Tax avoidance and evasion in a dynamic setting

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Table of contents

1. Introduction
2. Model
3. Analysis
4. Conclusion
Intro
Introduction

- Tax avoidance and evasion alter effective tax rates
- Tax systems differentiate between (legal) avoidance and (illegal) evasion but they both reduce revenues collected
- Evasion leads to sizeable revenue losses: 20% of GDP in Europe (Murphy 2019) (13% in Italy, Albarea et al. 2020) under-reporting is $\approx 18\%$ in US with a tax gap of 500 billion
- Avoidance also significant: 4% of GDP in Europe (EPRS, 2015), latest IRS and Treasury claim figures up to 500 billion
- We develop a model to study the optimal evasion and avoidance decision in an inter-temporal setting
• Contributions in a static framework (joint avoidance/evasion):
  • Cross and Shaw (1981; 1982) point out importance of joint analysis of avoidance-evasion
  • Alm (1988) and Alm and McCallin (1990) study the case of risk-less and risky avoidance
  • Cowell (1990) investigates distributional impacts
  • Neck (1990) studies interactions with labour supply
  • Gamannossi and Rablen (2016;2017) explore the cases of bounded rationality and optimal enforcement

• Contributions in a dynamic framework (only evasion):
  • Wen-Zhung and Yang (2001) and Dzhumashev and Gahramanov (2011) first models considering just evasion
  • Levaggi and Menoncin (2012; 2013) identify determinants of Yitzhaki puzzle
  • Bernasconi et al. (2015; 2019) study roles of uncertainty and habit
Research Goals

- Characterize optimal avoidance and evasion
- Analyze how deterrence instruments affect compliance and revenues
- Characterize optimal fiscal parameters for the government under various objectives
  - minimizing evasion
  - minimizing non-compliance
  - maximizing revenues
  - maximizing growth
Model
Modelling features and assumptions

Avoidance and evasion differ in their level of sophistication

- **Evasion is cost-less** and carries a fine $\eta$ if detected
- **Avoidance costs** $f(a)$ but entails a reduced fine $\eta(1 - \beta)$ if detected
  - $f(a)$ increasing, convex and $f(0) = 0$
  - We call the fine reduction $\beta$ the **avoidance premium**

Both $f$ and $\beta$ depend on the fiscal and tax administration specifics

- High avoidance cost and low avoidance premium when:
  - Tax code is simpler and less-ambiguous
  - Legal/investigatory resources of tax authorities are higher
  - Courts have higher effectiveness

Avoidance and evasion are **both correctly detected** upon audit

The agent suffers from **fiscal illusion**

- The effect of compliance on revenues is overlooked
Consumer’s preferences

The agent’s utility increases in the consumption of a *privately produced* good $c_t$ and a *publicly produced* good $g_t$

The agent utility function is:

$$U = \left( \frac{c_t - c_m}{1 - \delta} \right)^{1-\delta} + v(g_t)$$

- $c_m$ is a minimum consumption level
- $\delta$ drives concavity of utility from $c_t$
- $v(\bullet)$ is an increasing and concave function

**Absolute risk-aversion** $\frac{\delta}{c_t - c_m}$

- Lower risk aversion when $c_t$ is higher (DARA)
- Higher risk aversion when either $\delta$ or $c_m$ is higher
Capital Accumulation

The capital accumulated $dk_t$ is equal to production minus expenses:

$$dk_t = [y_t - c_t - \tau y_t (1 - e_t - a_t) - f(a_t) y_t] \ dt - \eta \tau y_t [e_t + (1 - \beta) a_t] \ d\Pi_t$$

Production, $y_t$

- Deterministic function $y_t = Ak_t$, $0 < A < 1$ TFP

Expenses:

- Consumption, $c_t$
- Linear taxes on declared income $\tau y_t (1 - e_t - a_t)$
  - Share of income avoided $a_t$ and evaded $e_t$
- Avoidance costs $f(a_t)$
- Fine costs
  - Fine in case of detection is $\eta \tau y_t [e_t + (1 - \beta) a_t]$
  - Audits follow a Poisson jump process $d\Pi_t$ with frequency $\lambda$
The optimization problem

\[
\max_{\{c_t, e_t, a_t\}_{t \in [t_0, \infty[}} \mathbb{E}_{t_0} \left[ \int_{t_0}^{\infty} \frac{(c_t - c_m)^{1-\delta}}{1-\delta} e^{-\rho(t-t_0)} dt \right]
\]

under the capital dynamics:

\[
dk_t = [y_t - c_t - \tau y_t (1 - e_t - a_t) - f(a_t) y_t] dt - \\
\eta \tau y_t [e_t + (1 - \beta) a_t] d\Pi_t
\]
Analysis
Optimal solution

\[ a^* = (f')^{-1} \tau \beta, \]

\[ e_t^* = \frac{k_t - H}{\tau \eta A k_t} \left[ 1 - (\lambda \eta)^{\frac{1}{\delta}} \right] - (1 - \beta) a^*, \]

\[ c_t^* = c_m + (k_t - H) \left( \frac{\rho + \lambda}{\delta} + \frac{\delta - 1}{\delta} \left\{ \frac{1}{\eta} + A [(1 - \tau) + \tau \beta a^* - f(a^*)] \right\} - \frac{1}{\eta} (\lambda \eta)^{\frac{1}{\delta}} \right) \]

Where:

\[ (f')^{-1} \]

Inverse of the marginal cost of avoidance

\[ H := \frac{c_m}{A[\tau \beta a^* - f(a^*) + (1 - \tau)]} \]

PDV of future \( c_m \) discounted by TFP corrected by tax and avoidance
Evasion dynamics

Gamannossi, Levaggi and Menoncin

Tax avoidance and evasion in a dynamic setting

Gamannossi, Levaggi and Menoncin

Tax avoidance and evasion in a dynamic setting
Consumption dynamics

\[ c_t/k_t = m = 0 \]

\[ \text{Gamannossi, Levaggi and Menoncin} \]

\[ \text{Tax avoidance and evasion in a dynamic setting} \]

\[ \text{Years} \]
Tax avoidance and evasion in a dynamic setting
Comparative Statics

<table>
<thead>
<tr>
<th></th>
<th>$a^*$</th>
<th>$e_t^*$</th>
<th>$E_t^* = a^* + e_t^*$</th>
<th>$\mathbb{E}[dT_t]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda$</td>
<td>0</td>
<td>$-$</td>
<td>$-$</td>
<td>$+$</td>
</tr>
<tr>
<td>$\eta$</td>
<td>0</td>
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<td>$\beta$</td>
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<td>$-$</td>
</tr>
<tr>
<td>$\tau$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+/-$</td>
<td>$+/-$</td>
</tr>
</tbody>
</table>

$\frac{\partial \text{Col}}{\partial \text{Row}}$ Derivatives of column with respect to row

Where:

$$\mathbb{E}[dT_t] = \tau y_t (1 - e^*_t - a^*_t) dt + \lambda \eta \tau y_t [e^*_t + (1 - \beta) a^*_t] dt$$

are expected revenues collected:

- Revenues from declaration
- Expected revenues from enforcement
Comparative Statics - Remarks on $\beta$

The sign of $\frac{\partial e_t^*}{\partial \beta}$ is complex to study when $c_m > 0$

The case $c_m = 0$ offers some insights:

$$\frac{\partial e_t^*}{\partial \beta} \geq 0 \iff \frac{\partial a^*}{\partial \beta} \frac{1}{a^*} \leq \frac{1}{1 - \beta}.$$  

- The sign of the derivative depends on the semi-elasticity $\frac{\partial a^*}{\partial \beta} \frac{1}{a^*}$
  - If the semi-elasticity is higher than a threshold, $e$ is decreasing in $\beta$
  - The semi-elasticity is higher when $\beta$ is bigger

Avoidance deterrence increases evasion in economies with higher avoidance premium

- When $c_m > 0$ the increase in evasion is more likely than if $c_m = 0$
Comparative Statics - Remarks on $\tau$

Also for the sign of $\frac{1}{d_t} \frac{\partial E_t[dT_t]}{\partial \tau}$ assuming $c_m = 0$ provides some insights:

$$\frac{1}{d_t} \frac{\partial E_t[dT_t]}{\partial \tau} \geq 0 \iff \tau \leq \frac{1 - \beta a^*_t}{\beta \frac{\partial a^*_t}{\partial \tau}}.$$ 

Tax revenues display a Laffer curve behaviour

- When $\tau$ is low, raising $\tau$ increases revenues
- When $\tau$ is high, raising $\tau$ decreases revenues
- The higher the $\beta$, the lower the revenue-maximizing tax rate

An increase of $\tau$ has three impacts on revenues:

1. **Positive** - Marginal tax increase
2. **Positive** - Reduction of evasion
3. **Negative** - Increase in avoidance
Conclusion
Tax avoidance deterrence

Fines and audits are ineffective against tax avoidance ⇒ focus on $f, \beta, \tau$

Avoidance costs $f$

- Increasing both $f'$ and $f$ lowers avoidance and evasion
- Two components of avoidance costs:
  - **Knowledge costs**: Effort/Expertise to identify the “loophole” to exploit
  - **Set-up costs**: To meet law requirements (e.g., creation of legal entities)
    - Cannot be told apart from those of “intended” economic activities

Avoidance deterrence need to focus on knowledge costs alone

Measures to deter avoidance through $\beta$ and $f$

- Simplifying the tax system
  - Reducing the extent of variation of tax treatments
    - deductions, exemptions and preferential treatments
- Increasing the litigation budget of the tax administration
- Implementing anti-avoidance reforms at (multi)national level

Gamonnossi, Levaggi and Menoncin
Tax avoidance deterrence

Avoidance deterrence might increase evasion:

1. **Avoidance premium** $\beta$:
   - Decreasing a low $\beta$ reduces both avoidance and evasion
   - Decreasing a high $\beta$ entails an increase of evasion
   - Evasion increase is more likely when $c_m > 0$

2. **Tax rate** $\tau$:
   - Decreasing $\tau$ reduces avoidance but the increasing effect on evasion eventually lowers compliance and revenues

Negative effects can be sterilized using audit probability or fines

\[
a^* = (f')^{-1} \tau \beta,
\]

\[
e^*_t = \frac{k_t - H}{\tau \eta A k_t} \left[ 1 - (\lambda \eta)^{\frac{1}{\delta}} \right] - (1 - \beta) a^*.
\]
Concluding Remarks

We develop the first dynamic model with joint avoidance/evasion interaction. Interaction of avoidance and evasion is of crucial importance:

- Lead to the emergence of a Laffer curve
- Provide a possible interpretation for the Yitzhaki puzzle

Avoidance deterrence requires specific policies:

- Reduction of $\beta$ or increase of $f$
  - Long-run: Fiscal/judiciary reforms
  - Short-run: Increase of tax administration resources (legal)
    - Recent investments in data collection/analytics likely effective on evasion
    - Reduction of evasion might bolster avoidance
    - Need to balance deterrence activities

- Reduction of $\tau$

Avoidance deterrence might entail unintended consequences
Thank you!

Questions?