On VAT Thresholds

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Overview

- A popular element of VAT systems is ‘thresholds’ under which registration is voluntary
  - Nearly all countries set a VAT threshold (single or multiple)
    - UK: £87,000; Germany: €100,000; France: €35,000
- Idea of VAT threshold is that most revenues come from high-turnover firms and therefore a threshold saves on
  - compliance costs
  - At the expense of revenue loss and production inefficiency through:
    1. bunching
    2. cascading

Literature review

- Literature has discussed optimal threshold (single)
  - Keen and Mintz (2004, JPubE)
- Literature has also looked at estimating the extent of bunching at threshold
  - Almunia, Liu and Lockwood (2018)
- Optimal rule characterised in Keen and Mintz (2004) has been applied widely...but

- In Keen and Mintz (2004)
  - Output prices are fixed
  - Upstream sector is not modeled explicitly (fixed input intensity)
  - The only distortion is to the firm size due to bunching

Our contribution

- Our approach is more realistic
  - We model explicitly the upstream downstream link, B2B and B2C
  - Prices across the production chain are flexible
  - Input intensity is also flexible
  - We allow for bunching both upstream and downstream
  - So, distortions due to pricing and bunching, at *both* tiers along the production chain
- The implication is that threshold, and bunching, might be over/under estimated if B2B sector is not properly accounted for

Research questions

- If we impose uniformity in thresholds, in B2B and B2C, what is optimal threshold?
- Since the threshold defines VAT-registered and non VAT-registered firms
  - Who trades with who?
  - Is there a sorting in transactions?
- How does this optimal threshold compare to Keen and Mintz (2004)?

Description of the market

- Upstream-downstream channel in production
- Each upstream firm buys its inputs from a competitive sector
- Upstream sector consists of (a continuum) of firms selling to a continuum of downstream firms (B2B)
- Each downstream firm combines inputs from all upstream firms (‘preference’ for input variety) and all downstream firms sell to a representative consumer (B2C), who has preferences for variety (Dixit-Stiglitz preferences)
- All sectors produce but prices depend on the registration status of firms
- No evasion allowed (but can be added)

Description of the market

- Upstream firms produce differentiated inputs
- They are also vertically ranked wrt their productivity

$$a \sim G(\cdot)$$

on $[\underline{a}, \overline{a}]$

- Downstream firms produce differentiated products
- They are vertically ranked wrt their productivity

$$b \sim F(\cdot)$$

on $[\underline{b}, \overline{b}]$

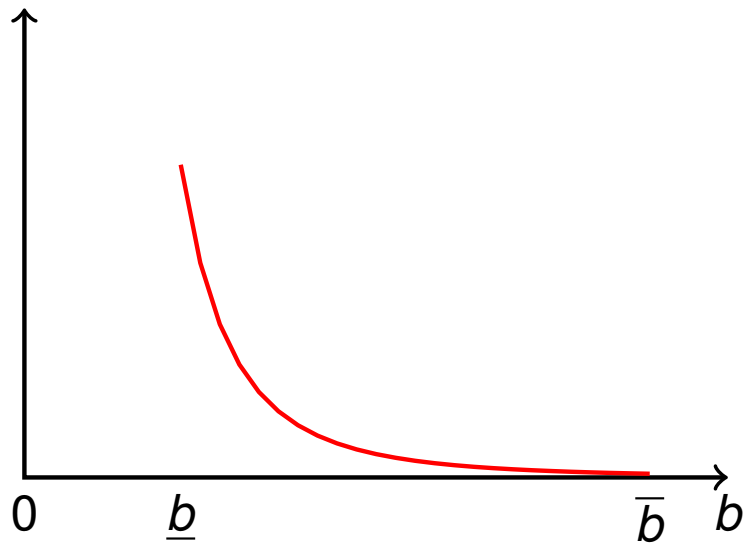
Distribution of productivities

- Truncated Pareto distribution
- Density

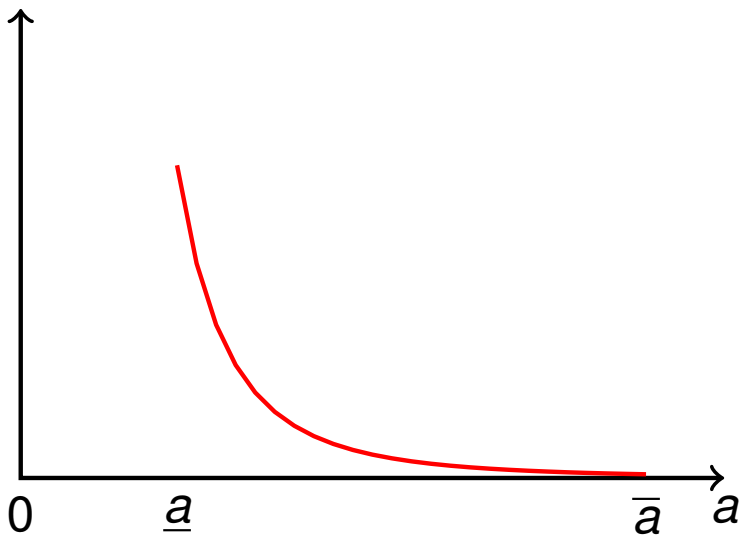
$$f(x) = \frac{cL^c x^{-(c+1)}}{1 - \left(\frac{L}{H}\right)^c}$$

- c is the shape parameter
- L: lower bound
- H is the upper bound

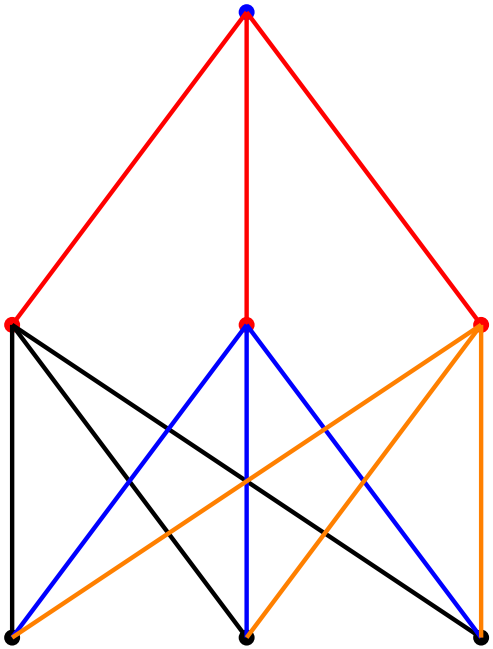
Pareto distribution of productivities, downstream



Pareto distribution of productivities, upstream



Graphical description of the market



Consumers

Competitive sector (milk)

Upstream firms (Cheese: Brie, Mozzarella, Feta)

Downstream firms (Restaurants: French, Italian, Greek)

Simple rule: No distortions

- Total tax revenue is

$$t \int_{z_b}^{\overline{b}} v(b) f(b) db$$

where z_b is the registration threshold and $v(b)$ is the value-added of firm with productivity b

- Tax authority chooses z_b to maximize ($\delta > 1$ is the social value of 1 \$ in the hands of government)

$$\delta \left\{ t \int_{z_b}^{\overline{b}} v(b) f(b) db - A(1 - F(z_b)) \right\}$$
$$- \quad \left\{ \int_{z_b}^{\overline{b}} v(b) f(b) db + \Gamma(1 - F(z_b)) \right\}$$

- where A are administrative costs per firm, Γ is each firm's compliance cost and t is the tax

- The FOC is

$$\underbrace{(\delta - 1)tv(z_b)}_{\text{MB of registering one more firm}} = \underbrace{\delta A + \Gamma}_{\text{MC of registering one more firm}}$$

- The added value $v(z_b)$ can be expressed as $v(y)y$ where y is the firm's turnover and $v(y)$ the % added value

- Then the FOC can be expressed as (Keen and Mintz (2004))

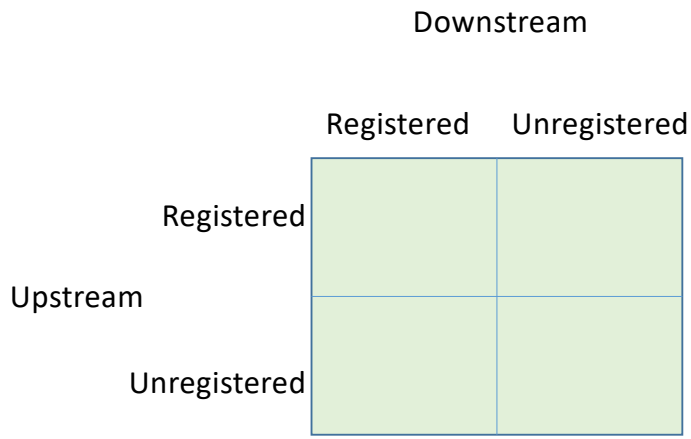
$$y = \frac{\delta A + \Gamma}{(\delta - 1)tv(y)}$$

- Then, if $t = 15\%$, $\delta = 1.3$, $v(y) = 35\%$, $A = \$500$ and $\Gamma = \$100$ the optimal threshold is

$$z = \$40,000$$

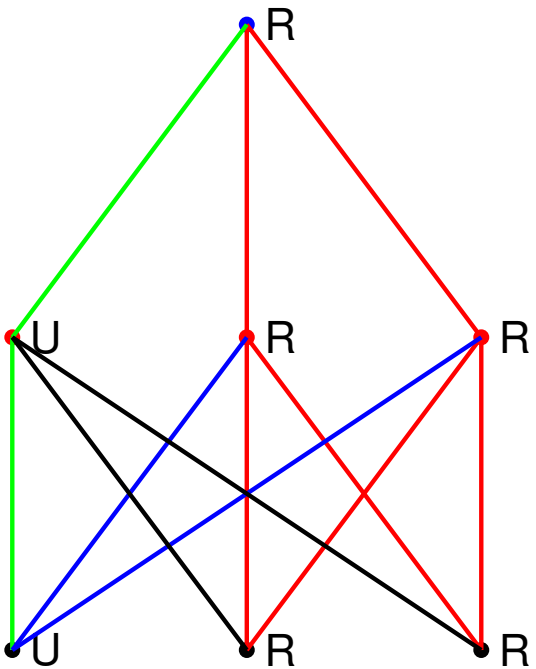
States of the world

- Prices and output depends on registration status along the production chain



Prices and outputs depend on 4 states of the world (excluding bunching)

Graphical representation of the 4 states



Competitive sector

Upstream firms

Downstream firms

Distortion of output choices

Distortion of input choices

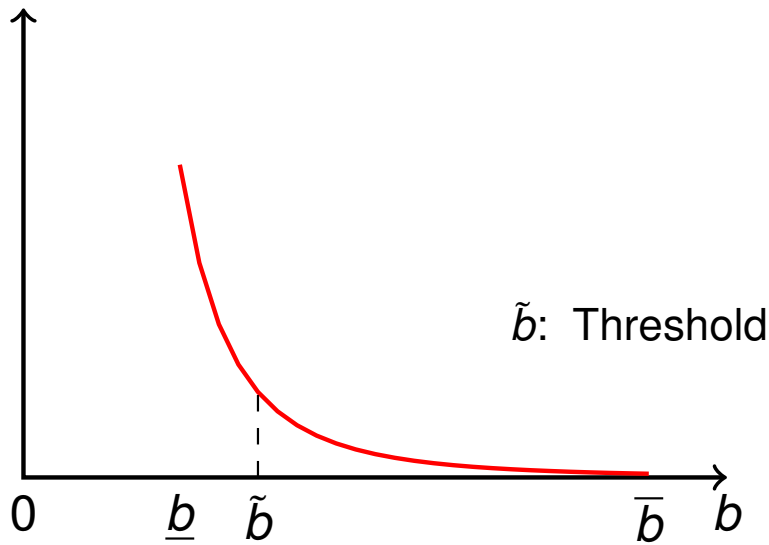
Distortion of input choices

Cascading; Distortion of input and output choices

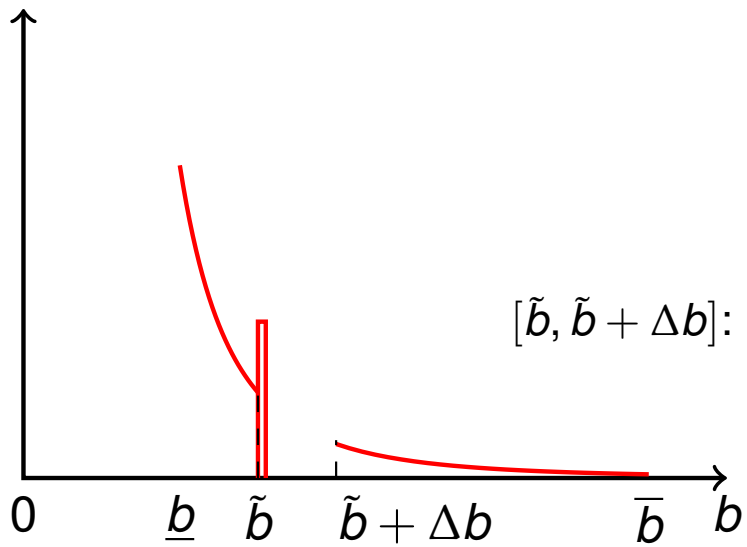
Bunching

- Firms right above the threshold prefer to lower output to avoid paying tax (bunching)
- This is an additional distortion

Bunching



Bunching



$[\tilde{b}, \tilde{b}+\Delta b]$: Bunching

Bunching

- Strategic interaction between the two sectors in terms of bunching incentives
  - The incentive of a downstream firm to bunch depends positively on how many upstream firms are unregistered
  - The incentive of an upstream firm to bunch depends positively on how many downstream firms are unregistered

Simulations

- We set the Pareto distribution parameters

$$\underline{a} = \underline{b} = 10, \overline{a} = \overline{b} = 500, c = 1.2$$

- The tax: 17.5%

- The administrative and compliance costs

$$A = 1,500, \Gamma = 500$$

- Number of firms: $1,000$ downstream and 200 upstream

Simulation results (no bunching yet)

	U registered
Min U turnover	17,522
Max U turnover	876,113
Min D turnover	6,992
Max D turnover	349,598
U Threshold	17,522
D Threshold	81,905
Tax revenue	2,459,305
Welfare	250,919

	U registered	Same threshold
Min U turnover	17,522	17,153
Max U turnover	876,113	857,700
Min D turnover	6,992	7,250
Max D turnover	349,598	362,477
U Threshold	17,522	62,750
D Threshold	81,905	62,750
Tax revenue	2,459,305	1,984,618
Welfare	250,919	348,782

	U registered	Equal thresholds	Unequal thresholds
Min U turnover	17,522	17,153	17,504
Max U turnover	876,113	857,700	875,203
Min D turnover	6,992	7,250	7,181
Max D turnover	349,598	362,477	359,026
U Threshold	17,522	62,750	43,709
D Threshold	81,905	62,750	82,829
Tax revenue	2,459,305	1,984,618	2,061,612
Welfare	250,919	348,782	365,744

Main result (so far)

- When we explicitly account for the production chain (upstream-downstream structure), optimal threshold, same for all sectors, is lower, than when all upstream firms are assumed to be registered
- Intuition: Taxing inputs is more distortive than taxing output
- Ideally, the social planner would like a low upstream threshold, so that most U firms are registered
- If, however, the threshold must be the same (for practical reasons), then it goes down

Next steps

- Allow for bunching at both sectors
- Better calibration of the simulation

Concluding remarks

- Optimal VAT threshold(s) in an upstream-downstream production chain
- Literature has ignored the upstream-downstream link
- So, the recommended thresholds are very likely to be biased with significant welfare/revenue implications
- **Result:** When the same threshold must be imposed, it should be lower than when the production chain link is ignored and all upstream firms are assumed to be registered
- Bunching at both sectors, on top of this, will have an additional effect