Optimal audit policies with heterogeneous agents

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Motivation: Tax evasion is a serious problem

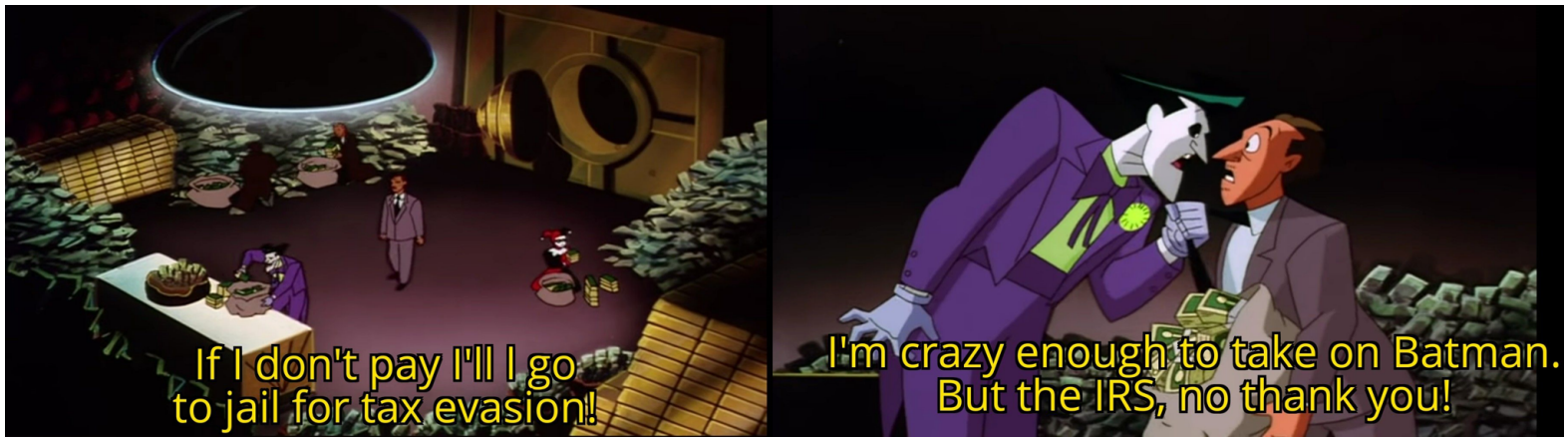

Figure: '*The New Batman Adventures*' Ep. 7, (Feb. 1998), from '*The Joker's Millions*', Detective Comics #180 (Feb. 1952).

Introduction

- Kukk et al. (2020) estimate that between **10%** and **40%** of self-employed income declarations are **under-reported** by individuals across EU countries.
- Gamannossi degl'Innocenti & Rablen (2020) claim that income tax evasion forces developed countries to annually forsake up to **20%** of the taxes which otherwise should have been collected.
- Scartascini & Castro (2015) remark that the problem is even more pronounced for developing countries, which are sometimes able to only secure **less than half** of their planned tax collections.

Contribution

- This paper considers a tax evasion game where the tax authority intends to prevent income under-reporting, and derives the optimal strategy from the point of view of the tax authority.

- I propose a two-step audit strategy, which consists of:
  1. A credible threat-to-audit message, followed by:
  2. A network-based audit policy.

- Acknowledging that this is not the first game-theoretic audit policy which has been recommended, to the best of my knowledge, it is the first one to be robust against:
  - Expected and non-expected utility theories.
  - Taxpayer heterogeneity.
  - Individual payoff or utility functions.

Literature review: seminal papers

- The formal study of tax evasion was pioneered by Allingham & Sandmo (1972), Srinivasan (1973), and Yitzhaki (1974).
  - However, the theoretical results do not fit the observations.
- The expected utility theory was challenged in laboratory experiments designed by Alm, Mcclelland, & Schulze (1992) and Alm, Jackson, & McKee (1992).
  - Individual taxpayers exhibit considerable **heterogeneity** in their behavior and seldom respond as in the expected utility theory.
- Further research has advocated for the use of social norms (Myles & Naylor (1996)), social interactions (Andreoni et al. (1998)) and prospect theory (Yaniv (1999); Bernasconi & Zanardi (2004)) to model taxpayer behavior more accurately.

Literature review: experiments

- Field experiments have proven to be advantageous to further investigate taxpayer behavior and communication (Ostrom, 2000; Stalans et al., 2006; Ashby et al., 2009; Onu & Oats, 2015).
- Alm et al. (2009, 2017) and Galbiati & Zanella (2012) found that taxpayers incorporate the behavior of their **'neighbors'** when they decide how much income to disclose.
  - These are called **'peer effects'** or 'endogenous social effects'.
- Field experiments have confirmed the capability of threat-to-audit letters as a tool to persuade tax compliance (Slemrod et al., 2001; Kleven et al., 2011; Pomeranz, 2015).
- Threat-to-audit messages (Boning et al., 2018; Lopez-Luzuriaga & Scartascini, 2019) and physical audits (Riedel et al., 2019; Drago et al., 2020) not only have direct effects on their targets, but they also spread throughout the taxpayer network.
  - This is commonly known as **'spillover' effects**.

Literature review: computational methods

- Computational systems and methods have provided an opportunity to **simulate** and study individual and collective taxpayer behavior (Mittone & Patelli, 2000; Davis et al., 2003; Mittone, 2006; Bloomquist, 2004; Korobow et al., 2007).

- Agent-Based Models (ABM's) also provided a framework to test tax evasion models including audit schemes, taxpayer networks and social interactions (Hokamp & Pickhardt, 2010; Prinz et al., 2014; Pellizzari & Rizzi, 2014; Andrei et al., 2014).

- Game-theoretic insights and representations have also contributed to yield more efficient audit strategies (Phillips, 2014; Hashimzade et al., 2014; Calimani & Pellizzari, 2014; Hashimzade et al., 2015, 2016; Gamannossi degl'Innocenti & Rablen, 2020).