H+\pi(t_I H-t_{CG}L)+m(t_I H-t_I L)) +(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))+A] +(1-\gamma^{i})t_{CG}L+F(\zeta_{\mathcal{L}})]$

ii) Tax Agency's Expected Tax Revenue

The tax agency's strategy consists of choosing the level of investigation, $\zeta_{\hat{L}}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$ that practitioners are required to exert in detecting tax evasion. This level of investigation is selected taking into consideration the effect that it will have on the probability that taxpayers seek practitioner assistance (or the proportion of taxpayers who seek practitioner assistance), the communication decisions of taxpayers, the probability that practitioners make incorrect inferences, and consequently, the amount of tax evasion and tax minimization that will occur. Table B.2 specifies the expected revenue to the tax agency for a given level of investigation, predetermined policy parameters, for each strategy of a particular taxpayer.

Table B.2

Tax Agency's Expected Payoffs

Strategy of taxpayer/ Terminal Node (see Figures 3.1a to 3.1e)	Tax agency expected tax revenue
L, β: No hire, $R^i_{\hat{L},t_l}$ {z33…z36}	$\gamma^i[\beta t_l L + (1-\beta)t_{CG}L - C] + (1-\gamma^i)t_l L$
L, β: No hire, $R^i_{\hat{L},t_{CG}}$ {z37…z40}	$\gamma^i[\beta(t_l L + \pi(t_l L - t_{CG}L)) + (1-\beta)t_{CG}L - C] + (1-\gamma^i)t_{CG}L$
L, β: Hire, $R_{\hat{L}}$, d=a {z41…z44}	$w(\zeta_{\hat{L}})[\gamma^p[\beta t_l L + (1-\beta)t_{CG}L - C] + (1-\gamma^p)(\beta t_l L + (1-\beta)t_{CG}L)]$
L, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r {z45…z48}	$(1-w(\zeta_{\hat{L}}))[\gamma^i[\beta t_l L + (1-\beta)t_{CG}L - C] + (1-\gamma^i)t_l L]$
L, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r {z49…z52}	$(1-w(\zeta_{\hat{L}}))[\gamma^i[\beta(t_l L + \pi(t_l L - t_{CG}L))$ $+ (1-\beta)t_{CG}L - C] + (1-\gamma^i)t_{CG}L]$
H, β: No hire, $R^i_{\hat{H},t_l}$ {z1}	$t_l H$

H, β: No hire, $R^i_{\hat{H},t_{CG}}$ {z2…z5}	$\gamma^i[\beta(t_lH+\pi(t_lH-t_{CG}H))+(1-\beta)t_{CG}H-C]+(1-\gamma^i)t_{CG}H$
H, β: No hire, $R^i_{\hat{L},t_l}$ {z6…z9}	$\gamma^i[\beta(t_lH+(\pi+m)(t_lH-t_lL))+(1-\beta)(t_{CG}H+m(t_{CG}H$ $-t_{CG}L)+\pi(t_{CG}H-t_lL))-C]+(1-\gamma^i)t_lL$
H, β: No hire, $R^i_{\hat{L},t_{CG}}$ {z10…z13}	$\gamma^i[\beta(t_lH+\pi(t_lH-t_{CG}L)+m(t_lH-t_lL))$ $+(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))-C]$ $+(1-\gamma^i)t_{CG}L$
H, β: Hire, $R_{\hat{H}}$, d=a {z14…z15}	$\beta t_lH+(1-\beta)t_{CG}H$
H, β: Hire, $R_{\hat{L}}$, d=a {z16…z19}	$(1-v(\zeta_{\hat{L}}))[\gamma^p[\beta(t_lH+(\pi+m)(t_lH-t_lL))$ $+(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))-C]$ $+(1-\gamma^p)[t_{CG}L+\beta(t_lL-t_{CG}L)]]$
H, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r {z20}	$v(\zeta_{\hat{L}})t_lH$
H, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r {z21…z24}	$v(\zeta_{\hat{L}})[\gamma^i[\beta(t_lH+\pi(t_lH-t_{CG}H))+(1-\beta)t_{CG}H-C]$ $+(1-\gamma^i)t_{CG}H]$
H, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r {z25…z28}	$v(\zeta_{\hat{L}})[\gamma^i[\beta(t_lH+(\pi+m)(t_lH-t_lL))+(1-\beta)(t_{CG}H+m(t_{CG}H$ $-t_{CG}L)+\pi(t_{CG}H-t_lL)-C]+(1-\gamma^i)t_lL]$
H, β: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$v(\zeta_{\hat{L}})[\gamma^i[\beta(t_lH+\pi(t_lH-t_{CG}L)+m(t_lH-t_lL))$ $+(1-\beta)(t_{CG}H+(\pi+m)(t_{CG}H-t_{CG}L))-C]+(1-\gamma^i)t_{CG}L]$

APPENDIX C

CHAPTER 4 PROOFS

Lemma 1:

Table C.1 summarizes low-type taxpayers' tax liabilities under the four reporting decisions, conditional on whether or not the return is audited by the tax agency.

TABLE C.1

Low-type Taxpayers' Tax Liabilities

	Tax Agency's Audit		
Taxpayer's Report	Audit True tax rate = t_I	Audit True tax rate = t_{CG}	No audit
$R^i_{\hat{H},t_I}$ [1]	t_IH	t_IH	t_IH
$R^i_{\hat{H},t_{CG}}$	$t_IL + A$	$t_{CG}L + A$	$t_{CG}H$
$R^i_{\hat{L},t_I}$	$t_IL + A$	$t_{CG}L + A$	t_IL
$R^i_{\hat{L},t_{CG}}$	$t_IL + \pi(t_IL - t_{CG}L) + A$	$t_{CG}L + A$	$t_{CG}L$

A comparison of the tax liabilities in Table C.1 reveals that, by Assumption 2, the report $R^i_{\hat{H},t_I}$ is strictly dominated by at least one report, $R^i_{\hat{H},t_{CG}}$, which itself is weakly

---

[1]Recall that the tax agency never audits a return $R^i_{\hat{H},t_I}$ as it collects the maximum amount of revenue at minimum cost.

dominated by at least another report, $R^i_{\hat{L},t_i}$ (by Assumption 1). Regardless of whether or not the tax agency audits taxpayers who report a low level of income and of the resulting outcome if an audit is performed, taxpayers incur a higher (or at least as high a) tax liability if they report a high rather than a low level of income (when their true level of income is low). Consequently, taxpayers will not overreport their level of income when they know that their true level of income is low.

Q.E.D.

Proposition 1:

Rewriting the optimality inequality (3) as,

$$\gamma^i(1+\beta\pi) \leq 1, \tag{C.1}$$

(1) When $0 < \gamma^i \leq 1/(1+\pi)$, condition (C.1) holds for *all* low-type taxpayers, irrespective of their beliefs β.

(2) Since the tax agency's audit probability and interest rate are fixed, when $1/(1+\pi) < \gamma^i < 1$, the left hand side of (C.1) varies only with β and is continuous and monotone increasing in β. Hence, there exists a unique value of β satisfying condition (C.1) such that $0<\beta_L^*<1$.

Q.E.D.

Proposition 2:

The first step in determining high-type taxpayers' reporting decisions consists of comparing the expected tax liabilities associated with the four reporting options, $R^i_{\hat{\theta},t_j}$, for $\hat{\theta} \in \{\hat{H},\hat{L}\}$, and $t_j \in \{t_I, t_{CG}\}$ (see Appendix B, Table B.1, for a specification of the expected tax liabilities). The resulting expressions are simplified and reformulated to obtain a distinct cut-off value for each comparison. These cut-off values are denoted by β^h_H, h=II,III,...,VI. The results are presented below.

A taxpayer, having belief β about the tax rate, always reports:

I. $R^i_{\hat{L},t_{CG}}$ as opposed to $R^i_{\hat{L},t_I}$ if, and only if:[2]

$$\gamma^i < \frac{1}{1+\pi} \quad \forall \ \beta \in [0,1]. \tag{C.2}$$

II. $R^i_{\hat{L},t_{CG}}$ as opposed to $R^i_{\hat{H},t_{CG}}$ if, and only if :[3]

$$\beta < \frac{(1-\gamma^i(1+\pi+m))(t_{CG}H - t_{CG}L)}{\gamma^i m[(t_I H - t_{CG}H) - (t_I L - t_{CG}L)]} \equiv \beta^{II}_H \tag{C.3}$$

III. $R^i_{\hat{L},t_{CG}}$ as opposed to $R^i_{\hat{H},t_I}$ if, and only if:

$$\beta < \frac{(t_I H - t_{CG}L) - \gamma^i(1+\pi+m)(t_{CG}H - t_{CG}L) - \gamma^i A}{\gamma^i[(1+\pi+m)(t_I H - t_{CG}H) - m(t_I L - t_{CG}L)]} \equiv \beta^{III}_H \tag{C.4}$$

---

[2]Note that a high-type taxpayer's choice between reporting $R^i_{\hat{L},t_{CG}}$ or $R^i_{\hat{L},t_I}$ does not depend on the beliefs of the taxpayer but on the tax agency's audit probability and the interest rate charged on underpayments. Consequently, a particular cut-off β is not obtained.

[3]For a given set of exogenous parameters, the critical β values calculated may be less than zero or greater than one. Given such an occurrence, one report will dominate the other for all $\beta \in [0,1]$. For example, when $\gamma^i > 1/(1+\pi+m)$, the right hand side of inequality (C.3), or β^{II}_H, is negative; hence, inequality (C.3) does not hold and $\beta > \beta^{II}_H$ for all $\beta \in [0,1]$. In this case, the report $R^i_{\hat{L},t_{CG}}$ is dominated by $R^i_{\hat{H},t_{CG}}$.

Alternatively, when $\gamma^i < 1/(1+\pi+m)$ and when the RHS of inequality (C.3) is greater than one, $\beta < \beta^{II}_H$ for all $\beta \in [0,1]$ and, therefore, taxpayers always report $R^i_{\hat{L},t_{CG}}$ as opposed to $R^i_{\hat{H},t_{CG}}$ ($R^i_{\hat{H},t_{CG}}$ is therefore the dominated report). Note that the RHS is greater than one if

$$\gamma^i > \frac{(t_{CG}H - t_{CG}L)}{(1+\pi)(t_{CG}H - t_{CG}L) + m(t_I H - t_I L)}.$$

IV. $R^{i}_{\hat{L},t_I}$ as opposed to $R^{i}_{\hat{H},t_{CG}}$ if, and only if:

$$\beta < \frac{(1-\gamma^{i}(1+\pi))(t_{CG}H - t_{I}L) - \gamma^{i}m(t_{CG}H - t_{CG}L)}{\gamma^{i}m[(t_{I}H - t_{CG}H) - (t_{I}L - t_{CG}L)]} \equiv \beta^{IV}_{H} \tag{C.5}$$

V. $R^{i}_{\hat{L},t_I}$ as opposed to $R^{i}_{\hat{H},t_I}$ if, and only if:

$$\beta < \frac{(t_{I}H - t_{I}L) - \gamma^{i}m(t_{CG}H - t_{CG}L) - \gamma^{i}(1+\pi)(t_{CG}H - t_{I}L) - \gamma^{i}A}{\gamma^{i}[(1+\pi+m)(t_{I}H - t_{CG}H) - m(t_{I}L - t_{CG}L)]} \equiv \beta^{V}_{H} \tag{C.6}$$

VI. $R^{i}_{\hat{H},t_{CG}}$ as opposed to $R^{i}_{\hat{H},t_I}$ if, and only if:

$$\beta < \frac{(t_{I}H - t_{CG}H) - \gamma^{i}A}{\gamma^{i}(1+\pi)(t_{I}H - t_{CG}H)} \equiv \beta^{VI}_{H} \tag{C.7}$$

The next step consists of comparing and rank ordering the cut-off β values, β^{h}_{H}, h=II,III,...,VI, obtained above. Since their ordering depends in part on the tax agency's audit probability, these comparisons lead to a set of cut-off audit probability values, denoted by γ^{i}_{k}, k=1,2,...,5. They are presented below.

(1) $\beta^{II}_{H} > \beta^{III}_{H}$ if:

$$\gamma^{i} < \frac{(1+\pi+m)(t_{CG}H - t_{CG}L) - m(t_{I}H - t_{I}L)}{(1+\pi+m)(1+\pi)(t_{CG}H - t_{CG}L) - mA\left[1 - \frac{(t_{I}L - t_{CG}L)}{(t_{I}H - t_{CG}H)}\right]} \equiv \gamma^{i}_{1} \tag{C.8}$$

(2) $\beta^{II}_{H} > \beta^{IV}_{H}$ if:

$$\gamma^{i} < \frac{1}{1+\pi} \equiv \gamma^{i}_{2} \tag{C.9}$$

(3) $\beta_H^{II} > \beta_H^{V}$ if:

$$\gamma^i < \frac{(1+\pi+m)(t_{CG}H - t_{CG}L) - m(t_I H - t_I L) + m(t_I L - t_{CG}L)\left[1 - \dfrac{(t_I L - t_{CG}L)}{(t_I H - t_{CG}H)}\right]}{(1+\pi+m)(1+\pi)(t_{CG}H - t_{CG}L) + [(1+\pi)m(t_I L - t_{CG}L) - mA]\left[1 - \dfrac{(t_I L - t_{CG}L)}{(t_I H - t_{CG}H)}\right]} \equiv \gamma_3^i \tag{C.10}$$

(4) $\beta_H^{II} > \beta_H^{VI}$ if:

$$\gamma^i < \frac{(1+\pi+m)(t_{CG}H - t_{CG}L) - m(t_I H - t_I L)}{(1+\pi+m)(1+\pi)(t_{CG}H - t_{CG}L) - mA\left[1 - \dfrac{(t_I L - t_{CG}L)}{(t_I H - t_{CG}H)}\right]} \equiv \gamma_1^i \tag{C.11}$$

(5) $\beta_H^{III} < \beta_H^{IV}$ if:

$$\gamma^i < \frac{(1+\pi)(t_{CG}H - t_I L) - m(t_I H - t_{CG}H) + m\dfrac{(t_I L - t_{CG}L)^2}{(t_I H - t_{CG}H)}}{(1+\pi+m)(1+\pi)(t_{CG}H - t_I L) + (1+\pi)m\dfrac{(t_I L - t_{CG}L)^2}{(t_I H - t_{CG}H)} - mA\left[1 - \dfrac{(t_I L - t_{CG}L)}{(t_I H - t_{CG}H)}\right]} \equiv \gamma_4^i \tag{C.12}$$

(6) $\beta_H^{III} > \beta_H^{V}$ if:

$$\gamma i < \frac{1}{1+\pi} \equiv \gamma_2^i \tag{C.13}$$

(7) $\beta_H^{III} > \beta_H^{VI}$ if:

$$\gamma^i < \frac{(1+\pi+m)(t_{CG}H - t_{CG}L) - m(t_I H - t_I L)}{(1+\pi+m)(1+\pi)(t_{CG}H - t_{CG}L) - mA\left[1 - \dfrac{(t_I L - t_{CG}L)}{(t_I H - t_{CG}H)}\right]} \equiv \gamma_1^i \tag{C.14}$$

(8) $\beta_H^{IV} > \beta_H^{V}$ if:

$$\gamma^i < \frac{(1+\pi)(t_{CG}H - t_l L) + m(t_{CG}H - t_{CG}L) - m(t_l H - t_l L)}{(1+\pi)^2(t_{CG}H - t_l L) + (1+\pi)m(t_{CG}H - t_{CG}L) - mA\left[1 - \frac{(t_l L - t_{CG}L)}{(t_l H - t_{CG}H)}\right]} \equiv \gamma_5^i \qquad \textbf{(C.15)}$$

(9) $\beta_H^{IV} > \beta_H^{VI}$ if:

$$\gamma^i < \frac{(1+\pi)(t_{CG}H - t_l L) + m(t_{CG}H - t_{CG}L) - m(t_l H - t_l L)}{(1+\pi)^2(t_{CG}H - t_l L) + (1+\pi)m(t_{CG}H - t_{CG}L) - mA\left[1 - \frac{(t_l L - t_{CG}L)}{(t_l H - t_{CG}H)}\right]} \equiv \gamma_5^i \qquad \textbf{(C.16)}$$

(10) $\beta_H^{V} > \beta_H^{VI}$ if:

$$\gamma^i < \frac{(1+\pi)(t_{CG}H - t_l L) + m(t_{CG}H - t_{CG}L) - m(t_l H - t_l L)}{(1+\pi)^2(t_{CG}H - t_l L) + (1+\pi)m(t_{CG}H - t_{CG}L) - mA\left[1 - \frac{(t_l L - t_{CG}L)}{(t_l H - t_{CG}H)}\right]} \equiv \gamma_5^i \qquad \textbf{(C.17)}$$

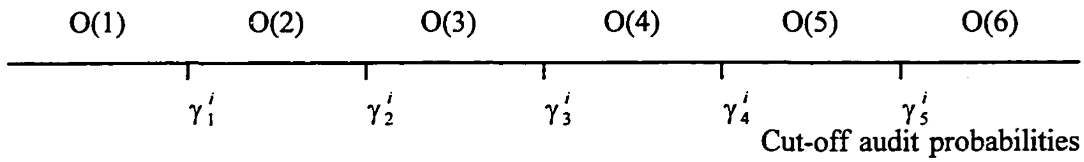
These critical audit probabilities, γ_k^i, k=1,2,...,5, are compared to one another and are then ranked in increasing order. Different rankings on γ_k^i may be obtained, depending on the set of parameter values. Figure C.1 below depicts one of the possible rankings.[4]

---

[4]Note that given Assumptions 1 and 2, it can be shown that the following relationships hold:

$$\gamma_5^i < \gamma_1^i < \gamma_2^i, \quad \textit{and}$$
$$\gamma_4^i < \gamma_2^i.$$

Through imposing additional assumptions on the parameter values, it can be demonstrated that the ranking obtained in Figure C.1 exists. Numerical analysis was performed to verify existence of the ranking; however, this analysis is not provided here.



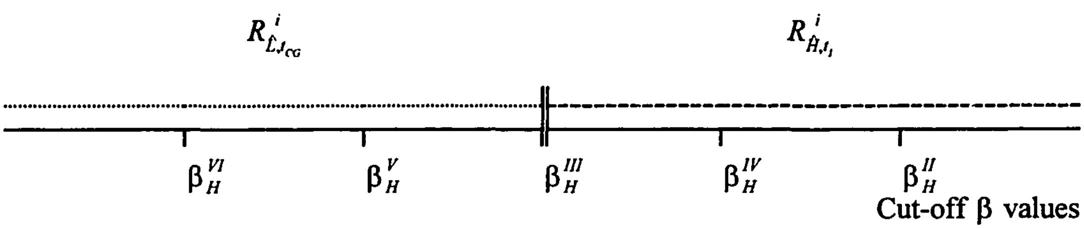
where O(n), n=1,2,... ,6, represents distinct orderings of the β values, β^h_H, h=II,III,...,VI, associated with each audit probability interval.

FIGURE C.1

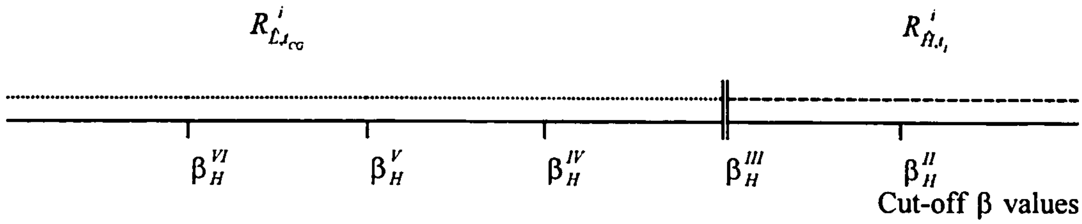
Cut-off audit probabilities

For each audit probability interval identified in Figure C.1, a distinct ordering of the cut-off β values, β^h_H, h=II,III,...,VI, and, hence, a different partitioning of the population of taxpayers is obtained. Given these cut-off values, high type taxpayers' reporting decisions can be specified for all taxpayers' beliefs $\beta \in [0,1]$ about the tax rate. The β orderings and taxpayers' reporting decisions are presented in Figure C.2 below.

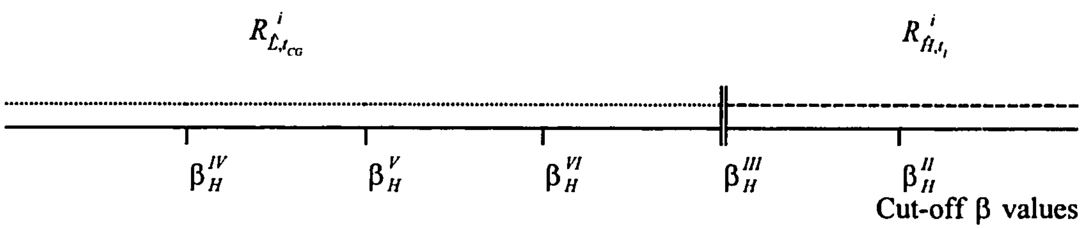
Ordering (1): where $0 \leq \gamma^i \leq \gamma^i_4$,



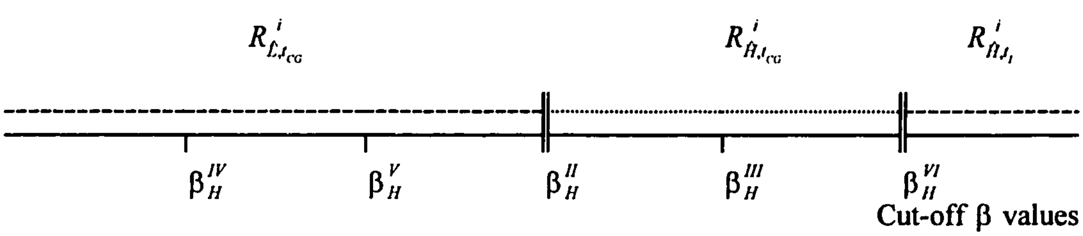
Ordering (2): where $\gamma^i_4 < \gamma^i \leq \gamma^i_5$,



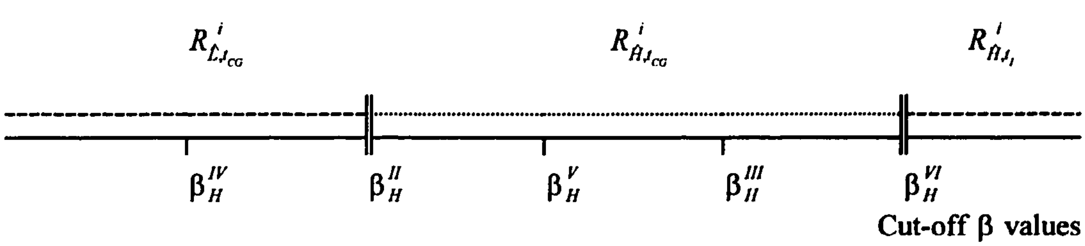
Ordering (3): where $\gamma^i_5 < \gamma^i \leq \gamma^i_1$,



Ordering (4): where $\gamma^i_1 < \gamma^i \leq \gamma^i_3$,



Ordering (5): where $\gamma^i_3 < \gamma^i \leq \gamma^i_2$,



Ordering (6): where $\gamma_2^i < \gamma^i < 1$,

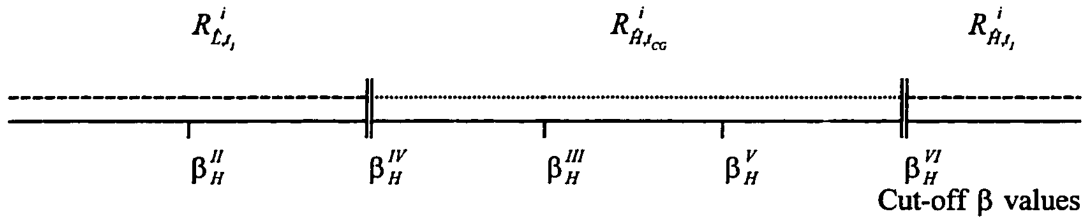


FIGURE C.2

Orderings on β and Taxpayers' Reporting Decisions

A closer examination of the results presented in Figure C.2 above reveals that, in terms of taxpayers' reporting decisions, orderings O(1), O(2), and O(3) (corresponding to the audit probability intervals $0 \le \gamma^i \le \gamma_4^i$, $\gamma_4^i < \gamma^i \le \gamma_5^i$, $\gamma_5^i < \gamma^i \le \gamma_1^i$, respectively) provide the same decision rule; that is, taxpayers' reporting decisions are to file the return $R^i_{\hat{L},t_{CG}}$ ($R^i_{\hat{H},t_1}$) depending upon whether their belief β about their tax rate is lower (higher) than the critical value, β_H^{III}. This critical value is the only value which affects taxpayers' reporting decisions, for each ordering mentioned above. A similar interpretation may be provided for the remaining audit probability intervals and β orderings. Consequently, the audit probability intervals can be combined into three regions: (1) $0 < \gamma^i \le \gamma_1^i$; (2) $\gamma_1^i < \gamma^i \le \gamma_2^i$; and (3) $\gamma_2^i < \gamma^i < 1$. The revised audit probability intervals, the relevant critical β values, and the resulting taxpayer reporting decisions are presented in Figure 4.1 in the text.

Q.E.D.

Lemma 2:

Table C.2

Low-type Taxpayers' Expected Tax Liabilities

	Tax Agency's Audit	
Taxpayer's Message /Report	Audit	No Audit
$R_{\hat{H}}$[5]	$\beta t_I H + (1-\beta) t_{CG} H$	$\beta t_I H + (1-\beta) t_{CG} H$
$R_{\hat{L}}$, and $R^i_{\hat{L},t_I}$ if d=r	$w(\zeta_{\hat{L}})[\beta t_I L + (1-\beta) t_{CG} L]$ $+(1-w(\zeta_{\hat{L}}))[\beta t_I L + (1-\beta) t_{CG} L] + A$	$w(\zeta_{\hat{L}})[\beta t_I L + (1-\beta) t_{CG} L]$ $+(1-w(\zeta_{\hat{L}})) t_I L$
$R_{\hat{L}}$, and, $R^i_{\hat{L},t_{CG}}$ if d=r	$w(\zeta_{\hat{L}})[\beta t_I L + (1-\beta) t_{CG} L]$ $+(1-w(\zeta_{\hat{L}}))[\beta (t_I L + \pi(t_I L - t_{CG} L))$ $+(1-\beta) t_{CG} L] + A$	$w(\zeta_{\hat{L}})[\beta t_I L + (1-\beta) t_{CG} L]$ $+(1-w(\zeta_{\hat{L}})) t_{CG} L$

A comparison of the expected tax liabilities under the "audit" and "no audit" outcomes described in Table C.2 reveals that, given Assumptions 1 and 2, the message $R_{\hat{H}}$ is strictly dominated by at least the message/report combination, $\{R_{\hat{L}},\ R^i_{\hat{L},t_I}$ if d=r$\}$; that is, under the audit outcome, $\{R_{\hat{L}},\ R^i_{\hat{L},t_I}$ if d=r$\}$ dominates $R_{\hat{H}}$ since,

---

[5]From Observation 1, the message $R_{\hat{H}}$ is always accepted. Furthermore, by assumption, the tax agency does not audit practitioner-prepared returns $R^p_{\hat{H},t_I}$ or $R^p_{\hat{H},t_{CG}}$. The dominance results would continue to hold even if there existed a positive probability that a message $R_{\hat{H}}$ may be rejected; that is, the message/report combination $\{R_{\hat{H}},\ R^i_{\hat{L},t_I}$ if d=r$\}$ would be dominated by $\{R_{\hat{L}},\ R^i_{\hat{L},t_I}$ if d=r$\}$ and $\{R_{\hat{H}},\ R^i_{\hat{L},t_{CG}}$ if d=r$\}$ would be dominated by $\{R_{\hat{L}},\ R^i_{\hat{L},t_{CG}}$ if d=r$\}$.

$$E(TL\,|\,Hire, L, \beta, R_{\hat{H}}) > E(TL\,|\,Hire, L, \beta, R_{\hat{L}}, R^{i}_{\hat{L},t_I}\ if\, d=r, Audit), \quad \textbf{(C.18)}$$

or equivalently, since,

$$\beta t_I H + (1-\beta) t_{CG} H > \beta t_I L + (1-\beta) t_{CG} L + A. \quad \textbf{(C.19)}$$

Under the no audit outcome, the dominance result also holds since,

$$E(TL\,|\,Hire, L, \beta, R_{\hat{H}}) > E(TL\,|\,Hire, L, \beta, R_{\hat{L}}, R^{i}_{\hat{L},t_I}\ if\, d=r, No\ Audit), \quad \textbf{(C.20)}$$

or equivalently, since,

$$\beta t_I H + (1-\beta) t_{CG} H > w(\zeta_{\hat{L}})[\beta t_I L + (1-\beta) t_{CG} L] + (1-w(\zeta_{\hat{L}})) t_I L. \quad \textbf{(C.21)}$$

Consequently, regardless of whether or not the tax agency performs an audit, low-type taxpayers always incur a higher (or at least as high a) tax liability if they communicate a high level of income to the practitioner than if they communicate a low level of income.

Q.E.D.

Lemma 3:

Conditional on practitioners being hired, taxpayers choose their message by comparing their expected tax liabilities from communicating $R_{\hat{H}}$ and $R_{\hat{L}}$. Since a message $R_{\hat{L}}$ may be rejected, taxpayers must also consider their fourth stage reporting decisions: that is, the expected tax liability from reporting $R_{\hat{L}}$ is conditioned on the probability that a message may be accepted or rejected and if rejected, on the report $R^{i}_{\hat{\theta},t_j}$, $\hat{\theta} \in \{\hat{H},\hat{L}\}$ and $t_j \in \{t_I, t_{CG}\}$, filed by taxpayers. Three comparisons must be made:[6]

I. $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{L},t_{CG}}\ if\, d=r)$

II. $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{H},t_{CG}}\ if\, d=r)$

III. $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{H},t_I}\ if\, d=r)$

---

[6]The message/report combination $\{R_{\hat{L}}, R^{i}_{\hat{L},t_I}$ if d=r} will never be chosen as it is dominated by at least another combination, for all $\gamma^i \in (0,1)$ (see Proposition 2).

When the above expressions are compared, simplified, and reformulated in terms of $v(\zeta_{\hat{L}})$, where $v(\zeta_{\hat{L}})$ is the probability that a message $R_{\hat{L}}$ will be correctly rejected by a practitioner who utilizes the level of investigation $\zeta_{\hat{L}}$, the critical values $v(\zeta_{\hat{L}})_g$, g=I,II,III, are obtained.

Q.E.D.

Proof of the monotonicity of $v(\zeta_{\hat{L}})_{II|\beta}$

The monotonicity of $v(\zeta_{\hat{L}})_{II|\beta}$ is demonstrated as follows. First, define

$$v(\zeta_{\hat{L}})_{II|\beta} = \frac{Num(II)}{Denom(II)}.$$

The first derivative is given by

$$\frac{\partial\, v(\zeta_{\hat{L}})_{II|\beta}}{\partial\beta} = \frac{\dfrac{\partial\, Num(II)}{\partial\beta}\cdot Denom(II) - \dfrac{\partial\, Denom(II)}{\partial\beta}\cdot Num(II)}{Denom(II)^2}$$

$$= \frac{Numerator(II)}{Denom(II)^2},$$

where Numerator(II) is given by equation (9) in the text. Note that (9) is not a function of β.

The second derivative is given by

$$\frac{\partial^2 v(\zeta_{\hat{L}})_{II|\beta}}{\partial\beta^2} = \frac{\dfrac{\partial\, Numerator(II)}{\partial\beta}\cdot Denom(II)^2 - 2\cdot\dfrac{\partial\, Denom(II)}{\partial\beta}\cdot Numerator(II)\cdot Denom(II)}{Denom(II)^4}$$

Since $\partial\, Numerator(II) / \partial\beta = 0$, the second derivative above can be rewritten as,

$$\frac{\partial^2 v(\zeta_{\hat{L}})_{II|\beta}}{\partial\beta^2} = \frac{-2\cdot\dfrac{\partial\, Denom(II)}{\partial\beta}\cdot Numerator(II)}{Denom(II)^3}$$

where

$$\frac{\partial\, Denom(II)}{\partial\beta} = -(1-\gamma^{p}(1+\pi+m))(t_I L - t_{CG} L) + (\gamma^{i}-\gamma^{p})(1+\pi)(t_I H - t_{CG} H)$$

$$-\gamma^{p} m (t_I H - t_{CG} H).$$

Since $\gamma^{p} < 1/(1+\pi+m)$ and $\gamma^{i} > 1/(1+\pi)$, then

$$\frac{\partial\, Denom(II)}{\partial\beta} > 0 \qquad \text{for all } \beta \in [0, \beta_H^{VI}].$$

Furthermore, as explained in the text, attention is focused on the case where Denom(II) is greater than zero. Thus, the sign of the second derivative depends on the sign of the first derivative, specifically, the sign of Numerator(II); that is,

$$\frac{\partial^2 v(\zeta_{\mathcal{L}})_{II|\beta}}{\partial\beta^2} \begin{cases} >0 & \text{when inequality (9)} < 0, \\ <0 & \text{when inequality (9)} > 0, \text{ and} \\ =0 & \text{when inequality (9)} = 0. \end{cases}$$

Consequently, under the conditions specified above, $v(\zeta_{\mathcal{L}})_{II|\beta}$ is a monotone function of β for $\beta \in [0, \beta_H^{VI}]$.

Q.E.D.

Proof of the monotonicity of $v(\zeta_{\mathcal{L}})_{III|\beta}$

The proof of the monotonicity of $v(\zeta_{\mathcal{L}})_{III|\beta}$ is similar to that obtained with respect to $v(\zeta_{\mathcal{L}})_{II|\beta}$. Define

$$v(\zeta_{\mathcal{L}})_{III|\beta} = \frac{Num(III)}{Denom(III)}.$$

The second derivative is given by

$$\frac{\partial^2 v(\zeta_{\mathcal{L}})_{III|\beta}}{\partial\beta^2} = \frac{\dfrac{\partial\, Numerator(III)}{\partial\beta}\cdot Denom(III)^2 - 2\cdot\dfrac{\partial\, Denom(III)}{\partial\beta}\cdot Numerator(III)\cdot Denom(III)}{Denom(III)^4}$$

where Numerator(III) is the numerator of the first derivative $\partial v(\zeta_{\mathcal{L}})_{III|\beta} / \partial\beta$ and is given by

$$(t_I H - t_{CG} H)[(1-\gamma^P(1+\pi+m))(t_I H - t_I L) - \gamma^P A] - [F(\zeta_H) - F(\zeta_L)][-\gamma^P(1+\pi+m)(t_I H - t_{CG} H) - (1-\gamma^P(1+\pi+m))(t_I L - t_{CG} L)] > 0.$$

(C.22)

Note that Numerator(III) is not a function of β. Since $\partial\, Numerator(III) / \partial\beta = 0$, the second derivative above can be rewritten as,

$$\frac{\partial^2 v(\zeta_L)_{III|\beta}}{\partial\beta^2} = \frac{-2 \cdot \dfrac{\partial\, Denom(III)}{\partial\beta} \cdot Numerator(III)}{Denom(III)^3}$$

where

$$\frac{\partial\, Denom(III)}{\partial\beta} = -\gamma^P(1+\pi+m)(t_I H - t_{CG} H) - (1-\gamma^P(1+\pi+m))(t_I L - t_{CG} L) < 0.$$

Since attention is focused on the case where Denom(III) is greater than zero, and since Numerator(III) is greater than zero, then,

$$\frac{\partial^2 v(\zeta_L)_{III|\beta}}{\partial\beta^2} > 0.$$

Consequently, under the conditions specified above, $v(\zeta_L)_{III|\beta}$ is a monotone function of β for $\beta \in [\beta_H^{VI}, 1]$.

Q.E.D.

Theorem 1(a):

The proof follows from the continuity and monotonicity of $0 < v(\zeta_L)_{II|\beta} < 1$. Given that $1/(1+\pi) < \gamma^i < 1$ and under the assumption that inequality (8) in the text holds for at least some $\beta \in [0, \beta_H^{VI}]$ and that $\partial v(\zeta_L)_{II|\beta} / \partial\beta > 0$, if the tax agency chooses a $\zeta_L^{\circ} > 0$ such that $v(\zeta_L^{\circ}) \in [v(\zeta_L)_{II|\beta=0}, v(\zeta_L)_{II|\beta=\beta_H^{VI}}]$, inequality (7) can be utilized to solve for a unique β_H^* which satisfies condition (10) rewritten below:

$$0 < v(\zeta_{\mathcal{L}}^{\circ}) = v(\zeta_{\mathcal{L}})_{II \mid \beta = \beta_H^*} < 1. \qquad \textbf{(C.23)}$$

Similarly, if $\partial v(\zeta_{\mathcal{L}})_{II \mid \beta} / \partial\beta < 0$ and if the tax agency chooses a $\zeta_{\mathcal{L}}^{\circ} > 0$ such that $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{II \mid \beta = \beta_H^{VI}}, v(\zeta_{\mathcal{L}})_{II \mid \beta = 0}]$, inequality (7) can be utilized to solve for the unique β_H^* such that (C.23) holds.

Finally, if $\partial v(\zeta_{\mathcal{L}})_{II \mid \beta} / \partial\beta = 0$ and if the tax agency chooses a $\zeta_{\mathcal{L}}^{\circ} > 0$ such that $v(\zeta_{\mathcal{L}}^{\circ}) = v(\zeta_{\mathcal{L}})_{II \mid \beta}$ for all $[0, \beta_H^{VI}]$, then a unique cut-off does not exist.

Q.E.D.

Theorem 1(b):

The proof is identical to that in Theorem 1(a) above except that inequality (8) in the text must hold for at least some $\beta \in [\beta_H^{VI}, 1]$. If the tax agency chooses a $\zeta_{\mathcal{L}}^{\circ} > 0$, such that $v(\zeta_{\mathcal{L}}^{\circ}) \in [v(\zeta_{\mathcal{L}})_{II \mid \beta = \beta_H^{VI}}, v(\zeta_{\mathcal{L}})_{II \mid \beta = 1}]$, inequality (15) can be utilized to solve for the β_H^{**} which satisfies condition (17) rewritten below:

$$0 < v(\zeta_{\mathcal{L}}^{\circ}) = v(\zeta_{\mathcal{L}})_{III \mid \beta = \beta_H^{**}} < 1. \qquad \textbf{(C.24)}$$

Since the RHS of inequality (15) is continuous and monotonically increasing in β over the interval $\beta \in [\beta_H^{VI}, 1]$ then there exists a unique β_H^{**} satisfying (C.24) above.

Q.E.D.

Lemma 4:

Low-type taxpayers compute their expected net benefit from hiring by comparing their expected tax liabilities under the hiring and no hiring alternatives. Two comparisons are made:

I. $E(TL \mid No\ hire, L, \beta, R_{\mathcal{L},t_i}^{i})$ *vs* $E(TL \mid Hire, L, \beta, R_{\mathcal{L}}, R_{\mathcal{L},t_i}^{i}\ if\ d = r)$

II. $E(TL\,|\,No\ hire, L, \beta, R^{i}_{\hat{L},t_{CG}})$ vs $E(TL\,|\,Hire, L, \beta, R_{\hat{L}}, R^{i}_{\hat{L},t_{CG}}\ if\ d=r)$

Q.E.D.

Lemma 5:

The proof is similar to that obtained in Lemma 4 except that the following six comparisons must be made:

I. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{H},t_{I}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$

II. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{H},t_{I}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{H},t_{I}}\ if\ d=r)$

III. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{H},t_{CG}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$

IV. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{H},t_{CG}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{H},t_{CG}}\ if\ d=r)$

V. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{L},t_{CG}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{H}})$

VI. $E(TL\,|\,No\ hire, H, \beta, R^{i}_{\hat{L},t_{CG}})$ vs $E(TL\,|\,Hire, H, \beta, R_{\hat{L}}, R^{i}_{\hat{L},t_{CG}}\ if\ d=r)$

Q.E.D.

Theorem 2:

From the hiring condition (32) and the definition of the cut-off β^{a}_{L},

$$w(\zeta^{o}_{\hat{L}})\,[(\gamma^{i}(1+\pi)-1)\,\beta^{a}_{L}\,(t_{I}L - t_{CG}L) + (\gamma^{i}-\gamma^{p})A\,] \geq F(\zeta^{o}_{\hat{L}}). \qquad \textbf{(C.25)}$$

β^{a}_{L} is the smallest value of β for which (C.25) holds. Furthermore, the LHS of (C.25) is monotonically increasing in β^{a}_{L} and becomes maximal at $\beta^{a}_{L}=\beta^{*}_{L}$. In contrast, the RHS of (C.25), $F(\zeta^{o}_{\hat{L}})$, does not vary with β. Consequently, there exists a unique β^{a}_{L}, $0 \leq \beta^{a}_{L} \leq \beta^{*}_{L}$ satisfying the condition for hiring, inequality (32).

Q.E.D.

Theorem 3:

The proof is similar to that of Theorem 2 except that substitutions are made where appropriate. The hiring condition (32) and the cut-off value β_L^a above are replaced by (42) and β_H^a, respectively, and β_H^a is the unique cut-off value satisfying the condition for hiring, inequality (42).

Q.E.D.

Proposition 6:

The approach to the derivation of this proposition is identical to that of Propositions 4 and 5. As in these prior cases, when $1/(1+\pi)<\gamma^i<1$, $\gamma^p<\gamma_\dagger^p$, and for a given level of investigation $\zeta_{\mathcal{L}}^\circ$ and a resulting $v(\zeta_{\mathcal{L}}^\circ)$, the expected net benefit function is monotonically increasing in β for $\beta \le \beta_H^{VI}$, is continuous and becomes maximal at $\beta = \beta_H^{VI}$ (although not differentiable at this point) and is monotonically decreasing in β for $\beta \ge \beta_H^{VI}$. Given the form of the expected net benefit function (given by inequalities (26) and (24)), inequality (51) provides a sufficient condition for some hiring to occur: that is, an optimal decision to hire characterized by the unique cut-off β_H^x, $\beta_H^x \le \beta_H^{VI}$, exists, if, and only if inequality (51) holds. The proof is as follows.

From the hiring condition (51) and the definition of the cut-off β_H^x [7]

---

[7]As in prior cases, the cut-off β_H^x occurs at a point $\beta_H^x=0$ such that inequality (49) holds or at a point $0<\beta_H^x \le \beta_H^{VI}$ such that

$$\Delta(TL \mid H, \beta = \beta_H^x, R_{\mathcal{L}}, R_{\hat{H},t_{CG}}^i) = 0.$$

$$(1-v(\zeta_{\hat{L}}^{\circ}))[(1-\gamma^{p}(1+\pi+m))[(t_{CG}H-t_{CG}L)-\beta_{H}^{x}(t_{I}L-t_{CG}L)] \\ +(\gamma^{i}-\gamma^{p})(1+\pi)\beta_{H}^{x}(t_{I}H-t_{CG}H)-\gamma^{p}m\beta_{H}^{x}(t_{I}H-t_{CG}H)+(\gamma^{i}-\gamma^{p})A]\geq F(\zeta_{\hat{L}}^{\circ}). \tag{C.26}$$

β_H^x is the smallest value of β for which (C.26) holds. Furthermore, when $\gamma^p < \gamma_\dagger^p$, the gross expected benefit function is increasing in β_H^x and becomes maximal at $\beta_H^x = \beta_H^{VI}$. Since F($\zeta_{\hat{L}}^{\circ}$) does not vary with β, there exists a unique β_H^x, $\beta_H^x \leq \beta_H^{VI}$, satisfying the hiring condition, (inequality (51)). Where this inequality does not hold, hiring never occurs.

Consider the case where $\beta \geq \beta_H^{VI}$. Taxpayers having beliefs $\beta \geq \beta_H^{VI}$ evaluate the expected net benefit from hiring using inequality (24). Since the LHS of (24) is monotonically decreasing in β, there exists a unique $\beta_H^{\bar{z}}$, $\beta_H^{\bar{z}} \geq \beta_H^{VI}$ which occurs at a point $\beta_H^{\bar{z}} = 1$ such that inequality (50) holds or at a point $\beta_H^{VI} \leq \beta_H^{\bar{z}} < 1$ such that

$$\Delta(TL \mid H, \beta = \beta_H^{\bar{z}}, R_{\hat{L}}, R_{\hat{H}, t_I}^{i}) = 0. \tag{C.27}$$

Finally at $\beta = \beta_H^{VI}$,

$$\Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\hat{L}}, R_{\hat{H}, t_{CG}}^{i}) = \Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\hat{L}}, R_{\hat{H}, t_I}^{i}). \tag{C.28}$$

Thus the expected net benefit function (given by (26) and (24)) is continuous and becomes maximal at $\beta = \beta_H^{VI}$. Given the monotonicity over the β intervals and the continuity of $\Delta(TL \mid \cdot)$, taxpayers' hiring decisions are characterized by two cut-off values, β_H^x, $\beta_H^x \leq \beta_H^{VI}$, and $\beta_H^{\bar{z}}$, $\beta_H^{\bar{z}} \geq \beta_H^{VI}$, such that the interval over which hiring occurs is $\beta_H^x \leq \beta \leq \beta_H^{\bar{z}}$.

Q.E.D.

Theorem 4:

It was demonstrated in the text that, when $1/(1+\pi) < \gamma^i < 1$, $\gamma^p \geq \gamma_\dagger^p$, and for a given level of investigation $\zeta_{\mathcal{L}}^{\circ}$ and a resulting $v(\zeta_{\mathcal{L}}^{\circ})$, the expected net benefit function (given by (26) and (24)) is monotonically decreasing in β for all $\beta \in [0,1]$. Furthermore, the expected net benefit function is continuous at β since

$$\Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\mathcal{L}}, R_{\hat{H},t_{CG}}^{i}) = \Delta(TL \mid H, \beta = \beta_H^{VI}, R_{\mathcal{L}}, R_{\hat{H},t_I}^{i}). \quad \textbf{(C.29)}$$

From the hiring condition (49) and the expected net benefit function definition (52), the expected net benefit from hiring is smallest when either $0 \leq \beta_H^d \leq \beta_H^{VI}$ such that

$$\begin{aligned}&(1 - v(\zeta_{\mathcal{L}}^{\circ}))[(1 - \gamma^p(1 + \pi + m))[(t_{CG}H - t_{CG}L) - \beta_H^d(t_I L - t_{CG}L)] \\ &+ (\gamma^i - \gamma^p)(1 + \pi)\beta_H^d(t_I H - t_{CG}H) - \gamma^p m \beta_H^d(t_I H - t_{CG}H) + (\gamma^i - \gamma^p)A] = F(\zeta_{\mathcal{L}}^{\circ})\end{aligned} \quad \textbf{(C.30)}$$

or when $\beta_H^{VI} \leq \beta_H^d < 1$ such that

$$\begin{aligned}&(1 - v(\zeta_{\mathcal{L}}^{\circ}))[(t_I H - t_{CG}L) - \beta_H^d(t_I L - t_{CG}L) - \gamma^p(1 + \pi + m)[\beta_H^d(t_I H - t_I L) \\ &+ (1 - \beta_H^d)(t_{CG}H - t_{CG}L)] - \gamma^p A] = F(\zeta_{\mathcal{L}}^{\circ})\end{aligned} \quad \textbf{(C.31)}$$

Furthermore, the expected net benefit function monotonically increases as β_H^d decreases and becomes maximal at $\beta_H^d = 0$. Consequently, there exists a unique β_H^d satisfying the hiring condition (49).

Q.E.D.

Proposition 8:

As mentioned in the text and as demonstrated below, the expected net benefit function (given by inequalities (25), (23), and under certain circumstances, (26), as explained below) is monotonically increasing in β for $\beta \geq \beta_H^{VI}$, is continuous (although not differentiable at the cut-off values β_H^{VI} and β_H^{*}), becomes maximal at $\beta = \beta_H^{VI}$, and is monotonically decreasing in β for $\beta \geq \beta_H^{VI}$. Given the form of the expected net benefit function, inequality (42) provides a sufficient condition for some hiring to occur: that is, an optimal decision to hire characterized by the unique cut-off β_H^k, $\beta_H^k \leq \beta_H^{VI}$, exists, if, and only if inequality (42) holds.

Furthermore, as stated in the proposition, where hiring occurs, one of two situations may arise regarding taxpayers' communication decisions: either *all* high-type taxpayers communicate $R_{\hat{H}}$ (i.e., when $\beta_H^* \leq \beta_H^k$) or *some* taxpayers communicate $R_{\hat{L}}$ while others $R_{\hat{H}}$ (i.e., when $\beta_H^k \leq \beta_H^*$).

Consider the first case, where *all* high-type taxpayers communicate $R_{\hat{H}}$. This case arises when the cut-off β_H^k occurs at a point $\beta_H^k \geq \beta_H^*$ such that

$$\Delta\,(TL\,|\,H, \beta = \beta_H^k, R_{\hat{H}}, R^i_{\hat{H},t_{CG}}) = 0. \tag{C.32}$$

It can be demonstrated that inequality (42) provides a sufficient condition for some hiring to occur and there exists a unique β_H^k, $\beta_H^* \leq \beta_H^k \leq \beta_H^{VI}$ satisfying this condition. Since the proof is identical to that of Theorem 3, it is not reproduced here.

Now, consider the case where *some* taxpayers communicate $R_{\hat{L}}$ while others $R_{\hat{H}}$. This case arises when inequality (42) holds and additionally, when inequality (26) evaluated at $\beta = \beta_H^*$ (or equivalently, condition (54) in the text) holds such that the cut-off β_H^k occurs at a point $\beta_H^k \leq \beta_H^*$. From the hiring condition (54) and the definition of the cut-off β_H^k [8]

$$\begin{aligned}(1 - v(\zeta_{\hat{L}}^\circ))[(1 - \gamma^p(1 + \pi + m))[(t_{CG}H - t_{CG}L) - \beta_H^k(t_lL - t_{CG}L)]\\ +(\gamma^i - \gamma^p)(1 + \pi)\beta_H^k(t_lH - t_{CG}H) - \gamma^p m \beta_H^k(t_lH - t_{CG}H) + (\gamma^i - \gamma^p)A] \geq F(\zeta_{\hat{L}}^\circ).\end{aligned} \tag{C.33}$$

β_H^k is the smallest value of β for which (C.33) holds and taxpayers having beliefs $\beta \leq \beta_H^*$ communicate the message $R_{\hat{L}}$. Furthermore, under the assumptions specified in this case,

---

[8] The cut-off β_H^k occurs at a point $\beta_H^k = 0$ such that (26), evaluated at β=0, holds (see inequality (49)) or at a point $0 < \beta_H^k \leq \beta_H^*$ such that $\Delta\,(TL\,|\,H, \beta = \beta_H^k, R_{\hat{L}}, R^i_{\hat{H},t_{CG}}) = 0$.

the LHS of (C.33) is monotonically increasing in β_H^k and becomes maximal at $\beta_H^k = \beta_H^*$. Consequently, there exists a unique β_H^k, $0 \leq \beta_H^k \leq \beta_H^*$ satisfying condition (54) -- that some taxpayers hire and communicate $R_{\hat{L}}$. If (54) does not hold, no taxpayers communicate $R_{\hat{L}}$.

Taxpayers having beliefs $\beta_H^* \leq \beta \leq \beta_H^{VI}$ evaluate the expected net benefit from hiring using inequality (25). Note that at $\beta = \beta_H^*$, the expected net benefit functions, given by inequalities (26) and (25), intersect and, thus, $\Delta(TL \mid \cdot)$ is continuous; that is,[9]

---

[9]The proof of the continuity of the expected net benefit function at $\beta = \beta_H^*$ is as follows. As demonstrated in Proposition 3, subcase 3.1, taxpayers choose to communicate $R_{\hat{L}}$ or $R_{\hat{H}}$ depending upon whether $v(\zeta_{\hat{L}}^{\circ})$, the probability that the practitioner detects an incorrect low message, is less than, greater than, or equal to $v(\zeta_{\hat{L}})_{II \mid \beta}$. It was also demonstrated that under the conditions specified in subcase 3.1, there exists a unique β_H^* such that

$$v(\zeta_{\hat{L}}^{\circ}) = v(\zeta_{\hat{L}})_{II \mid \beta = \beta_H^*},$$

where β_H^* is the critical value which makes taxpayers indifferent between communicating $R_{\hat{L}}$ or $R_{\hat{H}}$.

Multiplying the condition above by -1 and adding 1 to both sides yields the following:

$$(1 - v(\zeta_{\hat{L}}^{\circ})) = (1 - v(\zeta_{\hat{L}})_{II \mid \beta = \beta_H^*})$$

$$= \frac{[\gamma^i(1+\pi) -]\beta_H^*(t_I H - t_{CG} H) + \gamma^i A - (F(\zeta_{\hat{H}}) - F(\zeta_{\hat{L}}))}{(1-\gamma^P(1+\pi+m))[(t_{CG}H - t_{CG}L) - \beta_H^*(t_I L - t_{CG}L)] + (\gamma^i - \gamma^P)[\beta_H^*(1+\pi)(t_I H - t_{CG}H) + A] - \gamma^P m \beta_H^*(t_I H - t_{CG}H)}$$

or, restated,

$$[1 - v(\zeta_{\hat{L}}^{\circ})] \cdot [(1-\gamma^P(1+\pi+m))[(t_{CG}H - t_{CG}L) - \beta_H^*(t_I L - t_{CG}L)] + (\gamma^i - \gamma^P)[\beta_H^*(1+\pi)(t_I H - t_{CG}H) + A]$$
$$- \gamma^P m \beta_H^*(t_I H - t_{CG}H)] - F(\zeta_{\hat{L}})$$
$$= [\gamma^i(1+\pi) - 1]\beta_H^*(t_I H - t_{CG}H) + \gamma^i A - F(\zeta_{\hat{H}}).$$

Substituting the above into inequality (26) in the text and simplifying gives (C.34). Thus, the expected net benefit function is continuous at $\beta = \beta_H^*$.

$$\Delta(TL\,|H, \beta = \beta^{*}_{H}, R_{\hat{L}}, R^{i}_{\hat{H},t_{CG}}) = \Delta(TL\,|H, \beta = \beta^{*}_{H}, R_{\hat{H}}, R^{i}_{\hat{H},t_{CG}}). \qquad \textbf{(C.34)}$$

Thus, if hiring occurs at $\beta = \beta^{*}_{H}$, taxpayers are indifferent between communicating $R_{\hat{L}}$ and $R_{\hat{H}}$. Furthermore, β^{*}_{H} is the smallest value of β for which hiring occurs and taxpayers communicate $R_{\hat{H}}$. Since the expected net benefit function is monotonically increasing in β, if $\Delta(TL\,|\,\beta = \beta^{*}_{H}, \cdot) \geq 0$, then the hiring condition (42) must be satisfied.

Taxpayers having beliefs $\beta \geq \beta^{VI}_{H}$ evaluate the expected net benefit from hiring using inequality (23). Since the LHS of (23) is monotonically decreasing in β, there exists a unique β^{n}_{H}, $\beta^{n}_{H} \geq \beta^{VI}_{H}$, such that

$$\Delta(TL\,|\,H, \beta = \beta^{n}_{H}, R_{\hat{H}}, R^{i}_{\hat{H},t_{I}}) = 0. \qquad \textbf{(C.35)}$$

Finally at $\beta = \beta^{VI}_{H}$,

$$\Delta(TL\,|H, \beta = \beta^{VI}_{H}, R_{\hat{H}}, R^{i}_{\hat{H},t_{CG}}) = \Delta(TL\,|H, \beta = \beta^{VI}_{H}, R_{\hat{H}}, R^{i}_{\hat{H},t_{I}}). \qquad \textbf{(C.36)}$$

Thus the expected net benefit function (given by (25) and (23)) is continuous and becomes maximal at $\beta = \beta^{VI}_{H}$.

Given the monotonicity over the β intervals and the continuity of $\Delta(TL\,|\,\cdot)$, taxpayers' hiring decisions can be characterized by two cut-off values, β^{k}_{H}, $\beta^{k}_{H} \leq \beta^{VI}_{H}$, and β^{n}_{H}, $\beta^{n}_{H} \geq \beta^{VI}_{H}$, such that the interval over which hiring occurs is $\beta^{k}_{H} \leq \beta \leq \beta^{n}_{H}$.

Q.E.D.

Proposition 9:

A formal proof is not provided since the approach to the derivation of this proposition is identical to that of Proposition 8 except that the condition necessary for *some* taxpayers to hire and communicate $R_{\hat{L}}$ while others communicate $R_{\hat{H}}$ is given by inequality (24) evaluated at $\beta = \beta^{**}_{H}$, where $\beta^{**}_{H} \geq \beta^{VI}_{H}$ (as opposed to (26) evaluated at

$\beta = \beta_H^*$, $\beta_H^* \leq \beta_H^{VI}$, as in Proposition 8); that is,

$$(1 - v(\zeta_{\hat{L}}))[(t_I H - t_{CG}L) - \beta_H^{**}(t_I L - t_{CG}L) - \gamma^P(1 + \pi + m)[\beta_H^{**}(t_I H - t_I L) + (1 - \beta_H^{**})(t_{CG}H - t_{CG}L)] - \gamma^P A] \geq F(\zeta_{\hat{L}}). \tag{C.37}$$

Furthermore, it can be shown that the expected net benefit function (given by inequalities (23) and (24)) is continuous at $\beta = \beta_H^{**}$; that is,[10]

---

[10]The proof of the continuity of the expected net benefit function at $\beta = \beta_H^{**}$ is as follows. As demonstrated in Proposition 3, subcase 3.2, taxpayers choose to communicate $R_{\hat{L}}$ or $R_{\hat{H}}$ depending upon whether $v(\zeta_{\hat{L}}^{\circ})$, the probability that the practitioner detects an incorrect low message, is less than, greater than, or equal to $v(\zeta_{\hat{L}})_{III\,|\,\beta}$. It was also demonstrated that under the conditions specified in subcase 3.2, there exists a unique $\beta_H^{**}, \beta_H^{**} \geq \beta_H^{VI}$ such that

$$v(\zeta_{\hat{L}}^{\circ}) = v(\zeta_{\hat{L}})_{III\,|\,\beta = \beta_H^{**}},$$

where β_H^{**} is the critical value which makes taxpayers indifferent between communicating $R_{\hat{L}}$ or $R_{\hat{H}}$.

Multiplying the condition above by -1 and adding 1 to both sides yields the following:

$$(1 - v(\zeta_{\hat{L}}^{\circ})) = (1 - v(\zeta_{\hat{L}})_{III\,|\,\beta = \beta_H^{**}})$$

$$= \frac{(1 - \beta_H^{**})(t_I H - t_{CG}H) - (F(\zeta_{\hat{H}}) - F(\zeta_{\hat{L}}))}{(t_I H - t_{CG}L) - \gamma^P(1 + \pi + m)[(t_{CG}H - t_{CG}L) + \beta_H^{**}(t_I H - t_{CG}H)] - (1 - \gamma^P(1 + \pi + m))\beta_H^{**}(t_I L - t_{CG}L) - \gamma^P A}$$

or, restated,

$$[1 - v(\zeta_{\hat{L}}^{\circ})] \cdot [(t_I H - t_{CG}L) - \gamma^P(1 + \pi + m)[(t_{CG}H - t_{CG}L) + \beta_H^{**}(t_I H - t_{CG}H)] - (1 - \gamma^P(1 + \pi + m))\beta_H^{**}(t_I L - t_{CG}L) - \gamma^P A] - F(\zeta_{\hat{L}})$$
$$= (1 - \beta_H^{**})(t_I H - t_{CG}H) - F(\zeta_{\hat{H}}).$$

Substituting the above into inequality (24) and simplifying gives (C.38). Thus, the expected net benefit function is continuous at $\beta = \beta_H^{**}$.

$$\Delta(TL \mid H, \beta = \beta_H^{**}, R_{\hat{L}}, R^i_{\hat{H},t_i}) = \Delta(TL \mid H, \beta = \beta_H^{**}, R_{\hat{H}}, R^i_{\hat{H},t_i}). \quad \textbf{(C.38)}$$

Thus, taxpayers having beliefs $\beta_H^k \le \beta \le \beta_H^{**}$ hire and communicate $R_{\hat{H}}$ whereas those having beliefs $\beta_H^{**} \le \beta \le \beta_H^n$ hire and communicate $R_{\hat{L}}$.

Finally, in contrast with Proposition 8, full hiring may occur when both (40) and (50) hold such that β_H^k=0 and β_H^n=1.

Q.E.D.

Proposition 10:

This proof follows from Propositions 8 and 9 as well as from taxpayers' communication decisions specified in Proposition 3.

Q.E.D.

Proposition 11:

Once again, the approach to the derivation is identical to that of Propositions 8 and 9.

Q.E.D.

Proposition 12:

This proof follows directly from Proposition 8 and from taxpayers' communication decisions specified in Proposition 3.

Q.E.D.

APPENDIX D

CONDITIONAL TAX AGENCY EXPECTED TAX REVENUE

Each table presented below provides a breakdown of the tax agency's expected tax revenue for a given class or subclass of potential equilibrium taxpayer strategies. The expected tax revenue function within a class (or subclass) is the summation of all the expected payoffs in that table.

TABLE D.1.1

Tax Agency Expected Tax Revenue -- Class 1

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: Hire, $R_{\hat{L}}$, d=a	$0 \leq \beta \leq 1$	$p(H)F(\beta(0,1))[(1-v(\zeta_{\hat{L}}))[t_{CG}L+\bar{\beta}(0,1)(t_l L-t_{CG}L)$ $+\gamma^{p}(1-\bar{\beta}(0,1))(1+\pi+m)(t_{CG}H-t_{CG}L)$ $+\gamma^{p}\bar{\beta}(0,1)(1+\pi+m)(t_l H-t_l L)-\gamma^{p}C]]$
H: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_l}$ if d=r	$\beta^{VI}_{H} \leq \beta \leq 1$	$p(H)F(\beta(VI,1))v(\zeta_{\hat{L}})t_l H$
H: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_{CG}}$ if d=r	$0 \leq \beta \leq \beta^{VI}_{H}$	$p(H)F(\beta(0,VI))v(\zeta_{\hat{L}})[t_{CG}H+\gamma^{i}\bar{\beta}(0,VI)(1+\pi)(t_l H$ $-t_{CG}H)-\gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, d=a	$0 \leq \beta \leq 1$	$p(L)F(\beta(0,1))[w(\zeta_{\hat{L}})[t_{CG}L+\bar{\beta}(0,1)(t_l L-t_{CG}L)-\gamma^{p}C]]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_l}$ if d=r	$\beta^{*}_{L} \leq \beta \leq 1$	$p(L)F(\beta(*,1))(1-w(\zeta_{\hat{L}}))[t_l L-\gamma^{i}(1-\bar{\beta}(*,1))(t_l L$ $-t_{CG}L)-\gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$0 \leq \beta \leq \beta^{*}_{L}$	$p(L)F(\beta(0,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L+\gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_l L$ $-t_{CG}L)-\gamma^{i}C]$

TABLE D.1.2

Tax Agency Expected Tax Revenue -- Class 2

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: Hire, $R_{\hat{L}}$, d=a	$0 \le \beta \le 1$	$p(H)F(\beta(0,1))[(1-v(\zeta_{\hat{L}}))[t_{CG}L+\bar{\beta}(0,1)(t_lL-t_{CG}L)$ $+\gamma^p(1-\bar{\beta}(0,1))(1+\pi+m)(t_{CG}H-t_{CG}L)$ $+\gamma^p\bar{\beta}(0,1)(1+\pi+m)(t_lH-t_lL)-\gamma^pC]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r	$\beta_H^{VI} \le \beta \le 1$	$p(H)F(\beta(VI,1))v(\zeta)t_lH$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$0 \le \beta \le \beta_H^{VI}$	$p(H)F(\beta(0,VI))v(\zeta_{\hat{L}})[t_{CG}H+\gamma^i\bar{\beta}(0,VI)(1+\pi)(t_lH$ $-t_{CG}H)-\gamma^iC]$
L: No hire, $R^i_{\hat{L},t_l}$	$\beta_L^c \le \beta \le 1$	$p(L)F(\beta(c,1))[t_lL-\gamma^i(1-\bar{\beta}(c,1))(t_lL-t_{CG}L)-\gamma^iC]$
L: No hire, $R^i_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta_L^a$	$p(L)F(\beta(0,a))[t_{CG}L+\gamma^i\bar{\beta}(0,a)(1+\pi)(t_lL$ $-t_{CG}L)-\gamma^iC]$
L:Hire, $R_{\hat{L}}$, d=a	$\beta_L^a \le \beta \le \beta_L^c$	$p(L)F(\beta(a,c))[w(\zeta_{\hat{L}})[t_{CG}L+\bar{\beta}(a,c)(t_lL-t_{CG}L)-\gamma^pC]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r	$\beta_L^* \le \beta \le \beta_L^c$	$p(L)F(\beta(*,c))(1-w(\zeta_{\hat{L}}))[t_lL-\gamma^i(1-\bar{\beta}(*,c))(t_lL$ $-t_{CG}L)-\gamma^iC]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$\beta_L^a \le \beta \le \beta_L^*$	$p(L)F(\beta(a,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L+\gamma^i\bar{\beta}(a,*)(1+\pi)(t_lL$ $-t_{CG}L)-\gamma^iC]$

TABLE D.1.3

Tax Agency Expected Tax Revenue -- Class 3a

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H:Hire, $R_{\hat{H}}$, d=a	$0 \le \beta \le \beta_H^*$	$p(H)\,F(\beta\,(0,*))[t_{CG}H + \bar{\beta}(0,*)(t_I H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta_H^* \le \beta \le 1$	$p(H)\,F(\beta\,(*,1))[(1 - v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(*,1)(t_I L - t_{CG}L)$ $+\gamma^p(1 - \bar{\beta}(*,1))(1 + \pi + m)(t_{CG}H - t_{CG}L)$ $+\gamma^p\bar{\beta}(*,1)(1 + \pi + m)(t_I H - t_I L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_I}$ if d=r	$\beta_H^{VI} \le \beta \le 1$	$p(H)F(\beta\,(VI,1))v(\zeta_{\hat{L}})t_I H$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$\beta_H^* \le \beta \le \beta_H^{VI}$	$p(H)\,F(\beta\,(*,VI))v(\zeta_{\hat{L}})[t_{CG}H + \gamma^i\bar{\beta}(*,VI)(1 + \pi)(t_I H$ $- t_{CG}H) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$ d=a	$0 \le \beta \le 1$	$p(L)\,F(\beta\,(0,1))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_I L - t_{CG}L) - \gamma^p C]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_I}$ if d=r	$\beta_L^* \le \beta \le 1$	$p(L)\,F(\beta\,(*,1))(1 - w(\zeta_{\hat{L}}))[t_I L - \gamma^i(1 - \bar{\beta}(*,1))(t_I L$ $- t_{CG}L) - \gamma^i C]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$0 \le \beta \le \beta_L^*$	$p(L)\,F(\beta\,(0,*))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i\bar{\beta}(0,*)(1 + \pi)(t_I L$ $- t_{CG}L) - \gamma^i C]$

TABLE D.1.4

Tax Agency Expected Tax Revenue -- Class 3b

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: Hire, $R_{\hat{H}}$, d=a	$0 \le \beta \le \beta_H^{**}$	$p(H)\,F(\beta(0,**))[t_{CG}H + \bar{\beta}(0,**)(t_I H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, or if d=a	$\beta_H^{**} \le \beta \le 1$	$p(H)\,F(\beta(**,1))[(1-v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(**,1)(t_I L - t_{CG}L)$ $+\gamma^P(1-\bar{\beta}(**,1))(1+\pi+m)(t_{CG}H - t_{CG}L)$ $+\gamma^P\bar{\beta}(**,1)(1+\pi+m)(t_I H - t_I L) - \gamma^P C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_I}$ if d=r	$\beta_H^{**} \le \beta \le 1$	$p(H)\,F(\beta(**,1))v(\zeta_{\hat{L}})t_I H$
L:Hire, $R_{\hat{L}}$, d=a	$0 \le \beta \le 1$	$p(L)F(\beta(0,1))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_I L - t_{CG}L) - \gamma^P C]]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_I}$ if d=r	$\beta_L^{*} \le \beta \le 1$	$p(L)F(\beta(*,1))(1-w(\zeta_{\hat{L}}))[t_I L - \gamma^i(1-\bar{\beta}(*,1))(t_I L$ $- t_{CG}L) - \gamma^i C]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$0 \le \beta \le \beta_L^{*}$	$p(L)\,F(\beta(0,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i\bar{\beta}(0,*)(1+\pi)(t_I L$ $- t_{CG}L) - \gamma^i C]$

TABLE D.1.5

Tax Agency Expected Tax Revenue -- Class 4a

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: Hire, $R_{\hat{H}}$, d=a	$0 \le \beta \le \beta_H^*$	$p(H)F(\beta(0,*))[t_{CG}H+\bar{\beta}(0,*)(t_IH-t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta_H^* \le \beta \le 1$	$p(H)\,F(\beta(*,1))[(1-v(\zeta_{\hat{L}}))[t_{CG}L+\bar{\beta}(*,1)(t_IL-t_{CG}L)$ $+\gamma^p(1-\bar{\beta}(*,1))(1+\pi+m)(t_{CG}H-t_{CG}L)$ $+\gamma^p\bar{\beta}(*,1)(1+\pi+m)(t_IH-t_IL)-\gamma^pC]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_I}$ if d=r	$\beta_H^{VI} \le \beta \le 1$	$p(H)\,F(\beta(VI,1))v(\zeta_{\hat{L}})t_IH$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$\beta_H^* \le \beta \le \beta_H^{VI}$	$p(H)\,F(\beta(*,VI))v(\zeta_{\hat{L}})[t_{CG}H+\gamma^i\bar{\beta}(*,VI)(1+\pi)(t_IH$ $-t_{CG}H)-\gamma^iC]$
L: No hire, $R^i_{\hat{L},t_I}$	$\beta_L^c \le \beta \le 1$	$p(L)\,F(\beta(c,1))[t_IL-\gamma^i(1-\bar{\beta}(c,1))(t_IL-t_{CG}L)-\gamma^iC]$
L: No hire, $R^i_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta_L^a$	$p(L)\,F(\beta(0,a))[t_{CG}L+\gamma^i\bar{\beta}(0,a)(1+\pi)(t_IL$ $-t_{CG}L)-\gamma^iC]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta_L^a \le \beta \le \beta_L^c$	$p(L)\,F(\beta(a,c))[w(\zeta_{\hat{L}})[t_{CG}L+\bar{\beta}(a,c)(t_IL-t_{CG}L)-\gamma^pC]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_I}$ if d=r	$\beta_L^* \le \beta \le \beta_L^c$	$p(L)\,F(\beta(*,c))(1-w(\zeta_{\hat{L}}))[t_IL-\gamma^i(1-\bar{\beta}(*,c))(t_IL$ $-t_{CG}L)-\gamma^iC]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$\beta_L^a \le \beta \le \beta_L^*$	$p(L)\,F(\beta(a,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L+\gamma^i\bar{\beta}(a,*)(1+\pi)(t_IL$ $-t_{CG}L)-\gamma^iC]$

TABLE D.1.6

Tax Agency Expected Tax Revenue -- Class 4b

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: Hire, $R_{\hat{H}}$, d=a	$0 \leq \beta \leq \beta_H^{**}$	$p(H)\,F(\beta\,(0, **))[t_{CG}H + \bar{\beta}(0, **)(t_I H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta_H^{**} \leq \beta \leq 1$	$p(H)F(\beta\,(**,1))[(1 - v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(**, 1)(t_I L - t_{CG}L) + \gamma^p(1 - \bar{\beta}(**, 1))(1 + \pi + m)(t_{CG}H - t_{CG}L) + \gamma^p \bar{\beta}(**, 1)(1 + \pi + m)(t_I H - t_I L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_I}$ if d=r	$\beta_H^{**} \leq \beta \leq 1$	$p(H)\,F(\beta\,(**,1))v(\zeta_{\hat{L}})t_I H$
L: No hire, $R^i_{\hat{L},t_I}$	$\beta_L^c \leq \beta \leq 1$	$p(L)\,F(\beta\,(c,1))[t_I L - \gamma^i(1 - \bar{\beta}(c,1))(t_I L - t_{CG}L) - \gamma^i C]$
L: No hire, $R^i_{\hat{L},t_{CG}}$	$0 \leq \beta \leq \beta_L^a$	$p(L)F(\beta\,(0,a))[t_{CG}L + \gamma^i \bar{\beta}(0,a)(1 + \pi)(t_I L - t_{CG}L) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta_L^a \leq \beta \leq \beta_L^c$	$p(L)\,F(\beta\,(a,c))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(a,c)(t_I L - t_{CG}L) - \gamma^p C]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_I}$ if d=r	$\beta_L^* \leq \beta \leq \beta_L^c$	$p(L)\,F(\beta\,(*,c))(1 - w(\zeta_{\hat{L}}))[t_I L - \gamma^i(1 - \bar{\beta}(*,c))(t_I L - t_{CG}L) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$\beta_L^a \leq \beta \leq \beta_L^*$	$p(L)\,F(\beta\,(a, *))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i \bar{\beta}(a, *)(1 + \pi)(t_I L - t_{CG}L) - \gamma^i C]$

TABLE D.1.7

Tax Agency Expected Tax Revenue -- Class 5

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^i_{\hat{H},t_l}$	$\beta^n_H \le \beta \le 1$	$p(H)\,F(\beta(n,1))t_l H$
H: No hire, $R^i_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^k_H$	$p(H)\,F(\beta(0,k))[t_{CG}H + \gamma^i\bar{\beta}(0,k)(1+\pi)(t_l H - t_{CG}H) - \gamma^i C]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^k_H \le \beta \le \beta^n_H$	$p(H)\,F(\beta(k,n))[(1 - v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(k,n)(t_l L - t_{CG}L) + \gamma^p(1 - \bar{\beta}(k,n))(1+\pi+m)(t_{CG}H - t_{CG}L) + \gamma^p\bar{\beta}(k,n)(1+\pi+m)(t_l H - t_l L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r	$\beta^{VI}_H \le \beta \le \beta^n_H$	$p(H)\,F(\beta(VI,n))v(\zeta_{\hat{L}})t_l H$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$\beta^k_H \le \beta \le \beta^{VI}_H$	$p(H)\,F(\beta(k,VI))v(\zeta_{\hat{L}})[t_{CG}H + \gamma^i\bar{\beta}(k,VI)(1+\pi)(t_l H - t_{CG}H) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$,d=a	$0 \le \beta \le 1$	$p(L)F(\beta(0,1))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_l L - t_{CG}L) - \gamma^p C]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r	$\beta^*_L \le \beta \le 1$	$p(L)\,F(\beta(*,1))(1 - w(\zeta_{\hat{L}}))[t_l L - \gamma^i(1 - \bar{\beta}(*,1))(t_l L - t_{CG}L) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$0 \le \beta \le \beta^*_L$	$p(L)F(\beta(0,*))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i\bar{\beta}(0,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^i C]$

TABLE D.1.8
Tax Agency Expected Tax Revenue -- Class 6

Strategy of Taxpayer	Beliefs	Expected Tax Revenue
H: No hire, $R^i_{\hat{H},t_I}$	$\beta^n_H \le \beta \le 1$	$p(H)F(\beta(n,1))t_I H$
H: No hire, $R^i_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^k_H$	$p(H)F(\beta(0,k))[t_{CG}H + \gamma^i \bar{\beta}(0,k)(1+\pi)(t_I H - t_{CG}H) - \gamma^i C]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^x_H \le \beta \le \beta^z_H$	$p(H)F(\beta(k,n))[(1-v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(k,n)(t_I L - t_{CG}L) + \gamma^p(1-\bar{\beta}(k,n))(1+\pi+m)(t_{CG}H - t_{CG}L) + \gamma^p \bar{\beta}(k,n)(1+\pi+m)(t_I H - t_I L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_I}$ if d=r	$\beta^{VI}_H \le \beta \le \beta^n_H$	$p(H)F(\beta(VI,n))v(\zeta_{\hat{L}})t_I H$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$\beta^k_H \le \beta \le \beta^{VI}_H$	$p(H)F(\beta(k,VI))v(\zeta_{\hat{L}})[t_{CG}H + \gamma^i \bar{\beta}(k,VI)(1+\pi)(t_I H - t_{CG}H) - \gamma^i C]$
L: No hire, $R^i_{\hat{L},t_I}$	$\beta^c_L \le \beta \le 1$	$p(L)F(\beta(c,1))[t_I L - \gamma^i(1-\bar{\beta}(c,1))(t_I L - t_{CG}L) - \gamma^i C]$
L: No hire, $R^i_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta^a_L$	$p(L)F(\beta(0,a))[t_{CG}L + \gamma^i \bar{\beta}(0,a)(1+\pi)(t_I L - t_{CG}L) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta^a_L \le \beta \le \beta^c_L$	$p(L)F(\beta(a,c))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(a,c)(t_I L - t_{CG}L) - \gamma^p C]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_I}$ if d=r	$\beta^*_L \le \beta \le \beta^c_L$	$p(L)F(\beta(*,c))(1-w(\zeta_{\hat{L}}))[t_I L - \gamma^i(1-\bar{\beta}(*,c))(t_I L - t_{CG}L) - \gamma^i C]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$\beta^a_L \le \beta \le \beta^*_L$	$p(L)F(\beta(0,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i \bar{\beta}(0,*)(1+\pi)(t_I L - t_{CG}L) - \gamma^i C]$

TABLE D.1.9

Tax Agency Expected Tax Revenue -- Class 7

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_l}$	$\beta^{n}_{H} \leq \beta \leq 1$	$p(H)\, F(\beta\,(n,1))t_l H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \leq \beta \leq \beta^{k}_{H}$	$p(H) F(\beta\,(0,k))[t_{CG}H + \gamma^{i}\bar{\beta}(0,k)(1+\pi)(t_l H - t_{CG}H) - \gamma^{i}C]$
H: Hire, $R_{\hat{H}}$ d=a	$\beta^{k}_{H} \leq \beta \leq \beta^{n}_{H}$	$p(H)\, F(\beta\,(k,n))[t_{CG}H + \bar{\beta}(k,n)(t_l H - t_{CG}H)]$
L: Hire, $R_{\hat{L}}$,d=a	$0 \leq \beta \leq 1$	$p(L) F(\beta\,(0,1))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_l L - t_{CG}L) - \gamma^{n}C]]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_l}$ if d=r	$\beta^{*}_{L} \leq \beta \leq 1$	$p(L)\, F(\beta\,(*,1))(1 - w(\zeta_{\hat{L}}))[t_l L - \gamma^{i}(1 - \bar{\beta}(*,1))(t_l L - t_{CG}L) - \gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$0 \leq \beta \leq \beta^{*}_{L}$	$p(L) F(\beta\,(0,*))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^{i}C]$

TABLE D.1.10

Tax Agency Expected Tax Revenue -- Class 8

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_l}$	$\beta^{n}_{H} \le \beta \le 1$	$p(H)\,F(\beta\,(n,1))t_l H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^{k}_{H}$	$p(H)F(\beta\,(0,k))[t_{CG}H + \gamma^{i}\bar{\beta}(0,k)(1+\pi)(t_l H - t_{CG}H) - \gamma^{i}C]$
H: Hire, $R_{\hat{H}}$ d=a	$\beta^{k}_{H} \le \beta \le \beta^{n}_{H}$	$p(H)\,F(\beta\,(k,n))[t_{CG}H + \bar{\beta}(k,n)\,(t_l H - t_{CG}H)]$
L: No hire, $R^{i}_{\hat{L},t_l}$	$\beta^{c}_{L} \le \beta \le 1$	$p(L)\,F(\beta\,(c,1))[t_l L - \gamma^{i}(1-\bar{\beta}(c,1))(t_l L - t_{CG}L) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta^{a}_{L}$	$p(L)F(\beta(0,a))[t_{CG}L + \gamma^{i}\bar{\beta}(0,a)(1+\pi)\,(t_l L - t_{CG}L) - \gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta^{a}_{L} \le \beta \le \beta^{c}_{L}$	$p(L)\,F(\beta\,(a,c))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(a,c)\,(t_l L - t_{CG}L) - \gamma^{p}C]]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_l}$ if d=r	$\beta^{*}_{L} \le \beta \le \beta^{c}_{L}$	$p(L)F(\beta\,(*,c))\,(1 - w(\zeta_{\hat{L}}))[t_l L - \gamma^{i}(1-\bar{\beta}(*,c))(t_l L - t_{CG}L) - \gamma^{i}C]$
L:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$\beta^{a}_{L} \le \beta \le \beta^{*}_{L}$	$p(L)F(\beta\,(0,*))\,(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^{i}C]$

TABLE D.1.11

Tax Agency Expected Tax Revenue --Class 9

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_l}$	$\beta^{n}_{H} \le \beta \le 1$	$p(H)\,F(\beta\,(n,1))t_l H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^{k}_{H}$	$p(H)F(\beta\,(0,k))[t_{CG}H + \gamma^{i}\bar{\beta}(0,k)(1+\pi)(t_l H - t_{CG}H) - \gamma^{i}C]$
H: Hire, $R_{\hat{H}}$ d=a	$\beta^{k}_{H} \le \beta \le \beta^{n}_{H}$	$p(H)\,F(\beta\,(k,n))[t_{CG}H + \bar{\beta}(k,n)(t_l H - t_{CG}H)]$
L: No hire, $R^{i}_{\hat{L},t_l}$	$\beta^{*}_{L} \le \beta \le 1$	$p(L)\,F(\beta\,(*,1))[t_l L - \gamma^{i}(1-\bar{\beta}(*,1))(t_l L - t_{CG}L) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta^{*}_{L}$	$p(L)F(\beta\,(0,*))[t_{CG}L + \gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^{i}C]$

TABLE D.1.12

Tax Agency Expected Tax Revenue --Class 10a

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^i_{\hat{H},t_l}$	$\beta^n_H \le \beta \le 1$	$p(H)\,F(\beta\,(n,1))t_l H$
H: No hire, $R^i_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^k_H$	$p(H)\,F(\beta\,(0,k))[t_{CG}H + \gamma^i \bar{\beta}(0,k)(1+\pi)(t_l H - t_{CG}H) - \gamma^i C]$
H: Hire, $R_{\hat{H}}$, d=a	$\beta^k_H \le \beta \le \beta^*_H$	$p(H)\,F(\beta\,(k,*))[t_{CG}H + \bar{\beta}(k,*)(t_l H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^*_H \le \beta \le \beta^n_H$	$p(H)\,F(\beta\,(*,n))[(1 - v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(*,n)(t_l L - t_{CG}L) + \gamma^p(1 - \bar{\beta}(*,n))(1 + \pi + m)(t_{CG}H - t_{CG}L) + \gamma^p \bar{\beta}(*,n)(1 + \pi + m)(t_l H - t_l L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r	$\beta^{VI}_H \le \beta \le \beta^n_H$	$p(H)\,F(\beta\,(VI,n))v(\zeta_{\hat{L}})t_l H$
H:Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_{CG}}$ if d=r	$\beta^*_H \le \beta \le \beta^{VI}_H$	$p(H)\,F(\beta\,(*,VI))v(\zeta_{\hat{L}})[t_{CG}H + \gamma^i \bar{\beta}(*,VI)(1+\pi)(t_l H - t_{CG}H) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, d=a	$0 \le \beta \le 1$	$p(L)F(\beta\,(0,1))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_l L - t_{CG}L) - \gamma^p C]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r	$\beta^*_L \le \beta \le 1$	$p(L)\,F(\beta\,(*,1))(1 - w(\zeta_{\hat{L}}))[t_l L - \gamma^i(1 - \bar{\beta}(*,1))(t_l L - t_{CG}L) - \gamma^i C]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$0 \le \beta \le \beta^*_L$	$p(L)\,F(\beta\,(0,*))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i \bar{\beta}(0,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^i C]$

TABLE D.1.13

Tax Agency Expected Tax Revenue --Class 10b

Strategy of Taxpayer	Beliefs	Tax Agency Expected Tax Revenue
H: No hire, $R^i_{\hat{H},t_l}$	$\beta^n_H \le \beta \le 1$	$p(H)\,F(\beta\,(n,1))t_l H$
H: No hire, $R^i_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^k_H$	$p(H)\,F(\beta\,(0,k))[t_{CG}H + \gamma^i \bar{\beta}(0,k)(1+\pi)(t_l H$ $- t_{CG}H) - \gamma^i C]$
H: Hire, $R_{\hat{H}}$, d=a	$\beta^k_H \le \beta \le \beta^{**}_H$	$p(H)F(\beta\,(k, **))[t_{CG}H + \bar{\beta}(k, **)(t_l H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^{**}_H \le \beta \le \beta^n_H$	$p(H)F(\beta\,(**, n))[(1 - v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(**, n)(t_l L - t_{CG}L)$ $+\gamma^p(1 - \bar{\beta}(**, n))(1 + \pi + m)(t_{CG}H - t_{CG}L)$ $+\gamma^p \bar{\beta}(**, n)(1 + \pi + m)(t_l H - t_l L) - \gamma^p C]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r	$\beta^{**}_H \le \beta \le \beta^n_H$	$p(H)\,F(\beta\,(**, n))v(\zeta_{\hat{L}})t_l H$
L: Hire, $R_{\hat{L}}$, d=a	$0 \le \beta \le 1$	$p(L)\,F(\beta\,(0,1))w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_l L - t_{CG}L) - \gamma^p C]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r	$\beta^*_L \le \beta \le 1$	$p(L)\,F(\beta\,(*, 1))(1 - w(\zeta_{\hat{L}}))[t_l L - \gamma^i(1 - \bar{\beta}(*, 1))(t_l L$ $- t_{CG}L) - \gamma^i C]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$0 \le \beta \le \beta^*_L$	$p(L)\,F(\beta\,(0, *))(1 - w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^i \bar{\beta}(0, *)(1 + \pi)(t_l L$ $- t_{CG}L) - \gamma^i C]$

TABLE D.1.14

Tax Agency Expected Tax Revenue --Class 11a

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_I}$	$\beta^{n}_{H} \le \beta \le 1$	$p(H)F(\beta(n,1))t_I H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \le \beta \le \beta^{k}_{H}$	$p(H)F(\beta(0,k))[t_{CG}H + \gamma^{i}\bar{\beta}(0,k)(1+\pi)(t_I H - t_{CG}H) - \gamma^{i}C]$
H: Hire, $R_{\hat{H}}$ d=a	$\beta^{k}_{H} \le \beta \le \beta^{*}_{H}$	$p(H)F(\beta(k,*))[t_{CG}H + \bar{\beta}(k,*)(t_I H - t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^{*}_{H} \le \beta \le \beta^{n}_{H}$	$p(H)F(\beta(*,n))[(1-v(\zeta_{\hat{L}}))[t_{CG}L + \bar{\beta}(*,n)(t_I L - t_{CG}L)$ $+\gamma^{p}(1-\bar{\beta}(*,n))(1+\pi+m)(t_{CG}H - t_{CG}L)$ $+\gamma^{p}\bar{\beta}(*,n)(1+\pi+m)(t_I H - t_I L) - \gamma^{p}C]]$
H: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_I}$ if d=r	$\beta^{VI}_{H} \le \beta \le \beta^{n}_{H}$	$p(H)F(\beta(VI,n))v(\zeta_{\hat{L}})t_I H$
H:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{H},t_{CG}}$ if d=r	$\beta^{*}_{H} \le \beta \le \beta^{VI}_{H}$	$p(H)F(\beta(*,VI))v(\zeta_{\hat{L}})[t_{CG}H + \gamma^{i}\bar{\beta}(*,VI)(1+\pi)(t_I H$ $-t_{CG}H) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_I}$	$\beta^{c}_{L} \le \beta \le 1$	$p(L)F(\beta(c,1))[t_I L - \gamma^{i}(1-\bar{\beta}(c,1))(t_I L - t_{CG}L) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_{CG}}$	$0 \le \beta \le \beta^{a}_{L}$	$p(L)F(\beta(0,a))[t_{CG}L + \gamma^{i}\bar{\beta}(0,a)(1+\pi)(t_I L$ $-t_{CG}L) - \gamma^{i}C]$
L: Hire, $R_{\hat{L}}$,d=a	$\beta^{a}_{L} \le \beta \le \beta^{c}_{L}$	$p(L)F(\beta(a,c))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(a,c)(t_I L - t_{CG}L) - \gamma^{p}C]]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_I}$ if d=r	$\beta^{*}_{L} \le \beta \le \beta^{c}_{L}$	$p(L)F(\beta(*,c))(1-w(\zeta_{\hat{L}}))[t_I L - \gamma^{i}(1-\bar{\beta}(*,c))(t_I L$ $-t_{CG}L) - \gamma^{i}C]$
L:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$\beta^{a}_{L} \le \beta \le \beta^{*}_{L}$	$p(L)F(\beta(a,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^{i}\bar{\beta}(a,*)(1+\pi)(t_I L$ $-t_{CG}L) - \gamma^{i}C]$

TABLE D.1.15

Tax Agency Expected Tax Revenue --Class 11b

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^i_{\hat{H},t_l}$	$\beta^n_H \leq \beta \leq 1$	$p(H)\,F(\beta\,(n,1))t_lH$
H: No hire, $R^i_{\hat{H},t_{CG}}$	$0 \leq \beta \leq \beta^k_H$	$p(H)F(\beta\,(0,k))[t_{CG}H+\gamma^i\bar{\beta}(0,k)(1+\pi)(t_lH -t_{CG}H)-\gamma^iC]$
H: Hire, $R_{\hat{H}}$, d=a	$\beta^k_H \leq \beta \leq \beta^{**}_H$	$p(H)\,F(\beta\,(k,**))[t_{CG}H+\bar{\beta}(k,**)(t_lH-t_{CG}H)]$
H: Hire, $R_{\hat{L}}$, d=a	$\beta^{**}_H \leq \beta \leq \beta^n_H$	$p(H)F(\beta\,(**,n))\,[(1-v(\zeta_{\hat{L}}))[t_{CG}L+\bar{\beta}(**,n)(t_lL -t_{CG}L)+\gamma^p(1-\bar{\beta}(**,n))(1+\pi+m)(t_{CG}H-t_{CG}L) +\gamma^p\bar{\beta}(**,n)(1+\pi+m)(t_lH-t_lL)-\gamma^pC]]$
H: Hire, $R_{\hat{L}}$, $R^i_{\hat{H},t_l}$ if d=r	$\beta^{**}_H \leq \beta \leq \beta^n_H$	$p(H)\,F(\beta\,(**,n))v(\zeta_{\hat{L}})t_lH$
L: No hire, $R^i_{\hat{L},t_l}$	$\beta^c_L \leq \beta \leq 1$	$p(L)\,F(\beta\,(c,1))[t_lL-\gamma^i(1-\bar{\beta}(c,1))(t_lL-t_{CG}L)-\gamma^iC]$
L: No hire, $R^i_{\hat{L},t_{CG}}$	$0 \leq \beta \leq \beta^a_L$	$p(L)F(\beta\,(0,a))[t_{CG}L+\gamma^i\bar{\beta}(0,a)(1+\pi)(t_lL-t_{CG}L)-\gamma^iC]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta^a_L \leq \beta \leq \beta^c_L$	$p(L)\,F(\beta\,(a,c))[w(\zeta_{\hat{L}})[t_{CG}L+\bar{\beta}(a,c)(t_lL-t_{CG}L)-\gamma^pC]]$
L: Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_l}$ if d=r	$\beta^*_L \leq \beta \leq \beta^c_L$	$p(L)\,F(\beta\,(*,c))(1-w(\zeta_{\hat{L}}))[t_lL-\gamma^i(1-\bar{\beta}(*,c))(t_lL -t_{CG}L)-\gamma^iC]$
L:Hire, $R_{\hat{L}}$, $R^i_{\hat{L},t_{CG}}$ if d=r	$\beta^a_L \leq \beta \leq \beta^*_L$	$p(L)\,F(\beta\,(a,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L+\gamma^i\bar{\beta}(a,*)(1+\pi)(t_lL -t_{CG}L)-\gamma^iC]$

TABLE D.1.16

Tax Agency Expected Tax Revenue --Class 12

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_I}$	$\beta^{VI}_{H} \leq \beta \leq 1$	$p(H)\,F(\beta\,(VI,1))t_I H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \leq \beta \leq \beta^{VI}_{H}$	$p(H)\,F(\beta\,(0,VI))[t_{CG}H + \gamma^{i}\bar{\beta}(0,VI)(1+\pi)(t_I H - t_{CG}H) - \gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, d=a	$0 \leq \beta \leq 1$	$p(L)\,F(\beta\,(0,1))w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(0,1)(t_I L - t_{CG}L) - \gamma^{p}C]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_I}$ if d=r	$\beta^{*}_{L} \leq \beta \leq 1$	$p(L)\,F(\beta\,(*,1))(1-w(\zeta_{\hat{L}}))[t_I L - \gamma^{i}(1-\bar{\beta}(*,1))(t_I L - t_{CG}L) - \gamma^{i}C]$
L:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$0 \leq \beta \leq \beta^{*}_{L}$	$p(L)\,F(\beta\,(0,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_I L - t_{CG}L) - \gamma^{i}C]$

TABLE D.1.17

Tax Agency Expected Tax Revenue --Class 13

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_l}$	$\beta^{VI}_{H} \leq \beta \leq 1$	$p(H)\,F(\beta\,(VI,1))t_l H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \leq \beta \leq \beta^{VI}_{H}$	$p(H)\,F(\beta\,(0,VI))[t_{CG}H + \gamma^{i}\bar{\beta}(0,VI)(1+\pi)(t_l H - t_{CG}H) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_l}$	$\beta^{c}_{L} \leq \beta \leq 1$	$p(L)\,F(\beta\,(c,1))[t_l L - \gamma^{i}(1-\bar{\beta}(c,1))(t_l L - t_{CG}L) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_{CG}}$	$0 \leq \beta \leq \beta^{a}_{L}$	$p(L)F(\beta\,(0,a))[t_{CG}L + \gamma^{i}\bar{\beta}(0,a)(1+\pi)(t_l L - t_{CG}L) - \gamma^{i}C]$
L: Hire, $R_{\hat{L}}$, d=a	$\beta^{a}_{L} \leq \beta \leq \beta^{c}_{L}$	$p(L)F(\beta\,(a,c))[w(\zeta_{\hat{L}})[t_{CG}L + \bar{\beta}(a,c)(t_l L - t_{CG}L) - \gamma^{P}C]]$
L: Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_l}$ if d=r	$\beta^{*}_{L} \leq \beta \leq \beta^{c}_{L}$	$p(L)\,F(\beta\,(*,c))(1-w(\zeta_{\hat{L}}))[t_l L - \gamma^{i}(1-\bar{\beta}(*,c))(t_l L - t_{CG}L) - \gamma^{i}C]$
L:Hire, $R_{\hat{L}}$, $R^{i}_{\hat{L},t_{CG}}$ if d=r	$\beta^{a}_{L} \leq \beta \leq \beta^{*}_{L}$	$p(L)\,F(\beta\,(a,*))(1-w(\zeta_{\hat{L}}))[t_{CG}L + \gamma^{i}\bar{\beta}(a,*)(1+\pi)(t_l L - t_{CG}L) - \gamma^{i}C]$

TABLE D.1.18

Tax Agency Expected Tax Revenue --Class 14

Strategy of Taxpayer	Beliefs	Tax Agency's Expected Tax Revenue
H: No hire, $R^{i}_{\hat{H},t_I}$	$\beta^{VI}_{H} \leq \beta \leq 1$	$p(H)\,F(\beta\,(VI,1))t_I H$
H: No hire, $R^{i}_{\hat{H},t_{CG}}$	$0 \leq \beta \leq \beta^{VI}_{H}$	$p(H)\,F(\beta\,(0,VI))[t_{CG}H + \gamma^{i}\bar{\beta}(0,VI)(1+\pi)(t_I H - t_{CG}H) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_I}$	$\beta^{*}_{L} \leq \beta \leq 1$	$p(L)F(\beta\,(*,1))[t_I L - \gamma^{i}(1-\bar{\beta}(*,1))(t_I L - t_{CG}L) - \gamma^{i}C]$
L: No hire, $R^{i}_{\hat{L},t_{CG}}$	$0 \leq \beta \leq \beta^{*}_{L}$	$p(L)\,F(\beta\,(0,*))[t_{CG}L + \gamma^{i}\bar{\beta}(0,*)(1+\pi)(t_I L - t_{CG}L) - \gamma^{i}C]$

APPENDIX E

CHAPTER 5 PROOFS

Proposition 14:

The existence of an equilibrium requires that the tax agency chooses the level of investigation $\zeta_{\pounds}^{*} \in [\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]_{ci^{*}}$ which maximizes its expected tax revenue given taxpayers' best responses in that class. High and low-type taxpayers, given the tax agency's optimal level of investigation, adopt their respective strategies in class ci* such that their expected tax liability is minimized. The equilibrium further requires that no agent has an incentive to alter his or her strategy.

In proving the existence of an equilibrium, it is sufficient to demonstrate that:

(1) $\zeta_{\pounds}$ is bounded;

(2) For every possible level of investigation, there always exists a unique optimal strategy for taxpayers; and

(3) The tax agency's conditional expected tax revenue function is continuous in $\zeta_{\pounds}$.

These conditions are discussed immediately below.

By assumption, the level of investigation is bounded such that $\zeta_{\pounds} \in [0,1]$ (see Section 3.4). Defining $\zeta_{\pounds}^{Min} \geq 0$ and $\zeta_{\pounds}^{Max} < 1$, the level of investigation $\zeta_{\pounds}$ which can be chosen by the tax agency belongs to the "global" interval $[\zeta_{\pounds}^{Min}, \zeta_{\pounds}^{Max}]$, the interval over which high and low-type taxpayers adopt any one of the 18 strategies in Table 4.2. The lower boundary, $\zeta_{\pounds}^{Min} \geq 0$, exists since any level of investigation must necessarily be greater than or equal to zero. An upper boundary also exists since, as $\zeta_{\pounds}$ increases, F($\zeta_{\pounds}$)

increases, at an increasing rate, such that beyond some level, say $\zeta_{\mathcal{L}}^{Max}$, the fee charged by practitioners exceeds the expected benefit from hiring, for all taxpayers.[1] Where $\zeta_{\mathcal{L}} > \zeta_{\mathcal{L}}^{Max}$, hiring never occurs and taxpayers make their reporting decisions independently of $\zeta_{\mathcal{L}}$. An increase in $\zeta_{\mathcal{L}}$ beyond $\zeta_{\mathcal{L}}^{Max}$ cannot increase the tax agency's expected tax revenue and, thus, $\zeta_{\mathcal{L}}^{Max}$ represents the upper boundary.

The second condition requires that, for every possible level of investigation which can be chosen by the tax agency, i.e., for every $\zeta_{\mathcal{L}} \in [\zeta_{\mathcal{L}}^{Min}, \zeta_{\mathcal{L}}^{Max}]$, there always exists a unique optimal strategy for taxpayers which is their best response to the chosen level of investigation. This strategy is chosen from among one of the 18 classes of potential equilibrium strategies in Table 4.2. By construction, the existence of an optimal strategy must hold given the characteristics of the Stackelberg equilibrium. The uniqueness follows from the results derived in the various propositions in Chapter 4, Section 4.2.

Finally, it must be demonstrated that, for each class, the tax agency's expected tax revenue function is continuous in $\zeta_{\mathcal{L}}$. Note that if the continuity result holds for one class, it holds for all classes since these functions are all defined from the same variables.

To demonstrate continuity, consider the tax agency's expected tax revenue function conditional on high and low-type taxpayers adopting their respective strategies in Class 13 (see Appendix D, Table D.1). In this class, *some* low-type taxpayers hire practitioners, communicate $R_{\mathcal{L}}$, and their message is accepted with probability $w(\zeta_{\mathcal{L}})$. Taxpayers adopting this strategy hold beliefs $\beta_L^a \leq \beta \leq \beta_L^c$. Conditional on this strategy, the tax agency's expected tax revenue is

$$p(L)F(\beta(a,c))\, w(\zeta_{\mathcal{L}})[t_{CG}L + \bar{\beta}(a,c)(t_I L - t_{CG}L) - \gamma^p C], \tag{E.1}$$

where $F(\beta(a,c))$ is the proportion of low-type taxpayers who hire practitioners, $w(\zeta_{\mathcal{L}})$ is

[1]Recall from Section 3.4 that $F(1) = \infty$.

the probability that the tax practitioner correctly accepts the message $R_{\pounds}$, and $\bar{\beta}(a,c)$ is the conditional mean over the interval (a,c). By assumption, w($\zeta_{\pounds}$) is continuous in $\zeta_{\pounds}$. Furthermore, the critical values β^{a}_{L} and β^{c}_{L} vary with $\zeta_{\pounds}$ and, thus, $F(\beta(a,c))$ and $\bar{\beta}(a,c)$ also vary with $\zeta_{\pounds}$. Since by assumption, the distribution over taxpayers' beliefs β is continuous, $F(\beta(a,c))$ and $\bar{\beta}(a,c)$ are also continuous. Since these are the only three components which vary with $\zeta_{\pounds}$, (E.1) above is continuous in the level of investigation. Since the sum of two or more continuous functions is also continuous, the expected tax revenue function in that class is continuous in $\zeta_{\pounds}$. This result holds for all classes.

Consequently, an equilibrium exists given that the three conditions above are satisfied. It should be noted, however, that since the tax agency's expected tax revenue function is not necessarily monotone, there may exist more than one level of investigation which maximizes its expected tax revenue. Given this occurrence, the tax agency has a choice over the class of taxpayer equilibrium strategies which it can induce. However, since it selects only one level of investigation and since this level is observed by all agents, only one class of taxpayer strategies exists in equilibrium.

Q.E.D.

REFERENCE LIST

Allingham, M. G., and A. Sandmo, [1972], "Income Tax Evasion: A Theoretical Analysis", *Journal of Public Economics*, 1: 323-38.

Alm, J. [1991], "A Perspective on the Experimental Analysis of Taxpayer Reporting", *The Accounting Review*, 66 (July): 577-593.

Alm, J. [1988a], "Compliance Costs and the Tax Avoidance-Tax Evasion Decision", *Public Finance Quarterly*, 16 (January): 31-66.

Alm, J. [1988b], "Uncertain Tax Policies, Individual Behavior, and Welfare", *American Economic Review*, 78 (March): 237-45.

American Bar Association on Taxpayer Compliance [1987], *Report and Recommendations*, (July). Chicago: American Bar Association.

American Institute of Certified Public Accountants [1984], "Preparer Verification Measure in Tax Bill Blocked", *Journal of Accountancy*, 158 (August): 11.

Antle, R. [1982], "The Auditor as an Economic Agent", *Journal of Accounting Research*, 20 (Autumn): 503-27.

Appleby, T. [1993], "Tax Scam Reflects Industry Woes", *Globe and Mail*, April 8: B2.

Baiman, S. [1990], "Agency Research in Managerial Accounting: A Second Look", *Accounting, Organizations, and Society*, 15(4):341-371.

Baiman, S., J. H. Evans, III, and J. Noel, [1987], "Optimal Contracts With a Utility-Maximizing Auditor", *Journal of Accounting Research*, 25 (Autumn): 217-44.

Balachandran, B. V. and N. J. Nagarajan, [1987], "Imperfect Information, Insurance, and Auditors' Legal Liability", *Contemporary Accounting Research*, 3(2): 281-301.

Beck, P., J. Davis, and W. Jung, [1994], "Tax Advice and Reporting Under Uncertainty: Theory and Experimental Evidence", Unpublished manuscript, University of Illinois at Urbana-Champaign.

Beck, P., J. Davis, and W. Jung, [1992], "Experimental Evidence on an Economic Model of Taxpayer Reporting Under Strategic and Non-strategic Audits", *Contemporary Accounting Research*, 9 (Fall): 86-112.

Beck, P., and W. Jung, [1989a], "An Economic Model of Taxpayer Compliance Under Uncertainty", *Journal of Accounting and Public Policy*, 8 (Spring): 1-27.

Beck, P., and W. Jung, [1989b], "Taxpayers' Reporting Decisions and Auditing Under Information Asymmetry", *The Accounting Review*, 64 (July): 468-87.

Becker, G. S. [1968], "Crime and Punishment: An Economic Approach", *Journal of Political Economy*, 76: 169-267.

Blackwell, D., and M. Girshick, [1954], *Theory of Games and Statistical Decisions*. Dover, New York: Wiley.

Boidman, N. [1983], "What Can Be Learned from the Experience of Other Countries with Income Tax Compliance Problems", 37 *Bulletin for International Fiscal Documentation*, 415:454-455.

Boyles III, J. V., and D. L. Feldman, [1988], "Practitioners' Forum: Defensive Strategies for CPAs in Tax Practice", *Journal of Accountancy*, (September): 162-168.

Calmes, J. [1991], "White House Urged IRS to Focus Audits on Lower-income Payers, Agency Says", *Wall Street Journal*, March 21: A2.

Canada, Auditor General's Office [1990], *Report of the Auditor General to the House of Commons*, Ottawa, Canada.

Christian, C. W., S. Gupta, and S. Lin [1992], "Determinants of Tax Preparer Usage: Evidence from Panel Data", working paper, Arizona State University.

Collins, J. H., V. C. Milliron, and D. R. Toy, [1990], "Factors Associated with Household Demand for Tax Preparers", *The Journal of the American Taxation Association*, (Fall): 9-25.

Cowell, F.A. [1990], *Cheating the Government*. Cambridge, MA: The MIT Press.

Cowell, F.A. [1985a], "Tax Evasion With Labour Income", *Journal of Public Economics*, 26(1): 19-34.

Cowell, F.A. [1985b], "The Economic Analysis of Tax Evasion", *Bulletin of Economic Research*, 37(3): 163-193.

Cross, R., and G. K. Shaw, [1981], "The Evasion-Avoidance Choice: A Suggested Approach", *National Tax Journal*, 34(1): 489-491.

Cross, R., and G.K. Shaw, [1982], "On the Economics of Tax Aversion", *Public Finance/Finance Publiques*, 37(1): 36-47.

Datar, S., G. Feltham, and J. Hugues, [1991], "The Role of Audits and Audit Quality in Valuing New Issues", *Journal of Accounting and Economics*, 14(1): 3-49.

Dubin, J. A., M. J. Graetz, M. A. Udell, and L. L. Wilde, [1992], "The Demand for Tax Preparation Services", *The Review of Economics and Statistics*, 74(1-2): 75-82.

Dye, R. A. [1992], "Incorporation, Insurance, and the Audit Market", working paper, Northwestern University.

Erard, B. [1993], "Taxation with Representation: An Analysis of the Role of Tax Practitioners in Tax Compliance", *Journal of Public Economics*, 52: 163-197.

Erard, B. [1990], "Impact of Tax Practitioners on Tax Compliance: Research Summary", Paper presented at the 1990 IRS Research Conference in Washington, D.C., (November).

Erard, B. and J. Feinstein, [1994], "Honesty and Evasion in the Tax Compliance Game", *The Rand Journal of Economics*, 25(Spring): 1-19.

Feltham, G. D. [1990], "A Microeconomic Framework for the Analysis of Decisions in a World of Taxation", Unpublished manuscript, Wilfred Laurier University.

Fischer, C. M., M. Wartick, and M. M. Mark, [1992], "Detection Probability and Taxpayer Compliance: A Review of the Literature", *Journal of Accounting Literature*, 11: 1-46.

Freund, J. E., R. E. Walpole, [1987], *Mathematical Statistics*. Englewood Cliffs, New Jersey: Prentice-Hall Inc.

Fudenberg, D. and J. Tirole, [1991], *Game Theory*. Cambridge, Massachusetts: The MIT Press.

Fuke, J. M. [1985], "Can Tax Advisers Successfully Serve Two Masters?", *CA Magazine*, (March): 32-37.

Graetz, M., J. Reinganum, and L. Wilde, [1986], "The Tax Compliance Game: Toward an Interactive Theory of Law Enforcement", *Journal of Law, Economics, and Organization*, 2 (Spring): 1-32.

Graetz, M., and L. Wilde, [1985], "The Economics of Tax Compliance: Fact and Fantasy", *National Tax Journal*, 38 (June): 355-63.

Greenberg, J. [1984], "Avoiding Tax Avoidance: A (Repeated) Game-Theoretic Approach", *Journal of Economic Theory*, 32: 1-13.

Harwood, G. B., E. R. Larkins, and J. Martinez-Vazquez, [1990], "Paid Tax Preparers' Role in Noncompliance: Some Empirical Evidence", working paper, Georgia State University.

Hemmer, T., C. H. Stinson, and I. Vaysman, [1993], "Self-audits, Penalties, and Taxpayer Compliance", Paper presented at the 1993 Tax Research Symposium, University of Illinois at Urbana-Champaign, October 1-2, 1993.

Hershey Jr., R. D. [1993], "U.S. Tax Cheating Worth $150-billion", *Globe and Mail*, December 30: B3.

Holden, J. P. [1991], "Practitioners' Standard of Practice and the Taxpayer's Reporting Position", (Symposium on Tax Ethics), *Capital University Law Review*, 20 (Spring): 327-344.

Internal Revenue Service (IRS) [1983], *Income Tax Compliance Research : Estimates for 1973-1981*, Office of Assistant Commissioner (Planning, Finance, and Research), Internal Revenue Service. Washington, D.C.: U.S. Department of the Treasury.

Jackson, B. R., and V. C. Milliron, [1989], "Tax Preparers: Government Agents or Client Advocates? A Response to the IRS's Survey on Tax Preparers' Attitudes", *Journal of Accountancy*, 167 (May): 75-82.

Jackson, B. R., and V. C. Milliron, [1986], "Tax Compliance Research: Findings, Problems, and Prospects", *Journal of Accounting Literature*, 5: 125-65.

Jakolev, J. (Ernst and Young, Toronto) [1993], "Ontario Audit Requirement", *Canadian Tax Highlights*, Canadian Tax Foundation, 1(7) (July 20):53-54.

Klepper, S., M. Mazur, and D. Nagin [1991], "Expert Intermediaries and Legal Compliance: The Case of Tax Preparers", *Journal of Law and Economics*, 34 (April): 205-229.

Klepper, S., and D. Nagin, [1989], "The Role of Tax Preparers in Tax Compliance", *Policy Science*, 22: 167-194.

KPMG Centre for Government Foundation [1994], "Survey of Canadian Attitudes Towards Taxation".

Landsberger, M., and I. Meilijson, [1982], "Incentive Generating State Dependent Penalty System", *Journal of Public Economics*, 19: 333-52.

Long, J. E., and J. B. Caudill, [1987], "The Usage and Benefits of Paid Tax Return Preparation", *National Tax Journal*, (March): 37-45.

Long, S. B., and J. A. Swingen, [1991], "Taxpayer Compliance: Setting New Agendas for Research", *Law and Society Review*, 25(3): 637-683.

Melumad, N., and D. Mookherjee, [1989], "Delegation as Commitment: The Case of Income Tax Audits", *Rand Journal of Economics*, 20: 139-63.

Melumad, N. and L. Thoman, [1990], "On Auditors and the Courts in an Adverse Selection Setting", *Journal of Accounting Research*, 28(Spring): 77-120.

Melumad, N., M. Wolfson, and A. Ziv, [1991], "Should Preparer Fees Be Subsidized? A Game-theoretic Analysis", 1991 Tax Research Symposium, Stanford University.

Middlemiss, J. [1994], "Too Many Accountants' Guilty of Fraud, Liberals Vow Crackdown on Shady Advisors", *The Bottom Line*, March:1.

Mookherjee, D., and I. P'ng, [1989], "Optimal Auditing, Insurance, and Redistribution", *Quarterly Journal of Economics*, 103: 399-415.

Moore, G. and W. R. Scott, [1989], "Auditors' Legal Liability, Collusion with Management, and Investors' Loss", *Contemporary Accounting Research*, 5(2): 754-74.

Novack, J. [1994], "You Know Who You Are, and So Do We", *Forbes*, April 11: 88-92.

Ontario, Legislative Assembly, Standing Committee on Finance and Economic Affairs, [1994], "Report on the Underground Economy in Ontario, 1993-94". Toronto: Standing Committee on Finance and Economic Affairs, Legislative Assembly, February 29: 17 pp..

Pencavel, J. H. [1979], "A Note on Income Tax Evasion, Labor Supply, and Nonlinear Tax Schedules", *Journal of Public Economics*, 12: 115-24.

Porcano, J. L., and T. M. Porcano, [1985], "Incorporating Probability Analysis in Taxpayer Appeal Decisions", *Journal of the American Taxation Association*, (Spring): 18-36.

Revenue Canada, Taxation, [1989], "Final Report of the Committee on the Restructuring of Compliance Programs", internal report.

Reuter News Service - Canada [1994], "Canada: Canada Underground Economy Small - Govt Agency", April 15.

Reinganum, J., and L. Wilde, [1991], "Equilibrium Enforcement and Compliance in the Presence of Tax Practitioners", *The Journal of Law, Economics, and Organizations*, 7(1): 163-181.

Reinganum, J., and L. Wilde, [1985], "Income Tax Compliance in a Principal-agent Framework", *Journal of Public Economics*, 26: 1-18.

Roth, J., J. Scholz, and A. Witte, [1989], *Taxpayer Compliance Volume 1: An Agenda for Research*. Philadelphia: University of Pennsylvania Press.

Schmidt, Glen [1993] "The Audit Function", Oral presentation at Tax Symposium: Asserting Taxpayers' Rights, Toronto, (February 5).

Scholes, M. S. and M. A. Wolfson, [1992], *Taxes and Business Strategy*. Englewood Cliffs, New Jersey: Prentice-Hall Inc.

Schwartz, R. [1993], "The Impact of Liability Rules and Auditing Standards on Audit Quality," working paper, Northwestern University.

Scotchmer, S. [1989], "The Effect of Tax Advisors on Tax Compliance", *In Taxpayer Compliance Volume 2: Social Science Perspectives*, edited by J. Roth and J. Scholz. Philadelphia: University of Pennsylvania Press.

Scotchmer, S., and J. Slemrod, [1989], "Randomness in Tax Enforcement", *Journal of Public Economics*, 38 (February): 17-32.

Shavell, S. [1988], "Legal Advice About Contemplated Acts: The Decision to Obtain Advice, its Social Desirability, and Protection of Confidentiality", *Journal of Legal Studies*, 17 (January): 123-50.

Shibano, T. [1989], "An Equilibrium Model of Attestation by Public Accountants", unpublished Ph.D dissertation, Stanford University.

Skinner, J., and J. Slemrod, [1985], "An Economic Perspective on Tax Evasion", *National Tax Journal*, (September): 345-353.

Slemrod, J. [1989], "Complexity, Compliance Costs, and Tax Evasion", In *Taxpayer Compliance Volume 2: Social Science Perspectives*, edited by J. Roth and J. Scholz. Philadelphia: University of Pennsylvania Press.

Slemrod, J. [1985], "The Return to Tax Simplification: An Econometric Analysis", National Bureau of Economic Research Working Paper No. 1756, (October).

Slemrod, J., and N. Sorum, [1984], "The Compliance Cost of the U.S. Individual Income Tax System", *National Tax Journal*, (December): 461-74.

Srinivasan, T. N. [1973], "Tax Evasion: A Model", *Journal of Public Economics*, 2 (November): 339-46.

Tauchen, H. V., and A. D. Witte, [1986], "The Impact of Law and Administrative Rules and Compliance", Proposal to the National Science Foundation. Available from the National Bureau of Economics Research.

Thoman, L. [1992], "The Clarity of the Tax Code and the Employment of Tax Advisors", working paper, Purdue University.

Titman, S., and B. Trueman, [1986], "Information Quality and the Valuation of New Issues", *Journal of Accounting and Economics*, (June): 159-72.

U.S. Internal Revenue Service (IRS) [1992], "Selected Historical and Other Data", *Statistics of Income Bulletin*, (Winter 1991-92): 130.

Witte, A. D., and D. F. Woodbury, [1983], "What We Know About Factors Affecting Compliance with the Tax Laws", *Income Tax Compliance: A Report of the ABA Section of Taxation Invitational Conference on Income Tax Compliance*, edited by Phillip Sawicki: 133-48. Reston, VA.

Yankelovich, Skelly, and White, Inc., [1984], *Taxpayer Attitudes Survey: Final Report. Public Opinion Survey Prepared for the Public Affairs Division, Internal Revenue Service*. New York, NY.

Yitzhaki, S. [1974], "A Note on Income Tax Evasion: A Theoretical Analysis", *Journal of Public Economics*, 3: 201-02.

Wall Street Journal [1994], "Tax Report: A Special Summary and Forecast of Federal and State Tax Developments", September 15, 1993: 1.

END

12-01-95

FIN