VAT Threshold(s)

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Overview

- Value Added Taxes (VAT) are almost ubiquitous (>160 countries) and account for a sizeable and growing part of total revenues ($\approx$ 4/5.5% of GDP in developing/developed country)

- A common feature of VAT systems is 'thresholds' on turnover
  - Above the threshold registration is compulsory
  - High variation in thresholds: Cameroon 80,000$; Pakistan 22,700$; Albania 32,000$; France €35,000; Germany €100,000; UK £87,000

- Imposing a registration threshold is sensible and practical
  - **Compliance costs** push out of the market small firms
  - **Admin. and compliance costs** might be higher than revenues for small firms

- The **threshold induces distortions** in firms' decisions:
  1. Distortion of firms' size $\rightarrow$ **bunching** below the threshold
  2. Distortion of **prices and quantities of inputs and outputs**

Related literature

Most closely related papers in the VAT threshold literature:

- The impact of VAT thresholds on **firms' size** and **registration choice**:
  - Firm **splitting** to stay below threshold (Onji 2009)
  - Firm choice of **bunching** and/or **voluntary registration** below threshold (Almunia et al. 2019)
- The **spreading along the production-chain** of firms' responses to VAT
  - **Transmission of compliance** (de Paula and Scheinkman 2010, Hoseini 2019, Hoseini and Briand 2020)
  - Firms prefer to trade with firms with same registration status -**transaction sorting** (Gadenne, Nandi and Rathelot 2019)
  - Increase in **vertical integration** induced by VAT (Singh 2019)
- **Optimal VAT threshold**
  - Seminal paper Keen and Mintz (2004) identifies revenue maximizing threshold
  - Later extended to account for evasion and informality Kanbur and Keen (2014)
  - Their optimal threshold has been widely applied but entails simplificatory assumptions that we relax

Our paper studies optimal VAT thresholds in a richer modelling setting

Current shortcomings

The economy in Keen and Mintz (2004) consists of a **Competitive market** that provides inputs to a **Final goods sector**

- The production-chain is compressed into two layers
- Input and output **prices are fixed**

The Keen and Mintz model takes into account just one of the distortions induced by the VAT threshold - the size decision

- Cannot account for interdependence of registration choices across the production-chain
- Cannot account for the impact of price/quantity distortions across the production-chain
- Optimal VAT Thresholds in this simplified setting is very likely to be biased

Our contribution

Building on Almunia et al. (2019) we set-up a more realistic model of the economy:

- Three layers allowing for heterogeneity in input substitutability **Competitive, Intermediate and Final**
- We explicitly model B2B and B2C links
  - **Prices** along the production chain **are flexible**
  - Input bought from registered/non-registered firms **(input intensity) is flexible**
  - Bunching occurs both in the Intermediate and in the Final good sectors

Our model accounts for distortions due to **bunching** and **price/quantity choices** as well as **their propagation along the production-chain**

Research Questions:

- **What are the revenue maximizing thresholds** for the Intermediate and Final sector?
  - How does our optimal thresholds **compare to the Keen and Mintz (2004)?**
- **What are the welfare maximizing thresholds** for the Intermediate and Final sector?

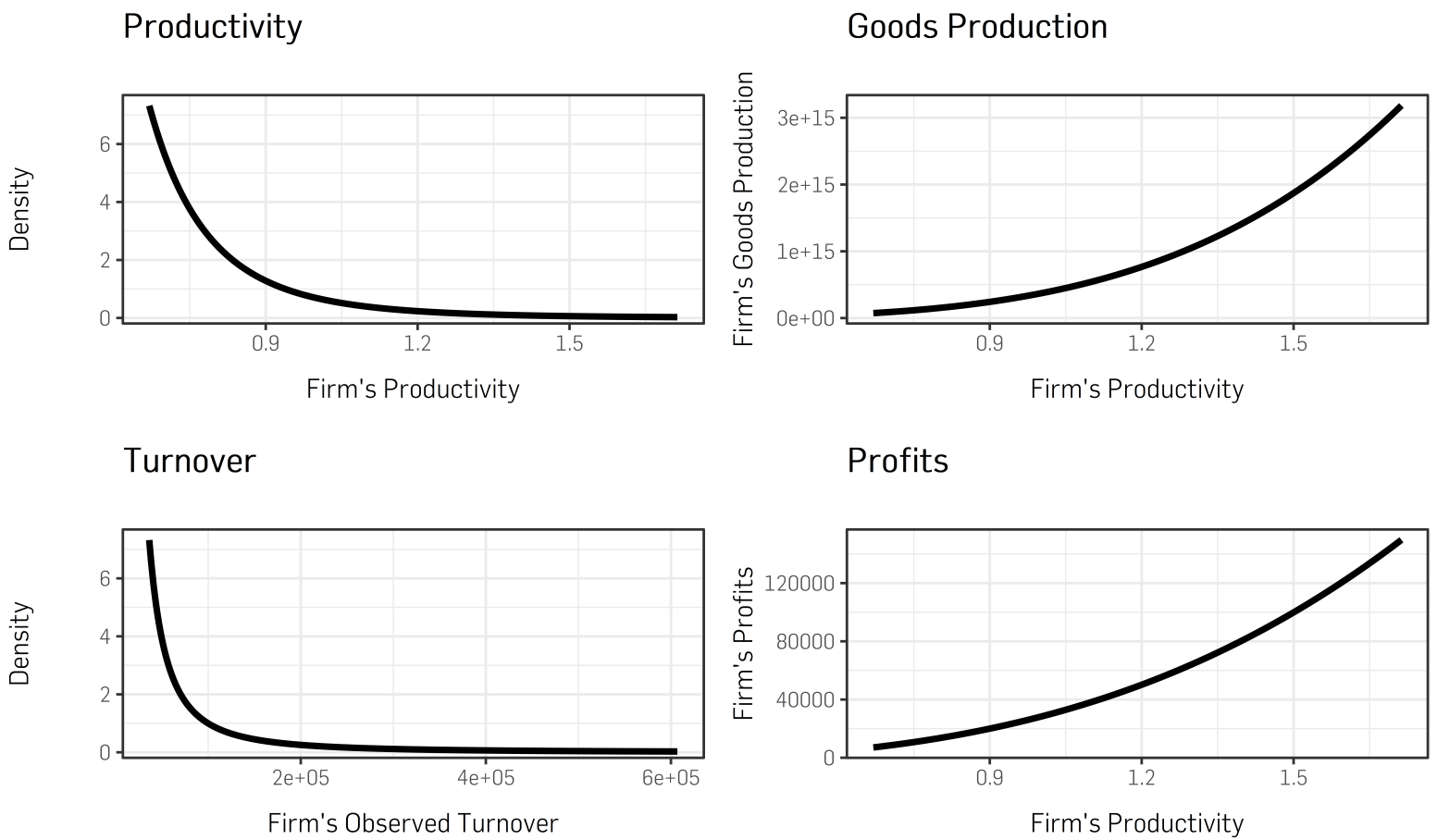
Model

(main insights)

Productivity and the firm

- The economy we model is a production-chain of **three sectors**: Competitive, Intermediate and Final
- The Competitive sector is **entirely registered** and with **fixed prices**
- Prices in the Intermediate and Final sectors depend on:
  - **Productivity** of the firms
    - More productive firms have lower prices (costs + markup)
    - We model productivities as Pareto distributed
  - **Registration status** of the firms - registration affects output buyers' price and VAT credits on input purchases

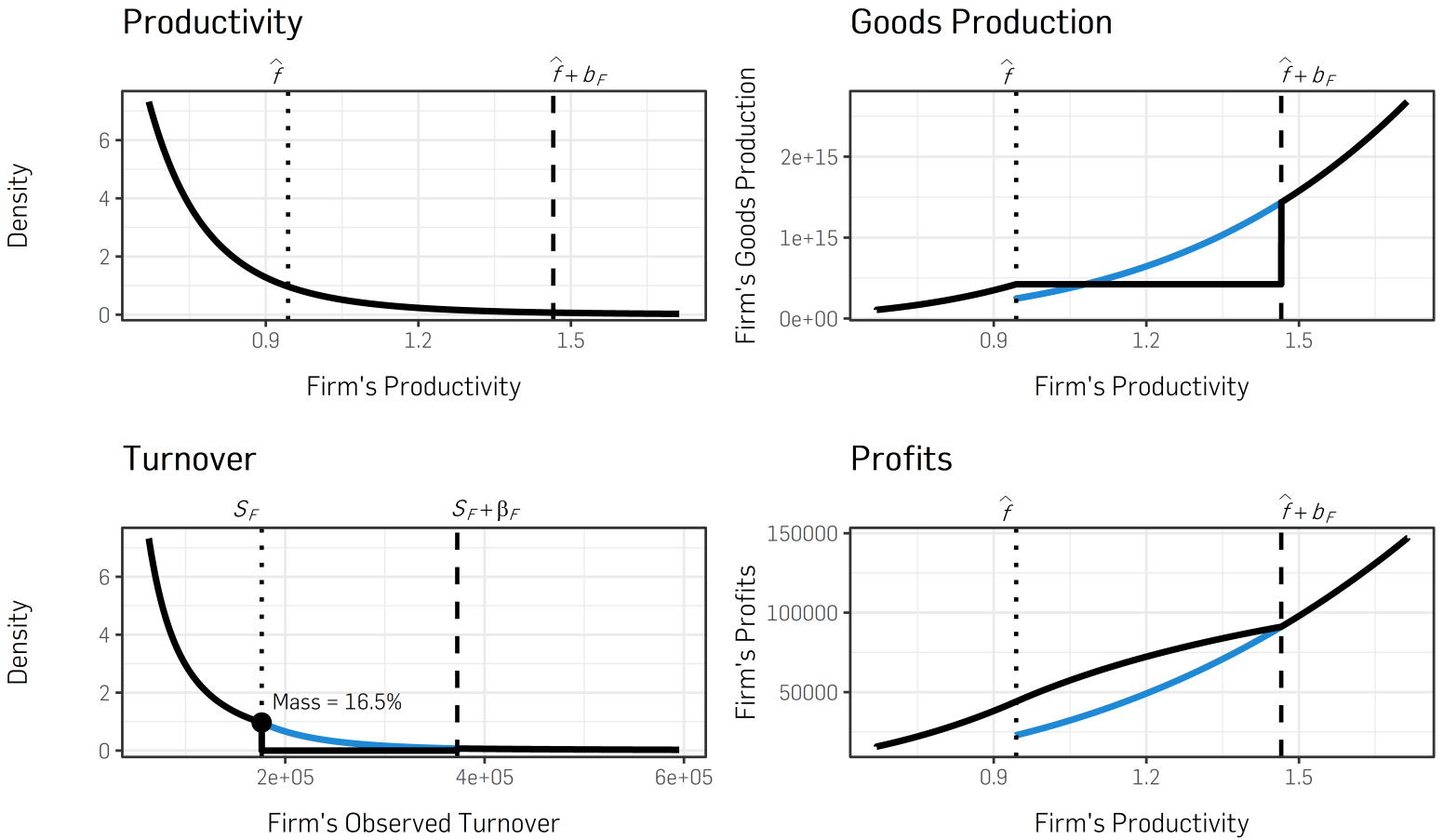
Productivity and the firm illustrated - w/o Threshold



Productivity, Threshold and Bunching

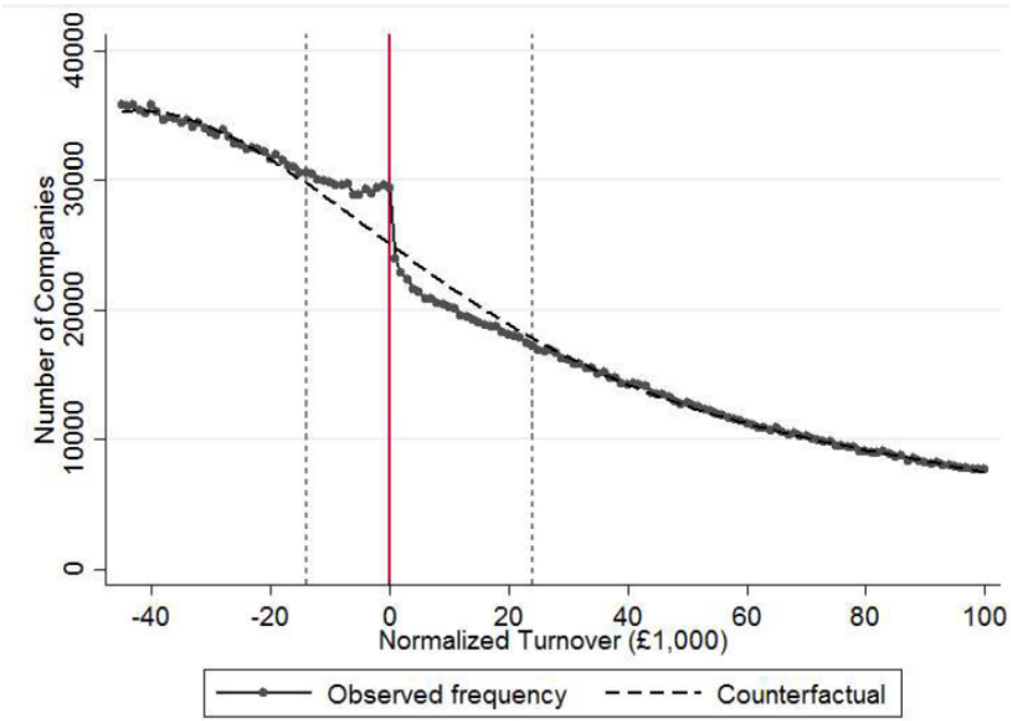
- Let's now consider the case where tax system entails a VAT threshold
- The VAT Threshold can be expressed in turnover or productivity terms
  - Threshold in Intermediate sector: turnover $s_I \longleftrightarrow$ productivity $\hat{i}$
  - Threshold in Final sector: turnover $s_F \longleftrightarrow$ productivity $\hat{f}$
- The threshold introduces a discontinuity in tax liabilities and profits
- Some firms with productivity higher than the threshold avoid registration by mimicking the ones at the threshold
  - They **sell same quantity/price** of firms at threshold
  - **Their profits are bigger** thanks to their higher productivity
  - This distortion wastes much of the possible gains from productivity
  - Above some value of productivity $\hat{i} + b_I$ $(\hat{f} + b_F)$ is more profitable to register
  - Bunching is performed by all firms:
    - Intermediate sector $i \in [\hat{i}, \hat{i} + b_I]$ - Final sector $f \in [\hat{f}, \hat{f} + b_F]$

Productivity and the firm illustrated - w/ Threshold



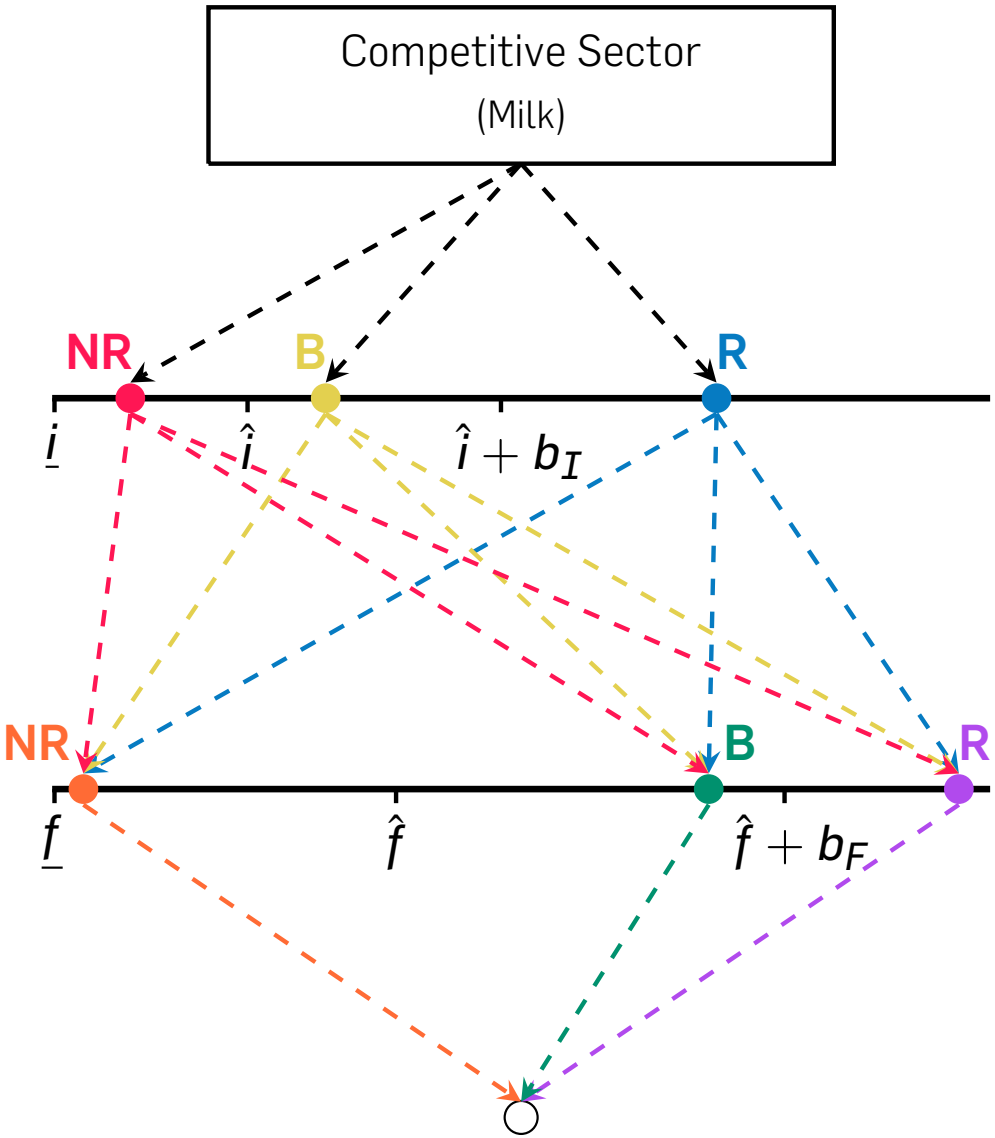
Bunching in UK

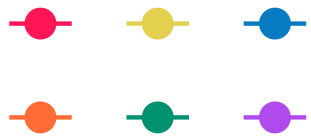
Turnover Distribution around the VAT Registration Threshold



Almunia et al. 2019

Illustration of the economy





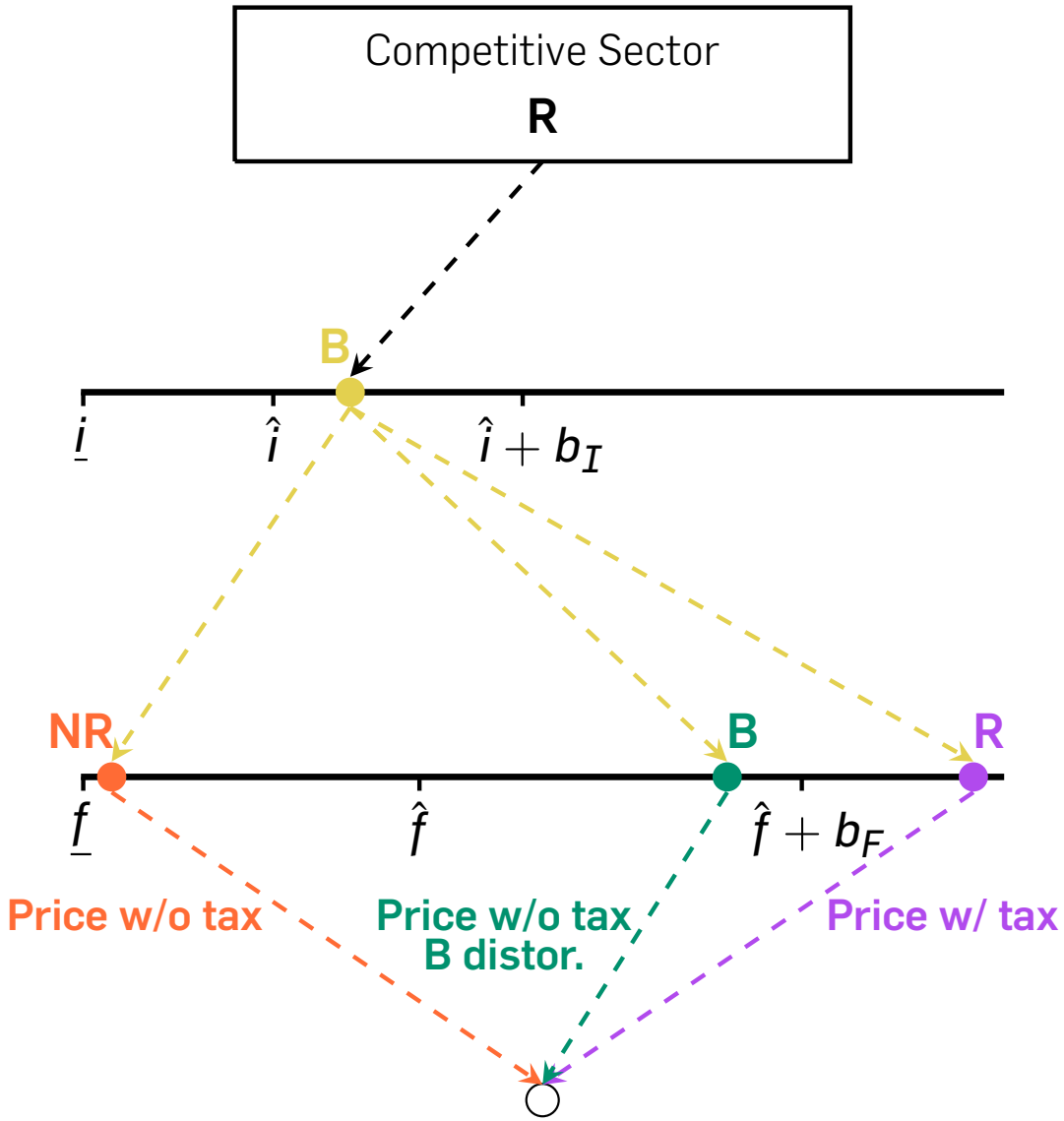
Different firms
(and goods sold)

Intermediate goods sector I
(Cheese: Brie, Mozzarella, Feta)

Final goods sector F
(Restaurants: French, Italian, Greek)

Consumers

Distortions - Intermediate Bunching



B:
Input distortion:
VAT not credited
Output distortion:
Indirect VAT effect (goods are complements)

R:
Input distortion:
Cascading
Output distortion:
Direct effect of VAT on price

B:
Input distortion:
Cascading
Output distortion:
Bunching + Indirect VAT effect (goods are complements)

NR:
Input distortion:
Cascading
Output distortion:
Indirect VAT effect (goods are complements)

Results

Interactions Intermediate/Final Sectors

- Strategic interaction of **registration** incentives
  - Final goods firms always prefer non-registration
  - Intermediate goods firms registration increases in the share of Final goods firms registered
- Strategic interaction of **bunching** incentives
  - The incentive to bunching for Final goods firms increases in the share of bunching Intermediate goods firms
  - The incentive to bunch for Intermediate goods firms increases in the share of bunching Final goods firms
- There is **imperfect sorting of trade** - Intermediate goods firms trade more with Final goods firms with same registration status

Model Calibration

We calibrate the model so to resemble the UK economy during 2004-2015

VAT tax rate	18.33%	
Cost of capital	15.4%	Maffii et al. (2019)
Wage	22700£	ONS (2020)
Admin. costs	1000 £	Keen and Mintz (2004)
Compliance costs	2000£	Walpole (2014)
N. firms Inter./Final	1.9 Million/1.9 Million	HMRC (2019)
Goods subs. Inter./Final	4/4	Melitz and Redding (2015)

The productivity distributions (Pareto) is calibrated to match empirical turnover
We minimize the MSE over:

- Percentage of Non-Registered and Bunching firms
- Turnover at threshold
- Turnover at the 90th quantile

	% NR+B	Turn. Thres.	Turn. 90q
Empirical	69.5	68900	151800
Calibrated Inter.	75.0	66263	158871
Calibrated Final	86.6	66155	161632

Optimal Thresholds - Net Revenues Maximization

- The optimal thresholds balance trade-offs involving
  - Administrative costs
  - Distortions of Tax Base
- We characterize analitically the optimal threshold (and the trade-offs involved) in the simple case where no bunching takes place
- We numerically compute optimal thresholds in the general case
  We study three settings where:
  1. We are the closest possible to the Keen and Mintz (2004) case
     - We compute the optimal Final sector threshold when the Intermediate sector is entirely registered. We then impose the optimal threshold to both sector while maximizing revenues
  2. The threshold is the same in both sectors
  3. The threshold can be different across sectors

Optimal Thresholds - Net Revenues Maximization

	Keen and Mintz Ext.	$s_I = s_F$	$s_I \neq s_F$
Intermed. Sect. - threshold turnover	176308	92331	86918
Final Sect. - threshold turnover	176308	92331	118634
Intermed. Sect. - % Nonreg.	80.316	30.195	0.002
Intermed. Sect. - % Bunch.	15.511	54.509	79.903
Intermed. Sect. - % Reg.	4.173	15.296	20.095
Final Sect. - % Nonreg.	81.389	50.011	69.023
Final Sect. - % Bunch.	16.459	42.704	25.844
Final Sect. - % Reg.	2.152	7.285	7.285
Total Net Revenues	4.04×10^{10}	4.06×10^{10}	4.10×10^{10}

Optimal Thresholds - Welfare Maximization

Welfare is a weighted sum of:

1. Individuals' utility
   - Individuals' utility (quasi-linear) **increases in Final goods consumed and disposable money**
   - Disposable money is equal to the various form of income (wage, capital, profits) minus the cost of the Final goods
2. Social value of net revenues
   - We assume the social value of net revenues to be 1.2 (Keen and Slemrod 2017)

Preliminary results show that welfare maximizing threshold is higher than the revenue maximizing one

- Welfare maximization entails higher production than in the revenue case
- Consequence of the role played by income and consumption utility

Conclusions

Concluding remarks

- VAT thresholds cause an array of distortions and interactions along the production chain
- Optimal VAT Thresholds not accounting for the production chain are very likely to be biased with significant revenue/welfare implications
- The revenue maximizing threshold computed accounting for the production chain is lower than the one in the simpler model

Next steps

- Complete the analysis of welfare maximizing threshold
- Investigate the relationship between product substitutability and optimal thresholds
- Allow for evasion and informality

Thank you for listening!

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