



Tax Administration
Research Centre

Optimal VAT Threshold(s)

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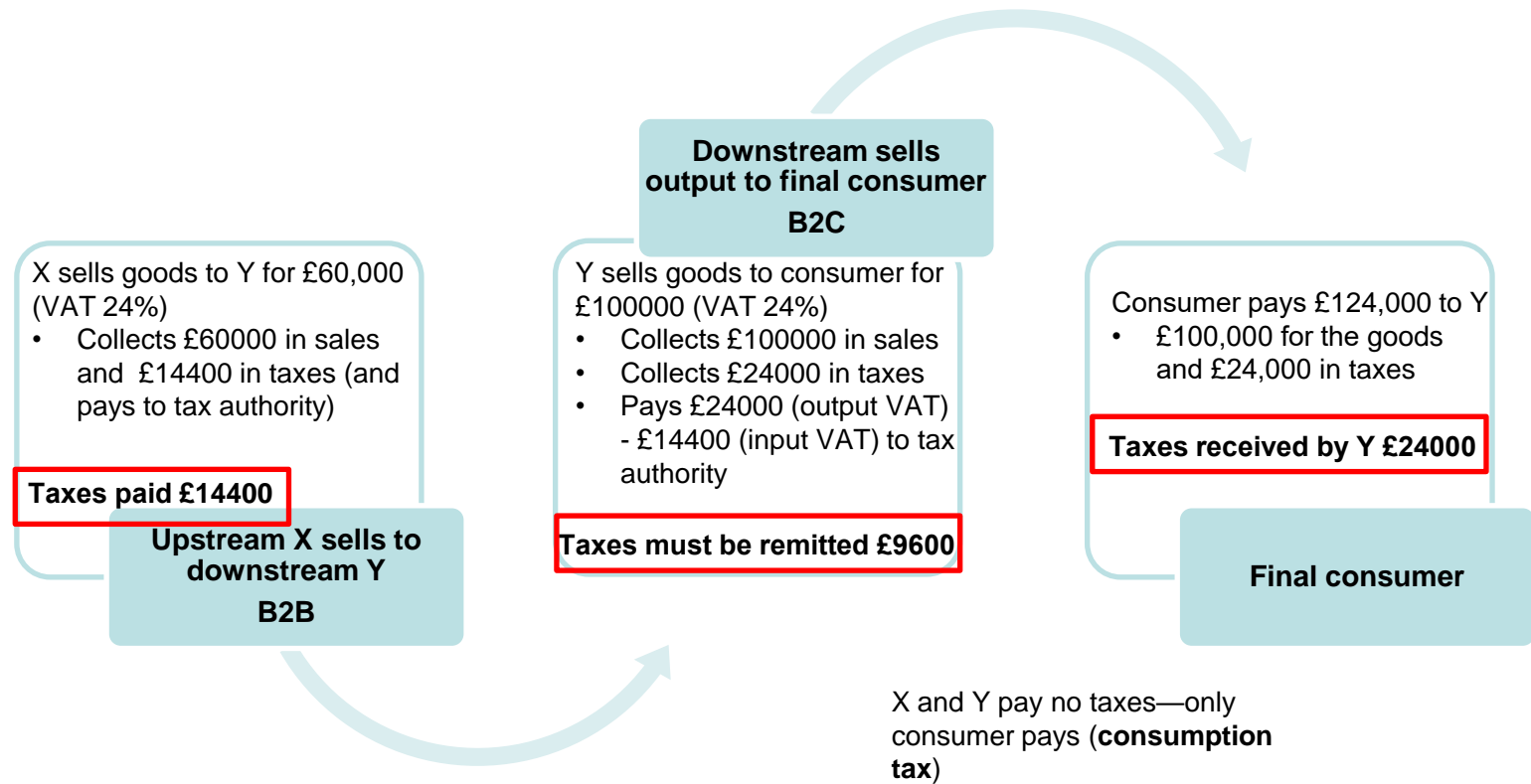
Economic
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Overview

- Value Added Tax
 - (Ingenious) consumption tax system based on collecting taxes in stages (French invention... 1954)
 - Over 160 countries have implemented VAT in almost 70 years
 - At each stage in production chain Added Value created is taxed
- Why VAT?
 - It is 'production neutral'
 - Additionally, it links businesses together ('paper trail of transactions')
 - Creating a 'visible' network and is known to be conducive to more compliance than General Sales Tax (GST)
 - Equivalent to a GST (if all firms are registered)

VAT stages



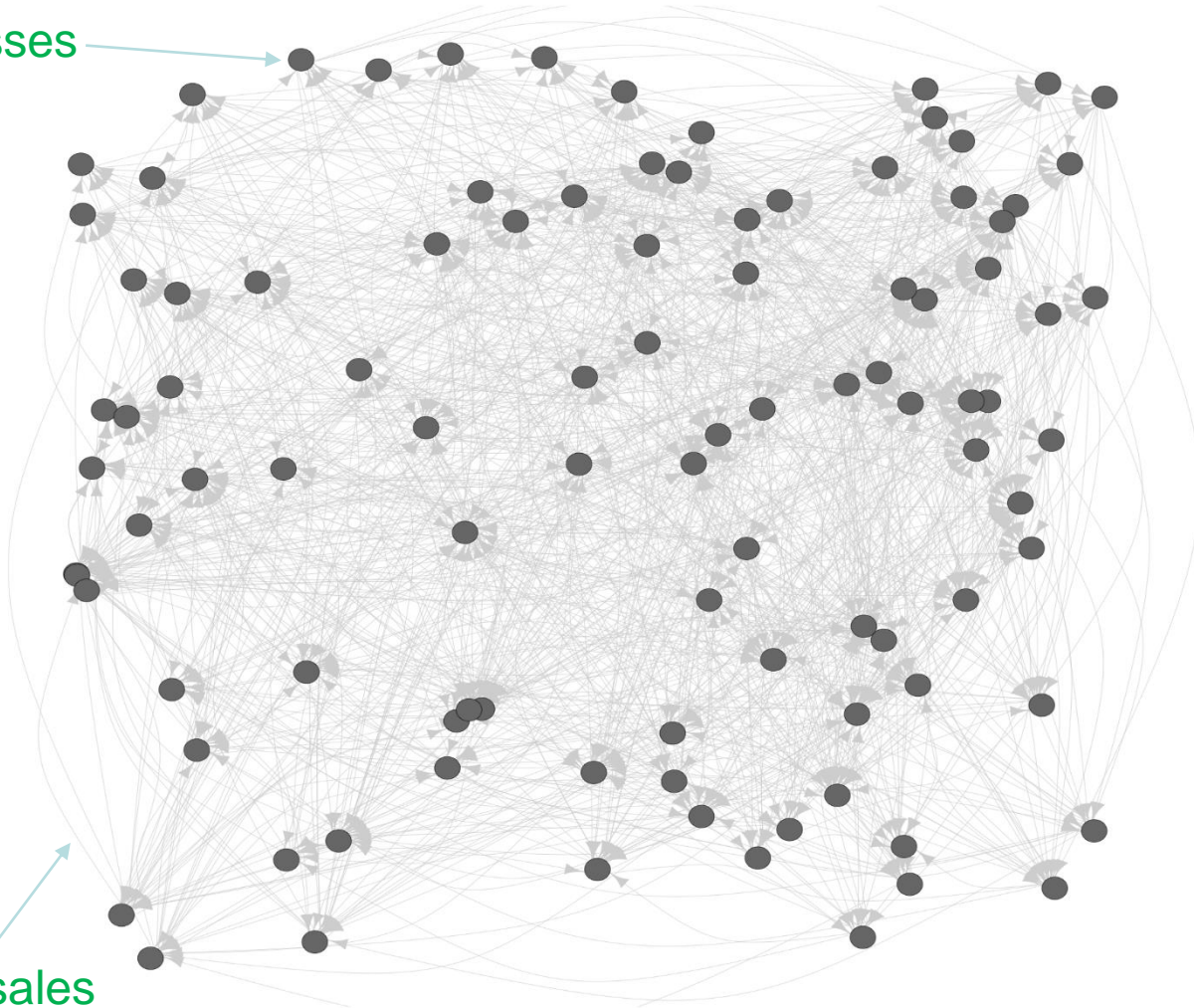
Important: There is an explicit credit and refund mechanism

What if non VAT registration?

- If a firm is non VAT registered then mechanism **credit-refund** mechanism breaks down and the VAT is **not production neutral**
- If upstream is not VAT registered, and downstream is, then there is cascading (tax on tax)
 - Upstream purchases goods tax-inclusive, cannot credit tax and then downstream levies VAT on sales
 - Tax paid on inputs is not neutralised
- If upstream is VAT registered, and downstream is not, then price of downstream is tax-inclusive
 - Input price of downstream is higher, but consumer price might be lower since downstream does not levy tax on final good

VAT network (VAT registered)

Dots are businesses
linked through
'invoices'

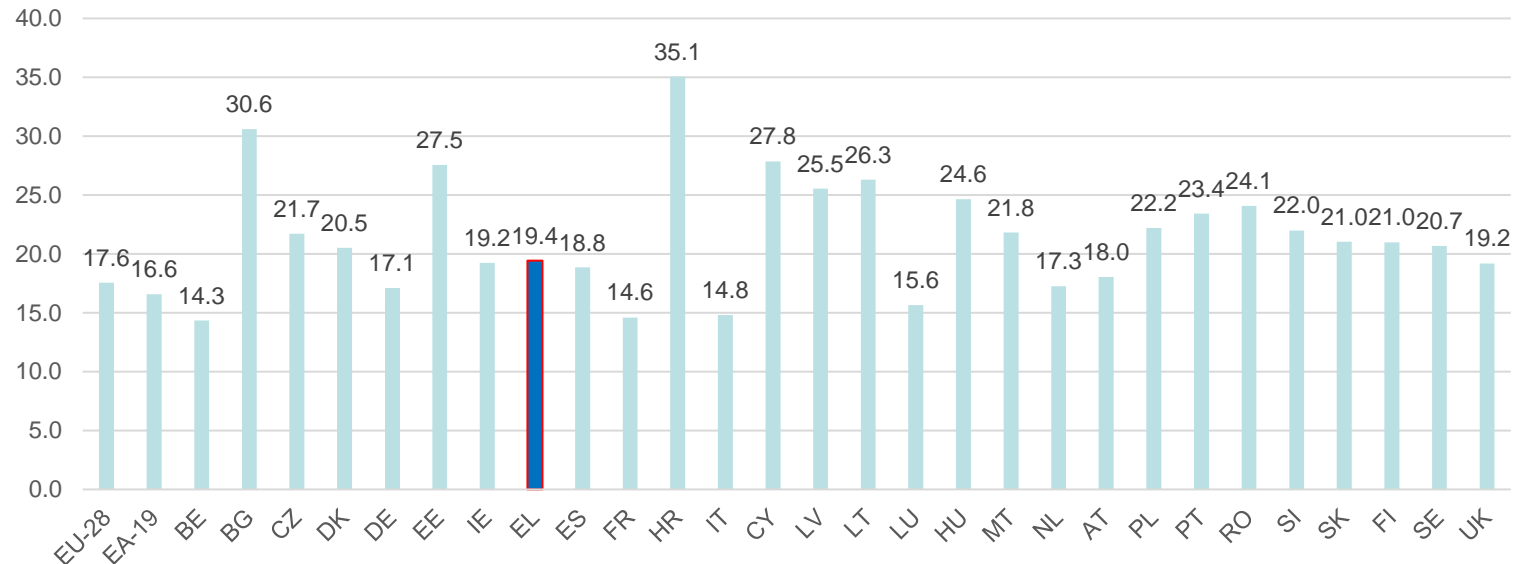


And arrows are sales

Significant revenues collected

- VAT collects significant revenues and is one of the main sources of tax revenues

D.211 Value Added Taxes (% of Total Revenues, 2018)



As with all taxes, there are compliance issues

- Significant VAT Gap (a worldwide phenomenon)

Member State	VAT Gap %	VAT Gap (Revenues in €mn)	Member State	VAT Gap %	VAT Gap (Revenues in €mn)
Belgium	12%	3996	Lithuania	25%	1119
Bulgaria	12%	625	Luxembourg	1%	23
Czechia	12%	2082	Hungary	14%	1893
Denmark	7%	2235	Malta	2%	13
Germany	10%	25016	The Netherlands	5%	2744
Estonia	5%	122	Austria	8%	2444
Ireland	13%	1938	Poland	14%	5764
Greece	34%	7399	Portugal	10%	1929
Spain	2%	1806	Romania	36%	6413
France	7%	12030	Slovenia	4%	128
Croatia	7%	459	Slovakia	23%	1791
Italy	24%	33629	Finland	7%	1622
Cyprus	1%	11	Sweden	1%	654
Latvia	15%	385	United Kingdom	11%	19199

VAT and policy issues

- Key policy issues related to VAT
 - How many tax rate(s), if any, and what level?
 - Should there be exempted goods?
 - Should there be a VAT registration threshold?
 - And if yes:
 - Should it be uniform across businesses/sectors?
 - What level should be set at?

Overview: Threshold

- Almost all VAT systems are subject to a VAT registration threshold
 - Idea:
 - If gross sales (turnover) are **below** a threshold then VAT registration is **voluntary**
 - If gross sales (turnover) are **above** then **VAT registration is compulsory**
- What does registration mean in practice?
 - If VAT register (and so a firm has a VAT ID) then
 - It can levy VAT on sales
 - But also **credit VAT on input purchased**



VAT threshold

- Thresholds vary across countries, and thresholds can be single or multiple

Thresholds vary

Country	Threshold, Euros	VAT Rate (Standard)	Effective Rate
Bulgaria	25,000	9%	6%
Greece	10,000	24%	13%
UK	98,000	20%	9.5%
Italy	15/20/35 and 40,000	22%	10.2%
Ireland	37,000 or 75,000	23%	10.1%
Denmark	6,700	25%	14.7%
Spain	N A	21%	8.5%
Germany	17,000	19%	10.6%

Why a threshold?

- Empirical regularity:
 - Most revenues (80:20 rule) come from high-turnover firms (80:20 rule)
 - Therefore setting a threshold saves on
 - ✓ Compliance costs (for both Tax Authority and firms)
- At the expense of
 - ✓ Revenue loss through...
 - ✓ Production inefficiency through tax cascading...
 - ✓ Production inefficiency through firms **bunching** below the threshold...
 - ✓ But also those who pretend they move to the threshold...(evasion)

Optimal threshold: An unexplored issue

- Optimal threshold widely applied...
- Only paper that discusses and derives rule of thumb is Keen and Mintz (JPubE: 2004)

Optimal threshold

- Easy to use 5-parameter rule

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

- But it has a significant limitation, as it assumes **no** B2B transactions
- The implication is that (optimal) VAT threshold might be **over/under estimated (relative to existing estimates)**
 - ...With significant welfare and revenue consequences for Revenue Authorities

Research questions (of policy significance)

- If B2B and B2C are considered, what is the optimal threshold?
 - Since threshold defines VAT-registered and non VAT-registered
 - Who trades with whom?
 - Is there a ‘sorting’ in transactions across businesses (VAT registered with VAT registered)?
- How does this optimal threshold compare to the one followed in practice?

Overview of results

- Downstream firms have always an incentive to remain non VAT-registered
- Upstream firms have the incentive to VAT-register the more downstream firms are VAT-registered
- The calibrated optimal (revenue maximising) VAT threshold when B2B and B2C transactions are considered is lower than the one recommended (and when all upstream are registered)

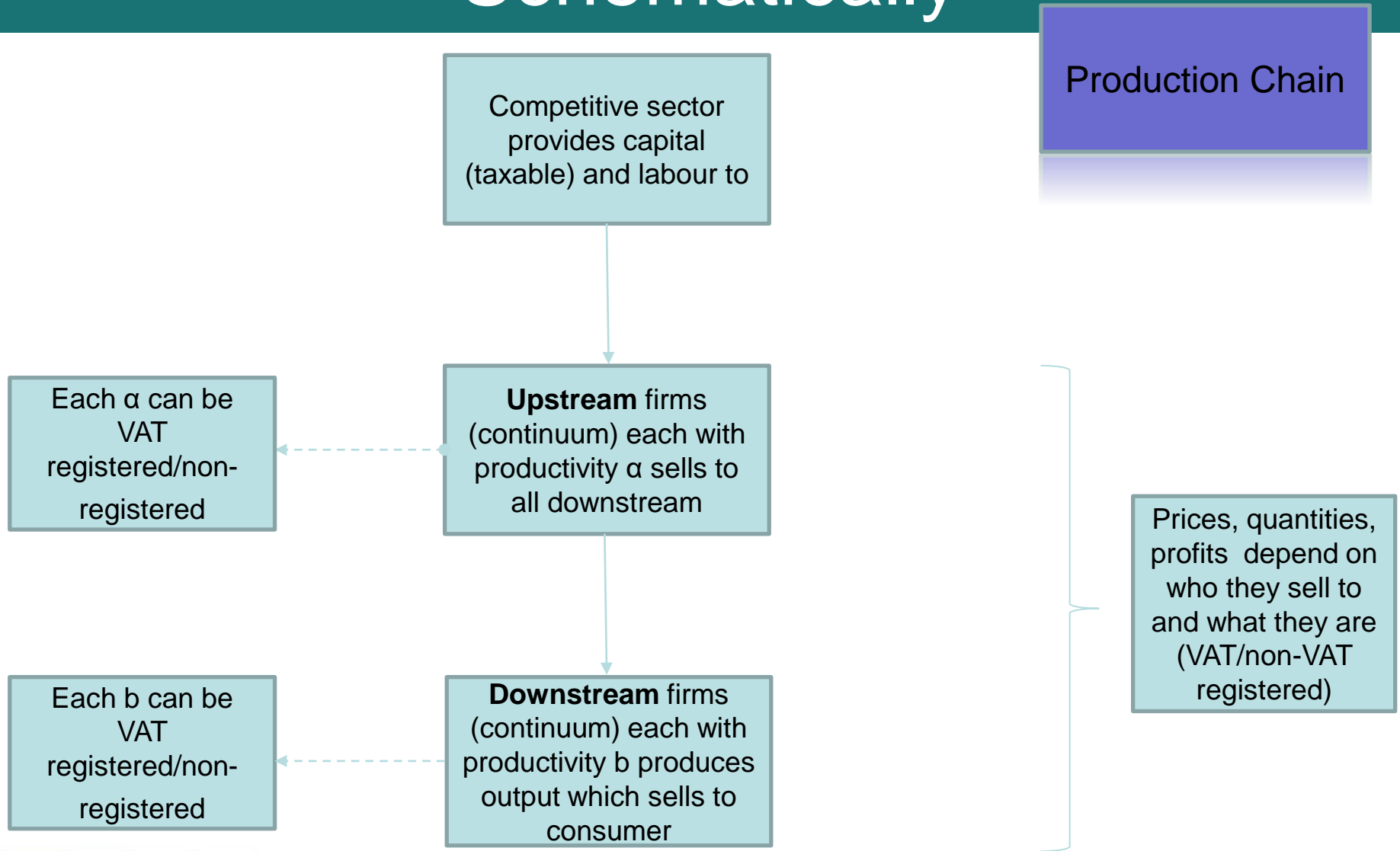
Road map

- ✓ Overview/motivation
- ✓ Research questions/overview of results
 - Brief (very) description of economy
 - Results (calibration to Bulgarian Tax Administrative Data)
 - Extensions

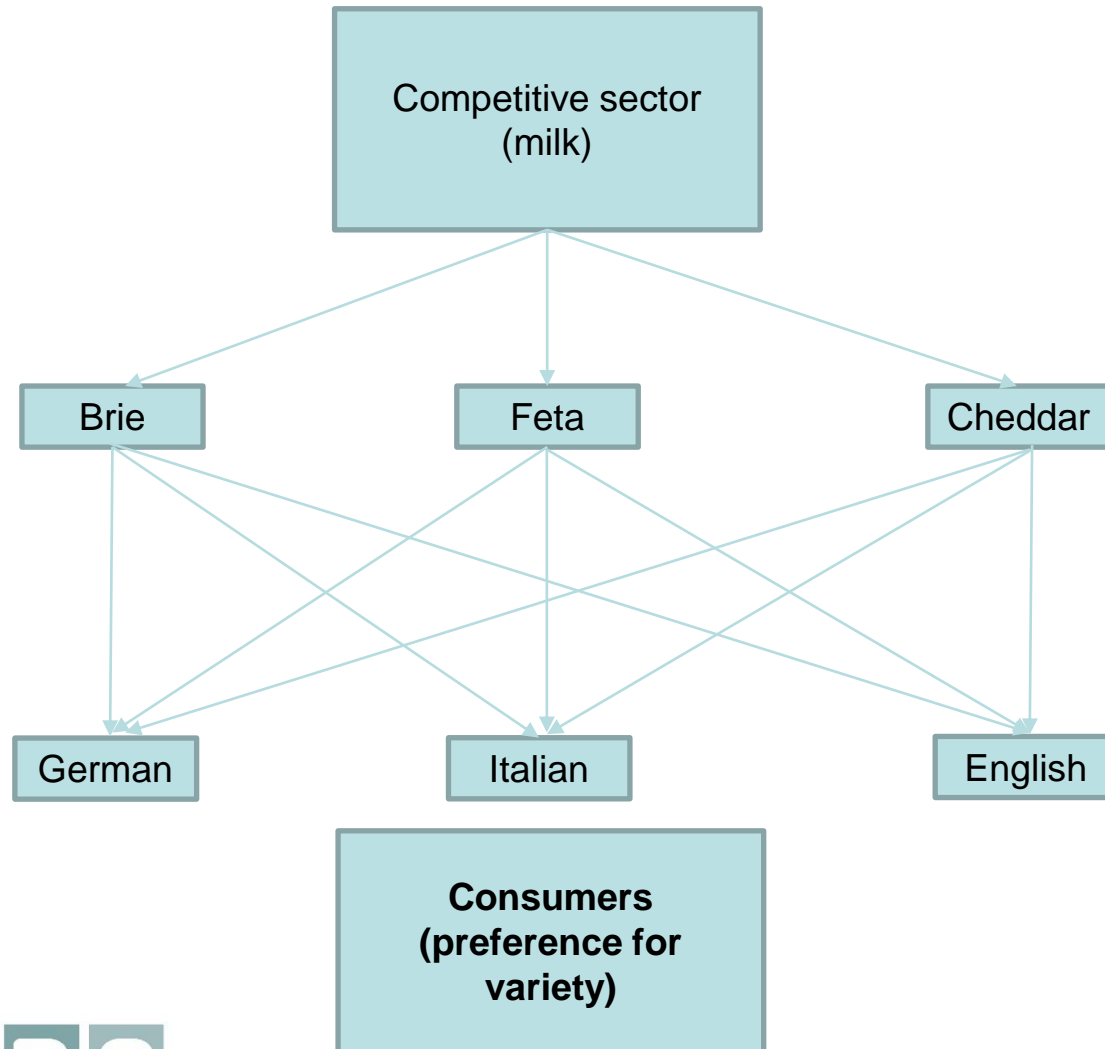
Description of economy (model)

- Monopolistic competition framework
- Upstream-downstream with B2B and B2C channel
- B2B sector consists of (a continuum) of firms selling to a continuum of B2C
- B2B firms combines inputs and all sell to representative consumer (B2C), who has preferences for variety (Dixit-Stiglitz preferences)
- All sectors produce but prices depend on registration status of firms...
- No evasion/misbehaviour allowed (but will/can be added)

Schematically



Schematically

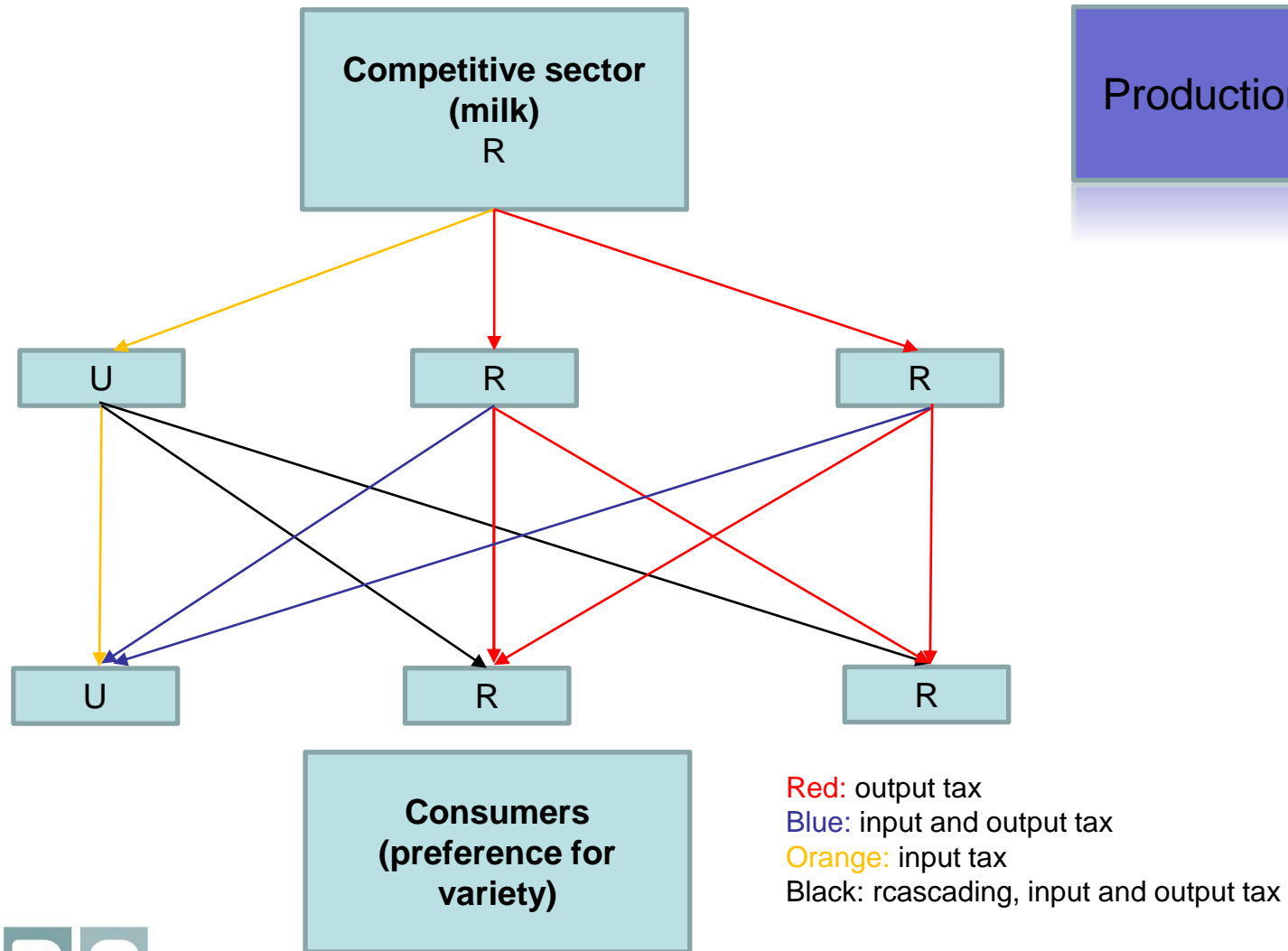


Production Chain

Upstream firms
(cheese makers)
Monopolistic competition

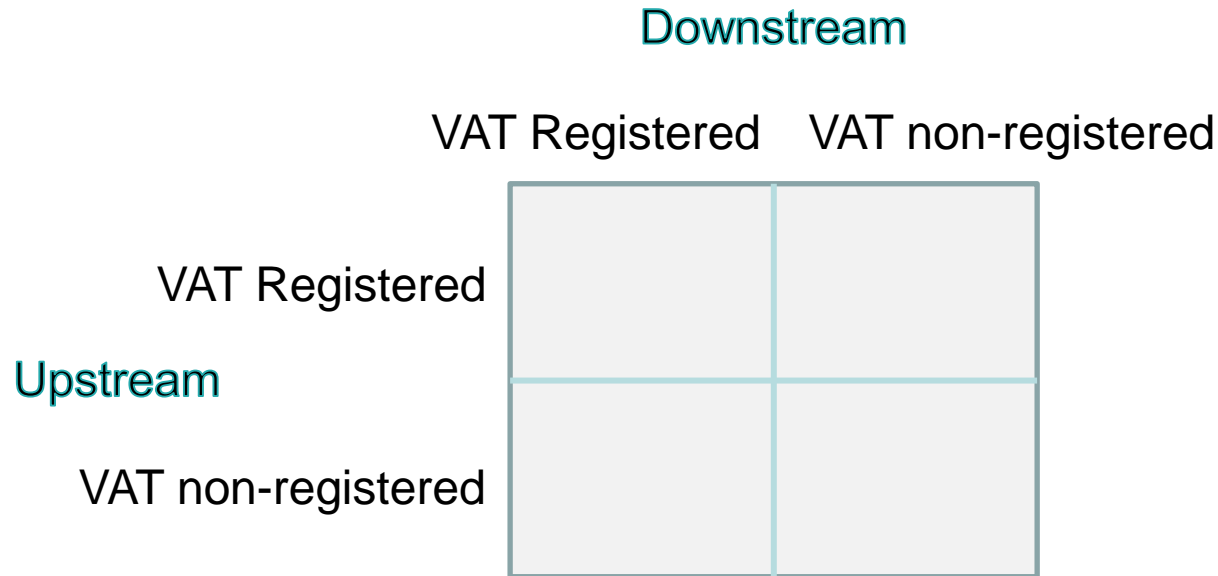
Downstream firms
(restaurants)
Monopolistic competition

Schematically



States of the (registration) world...

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



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

Elements: Pricing

■ Upstream:

- $p_I(n, i) = m_I c(n, i)$
- $p_I(r, i) = m_I c(r, i)$

$$p_I(n, f) > p_I(r, f)$$

■ Downstream

- $p_F(n, f) = m_F c(n, f)$
- $p_F(r, f) = m_F c(r, f)$

$$p_F(n, f) > p_F(r, f)$$

Elements: Cost – upstream

■ Cost (upstream):

- Productivity parameter, i , registration status, $\{n,r\}$, and prices of competitive sector

- $$c(n, i) = \frac{1}{i} (\omega^\sigma ((1+t)\tau)^{1-\sigma} + (1-\omega)^\sigma \omega^{1-\sigma})^{1/1-e_I}$$

- $$c(n, i) = \frac{1}{i} (\omega^\sigma (\tau)^{1-\sigma} + (1-\omega)^\sigma \omega^{1-\sigma})^{1/1-e_I}$$

- $$c(n, i) > c(r, i)$$

Elements: Cost – downstream

■ Cost (downstream):

- Productivity parameter, f , registration status, $\{n,r\}$, and prices of all upstream firms, their registration status, $\{n,r\}$, and the VAT threshold

- $$c(n, f, i) = \frac{1}{f} \left(\int_{\underline{i}}^i (p_I(n, i))^{1-e_I} M_I g_I(i) di + \int_{\bar{i}}^i ((1+t)p_I(r, i))^{1-e_I} M_I g_I(i) di \right)^{1/1-e_I}$$

- $$c(r, f, i) = \frac{1}{f} \left(\int_{\underline{i}}^i (p_I(n, i))^{1-e_I} M_I g_I(i) di + \int_{\bar{i}}^i (p_I(r, i))^{1-e_I} M_I g_I(i) di \right)^{1/1-e_I}$$

Result: Downstream

***Proposition:** All downstream firms prefer to remain non VAT-registered, irrespective of how many upstream firms VAT register*

- For downstream firms the cost is higher if they are non VAT-registered but the price they sell at is lower...and because the **demand effect offsets the cost effect** they prefer to remain unregistered

Result: Upstream

Proposition: *Suppose VAT registration is voluntary (and the compliance cost not too high) then whether upstream firms prefer to register or not depends positively on the fraction of downstream firms that are registered (and the intensity of taxable inputs purchased)*

- For upstream firms
 - The more taxable inputs purchased, the higher the incentive to register voluntarily for VAT
 - The more downstream are registered (so the less input distortion overall there is) the more upstream want to register

Tax Revenues (no bunching)

- *Tax base have 3 components*
 - *1. Revenues collected from the VAT-registered final good sector*
 - *2. Revenues collected from the intermediate goods sector sold to the non VAT-registered final good sector*
 - *3. Revenues collected from the sale of taxable input from the competitive sector to non VAT-registered firms in the intermediate sector*

Calibration

- We calibrate the model to Bulgarian Tax Administrative Data to determine optimal threshold
 - Have access to number of businesses
 - B2B
 - B2C
 - Cost of compliance
 - Assume productivity follows a Generalised beta distribution
 - And other production/utility parameters taken from literature

Table 8: Revenue maximization under different policy scenarios. Administrative costs

$A_I = A_F = 3500$, compliance costs $\Gamma_I = 2484$, $\Gamma_F = 2484$

	Benchmark	Max wrt \hat{f} (1)	Max wrt \hat{i} (2)	Max wrt both (3)	Max uniform (4)	All I reg. (5)
Net tax revenues (in bil.)	1.044	1.202	1.116	1.266	1.266	1.153
Perc. change rel. to bench.	-	15.179	6.937	21.291	21.289	15.179
Tax revenues (in bil.)	7.102	7.406	6.824	7.139	7.143	7.419
Perc. change rel. to bench.	-	4.286	-3.918	0.525	0.579	4.461
\hat{i}	0.510	-	1.169	1.105	1.097	0.002
\hat{i} (in thsnd.)	50091.780	-	506092.264	432266.732	424521.363	0.005
\hat{f}	0.487	1.063	-	1.063	1.068	1.063
\hat{f} (in thsnd.)	50071.845	440406.730	-	418576.939	424521.363	441419.648
Share above cutoff I	0.815	0.815	0.359	0.397	0.402	1.000
Share above cutoff F	0.221	0.075	0.221	0.075	0.074	0.075
Sales share above cutoff I	0.994	0.993	0.832	0.851	0.854	1.000
Sales share above cutoff F	0.969	0.774	0.967	0.764	0.762	0.774

Notes: We consider 5 different experiments: (1) Maximize tax revenues with respect to \hat{f} , keeping \hat{i} fixed at the benchmark value; (2) Maximize tax revenues with respect to \hat{i} , keeping \hat{f} fixed at the benchmark value; (3) Maximize tax revenues jointly with respect to \hat{f} and \hat{i} ; (4) maximize tax revenues subject to a uniform threshold; (5) Maximize tax revenues with respect to \hat{f} , keeping $\hat{i} = i_{min}$.

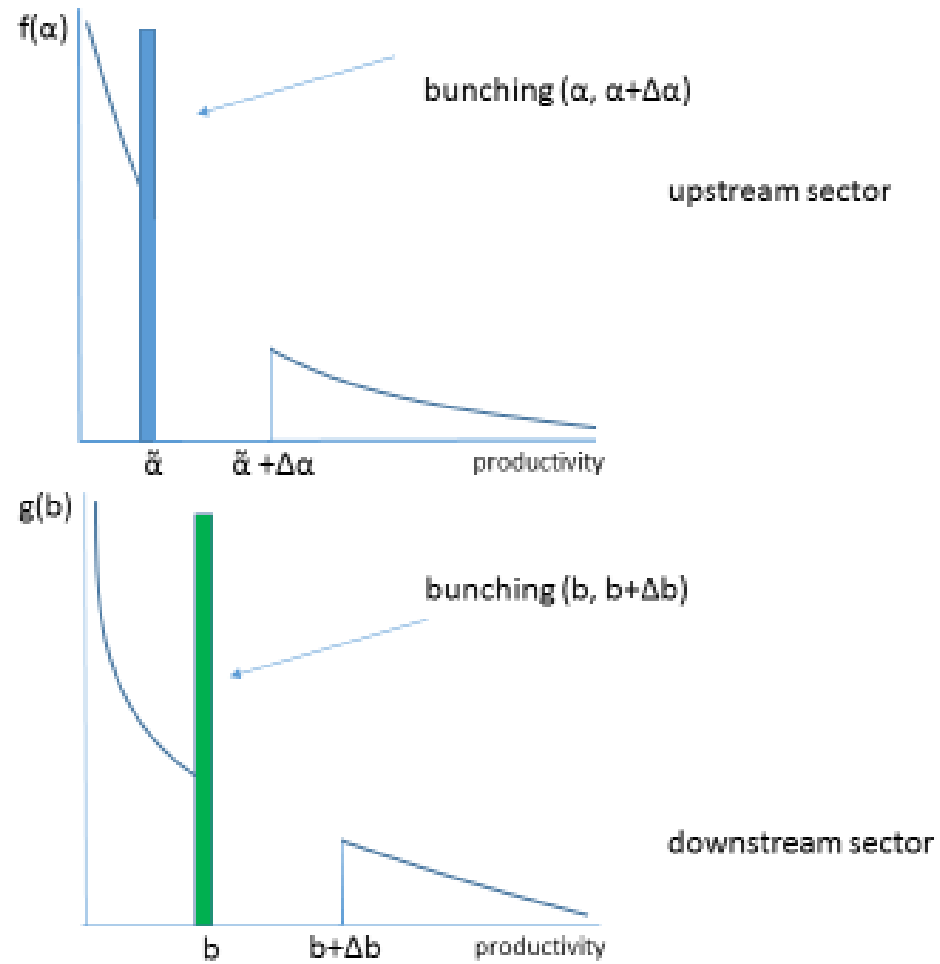
Concluding remarks

- Downstream firms would never register voluntarily
- Upstream firms may want to register voluntarily if **enough** downstream firms register
- Downstream incentives to bunch is affected by how many upstream firms register (and bunch)
- **Thresholds will affect bunching magnitude upstream and downstream...optimal threshold must account**
- Literature has ignored this interdependence, so the recommended thresholds are **very likely to be biased with significant welfare/revenue implications**
- **Policy prescription: Take production chain into account in determining optimal threshold**

Extensions

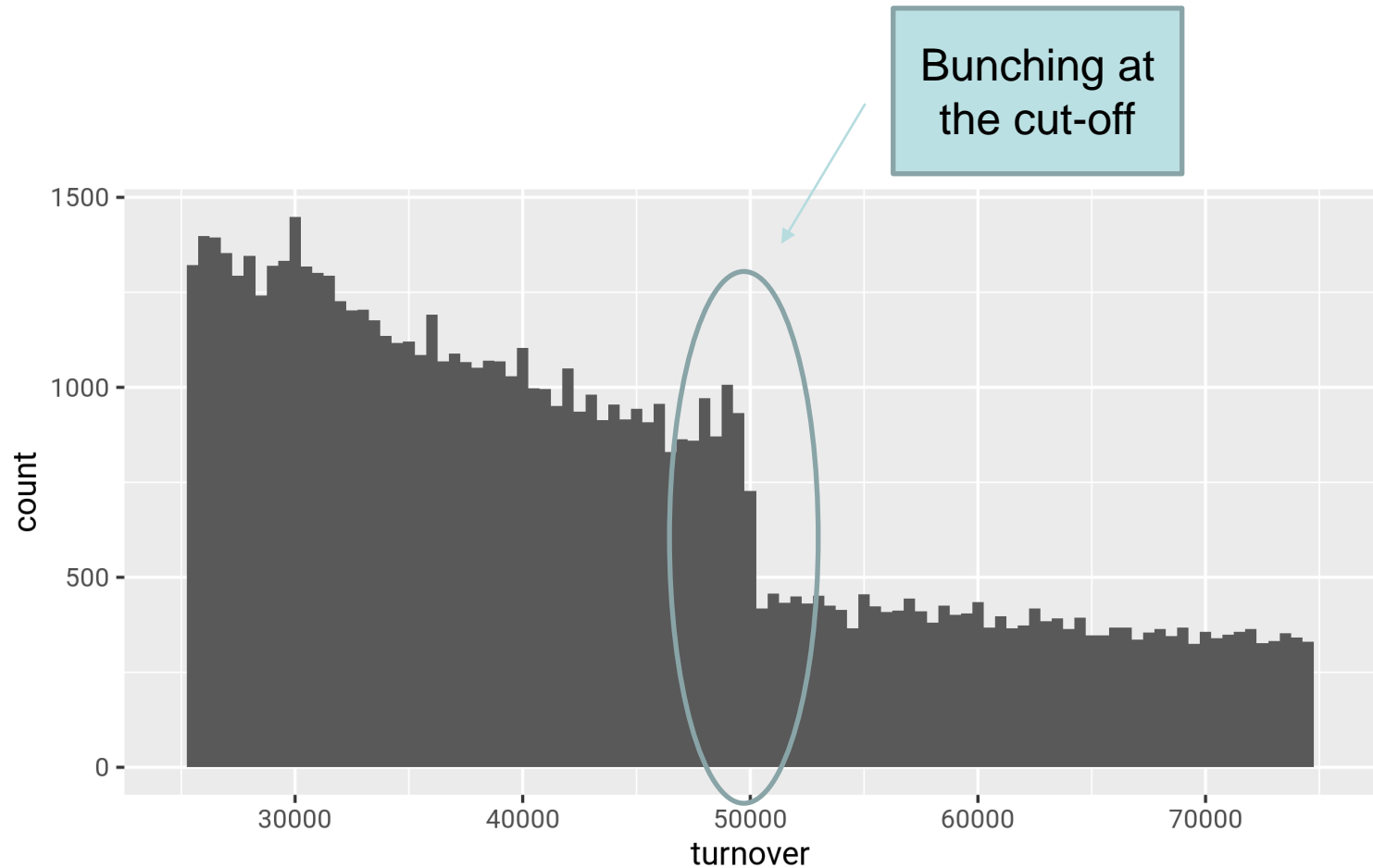
- Bunching (a realistic feature of behaviour) has been ignored
 - Firms strategically move to the left of the threshold

Bunching

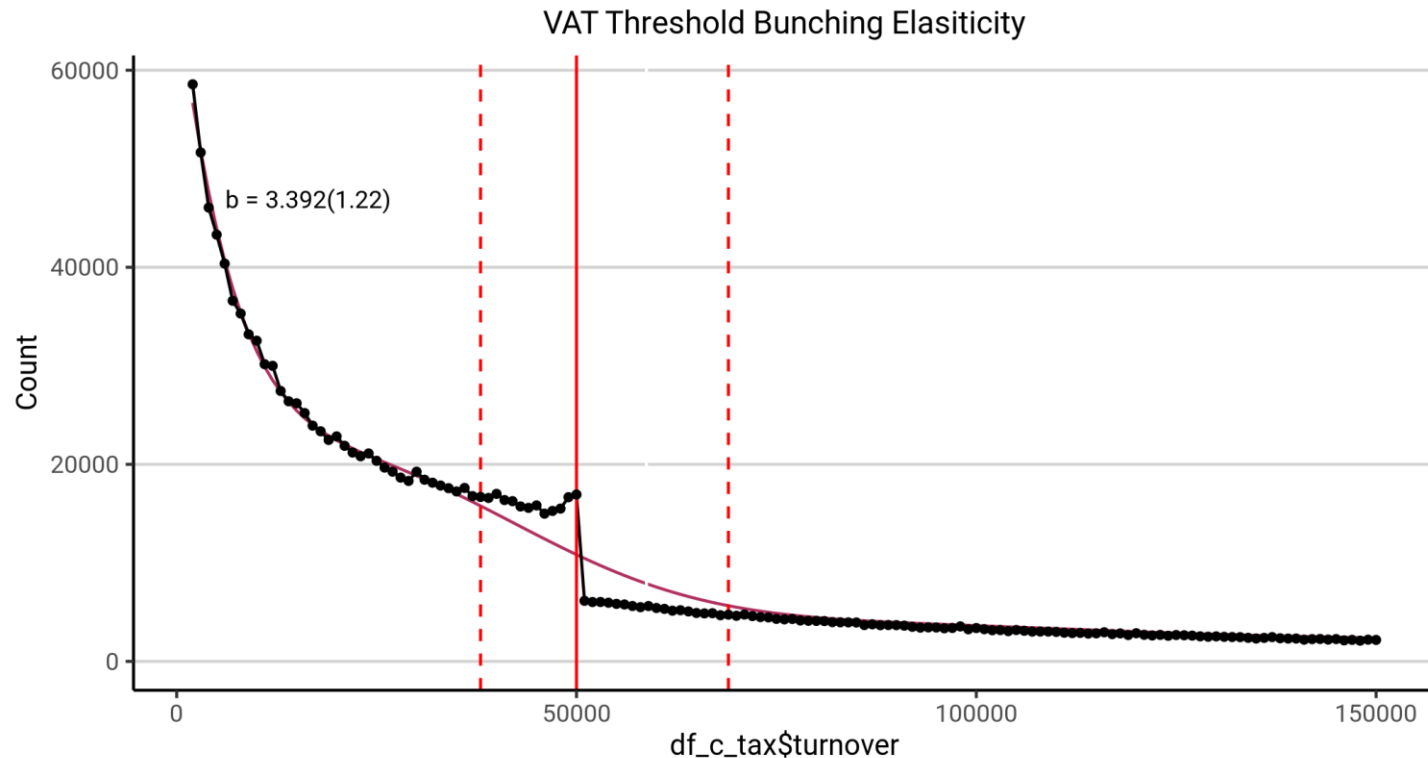


thresholds
jointly determined

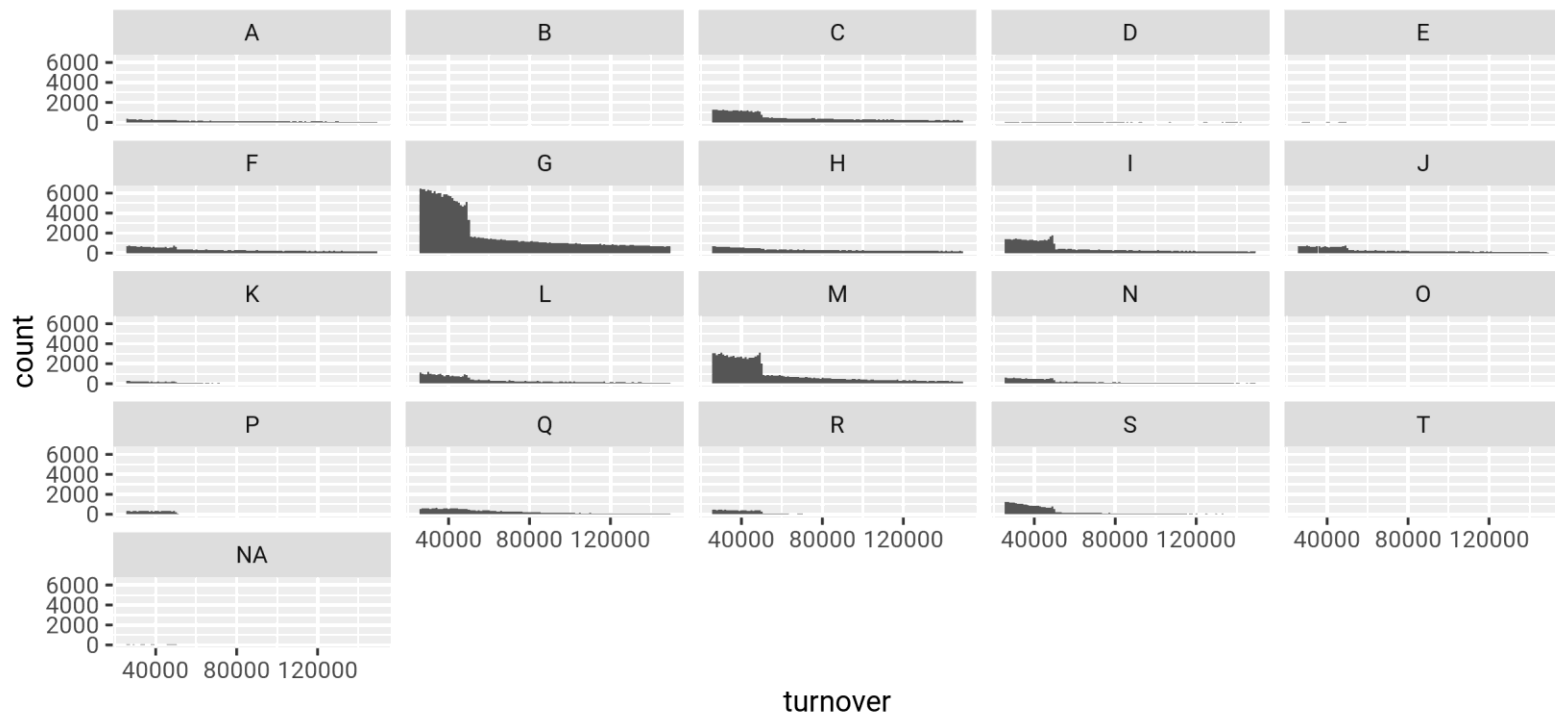
Zooming in...threshold 50k



'Notches' create bunching



And differs across sectors



Thank you

Thank you for listening!

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