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Is buying on Amazon like trading with a digital Atlantis?

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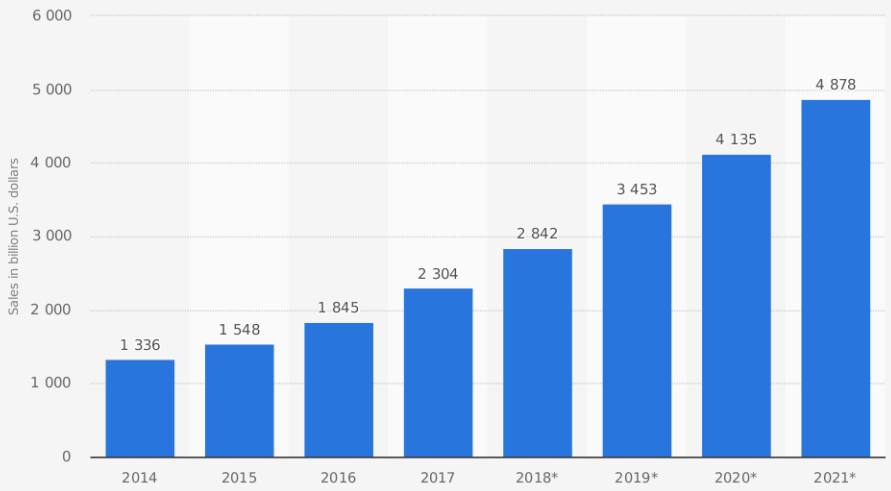
Why e-commerce?

- Volume of e-commerce is on a continuous growth path
- Share of e-commerce rises at the expense of traditional business
- Traditional business models face massive pressure



Source
eMarketer
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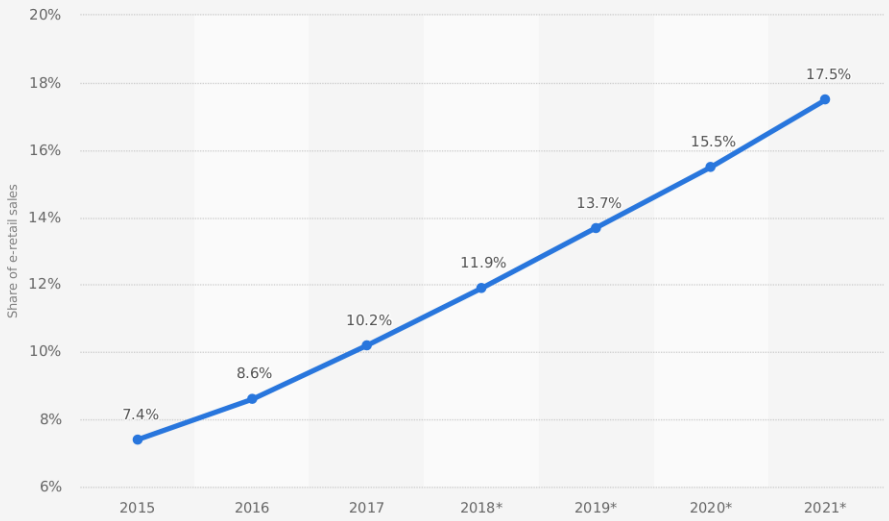
Additional Information:
Worldwide; eMarketer; 2014 to 2017



Sources
eMarketer; Website (retailtechnews.com)
© Statista 2018

Additional Information:
Worldwide; eMarketer; 2015 to 2017

What is our contribution?

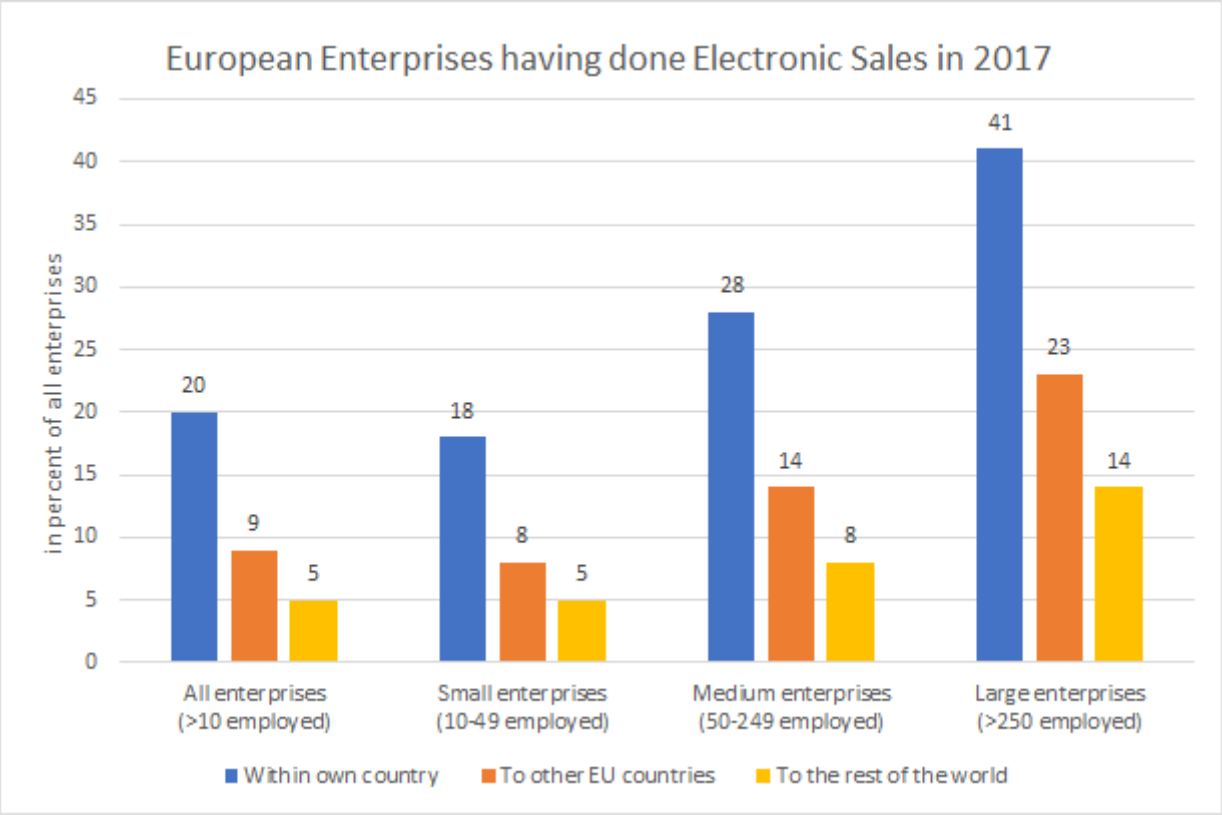
- Role of heterogenous firms in new markets (compare to Melitz 2003, Bernard et al. 2011, Helpman et al. 2004)
- E-commerce as more than just buyer-seller matching (compare to Freund and Weinhold 2004, Goldmanis et al. 2009)
- Non-linear effects in models of trade (Helpman & Redding 2010, Helpman et al. 2017)
- New empirical insights (compare to Anvari and Norouzi 2016, Couture et al. 2018, Dolfen et al. 2019, Duch-Brown et al. 2017, Falk and Hagsten 2015, Terzi 2011, Visser 2019)

This talk

- Stylized facts about e-commerce
- Theoretical approach
- Scenarios of e-commerce impacts
- Empirical approach & data
- Empirical results
- Conclusion

Stylized facts about e-commerce: 1/3

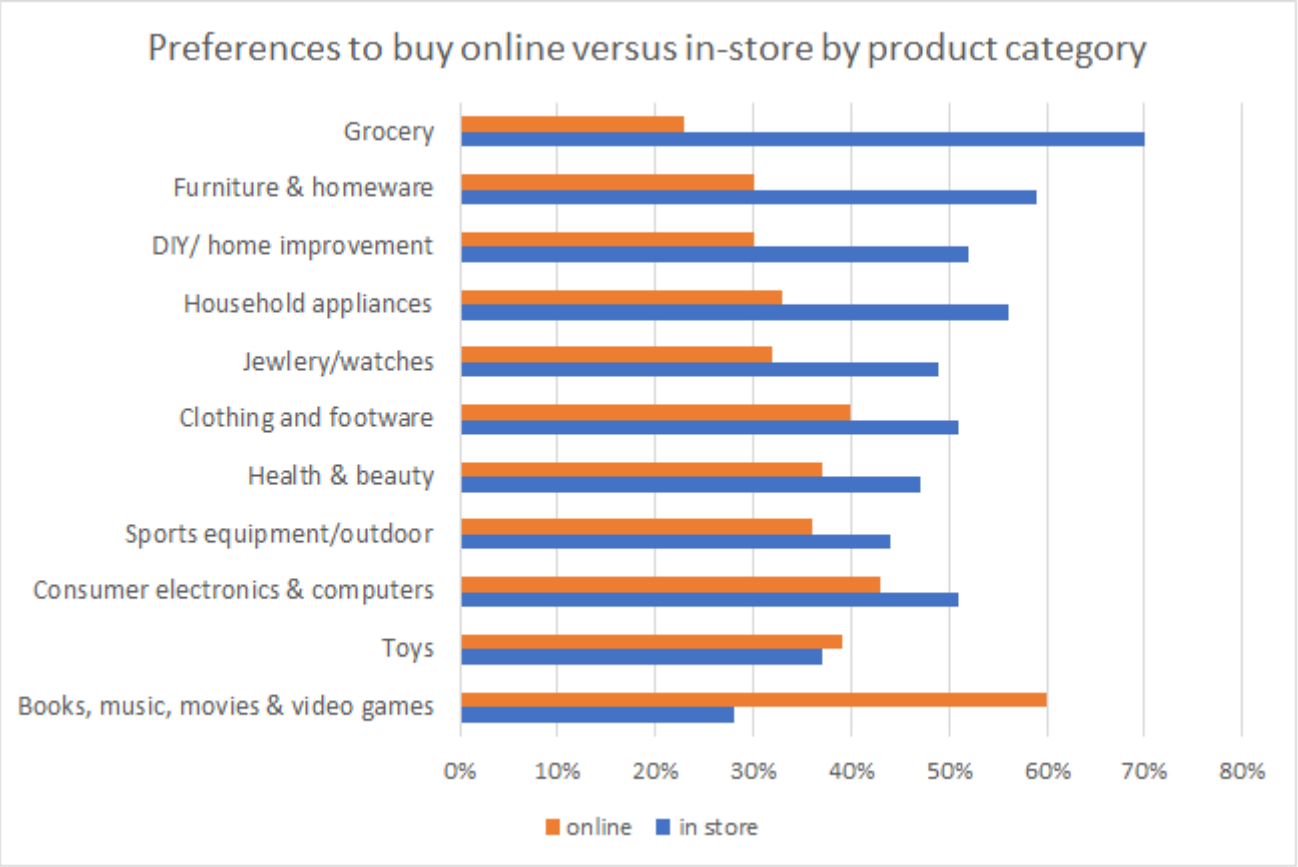
There is strong firm-level heterogeneity



Eurostat 2019

Stylized facts about e-commerce: 2/3

Consumer preferences for e-commerce versus traditional consumption differ across sectors



PwC 2017

Stylized facts about e-commerce: 3/3

Multichannel-marketing: big e-commerce players heavily invest in traditional infrastructure

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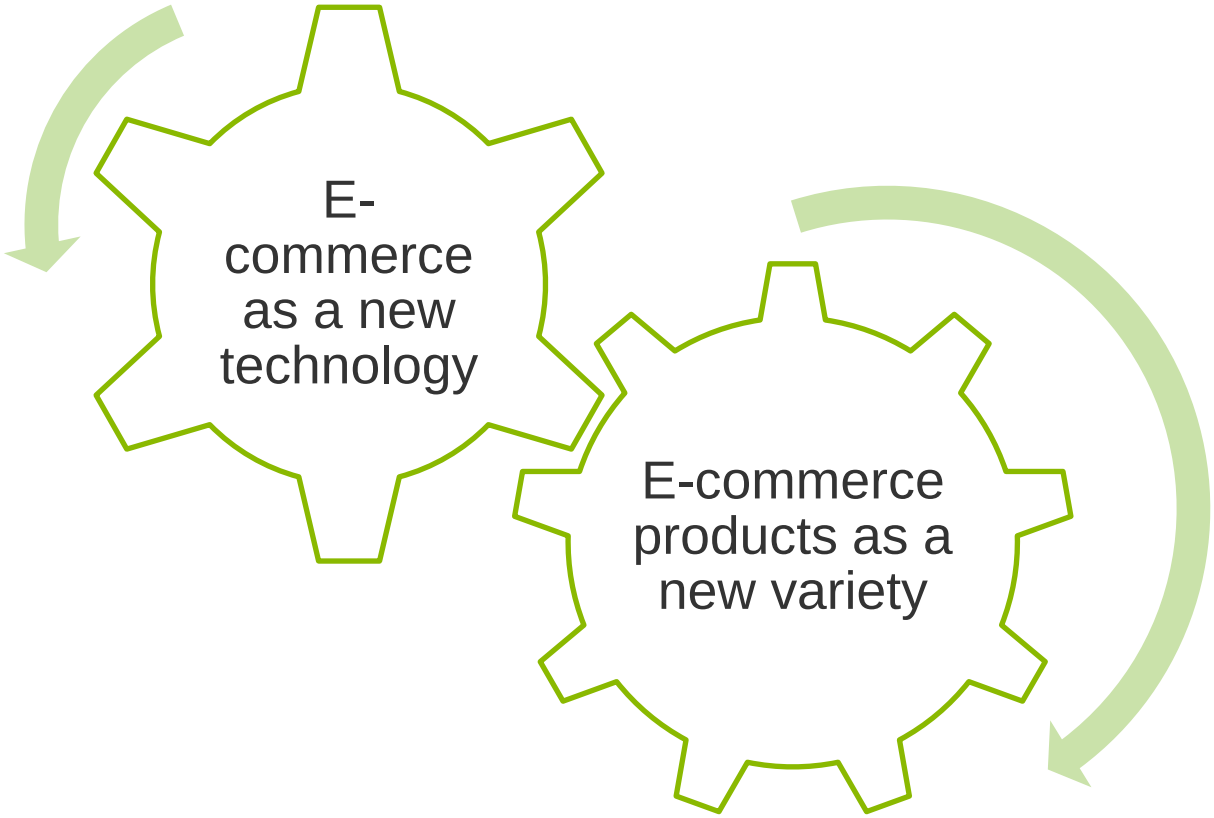
Theoretical approach: Melitz framework



Firm side

Benchmark (Melitz 2003)

Production cost (fixed + iceberg trade, φ = firm productivity):

$$l_{nij}^{b} = f_{nij} + \tau_{nij}\frac{q_{nij}}{\varphi}, \tau_{nij} \geq 1$$

Variety price:

$$p_{nij}^{b}(\varphi) \; \& = \frac{\sigma}{\sigma - 1}\frac{\tau_{nij}}{\varphi}$$

Firm profit:

$$\pi_{nij}^{b}(\varphi) = B_{nj}^{b}\left(\frac{\tau_{nij}}{\varphi}\right)^{1-\sigma} - f_{nij}$$

$$B_{nj}^{b} = \frac{(\sigma-1)^{\sigma-1}}{\sigma^{\sigma}}A_{nj}^{b}, \qquad A_{nj}^{b} = \beta_{nj}\, Y\left(P_{nj}^{b}\right)^{\sigma-1}$$

Twin varieties extension (TVO)

EC-cost (φ = firm productivity):

$$l_{nij}^{ec} = f_{nij}^{ec} + \tau_{nij}^{ec}\tau_{nij}\frac{q_{nij}^{ec}}{\varphi}$$

EC-variety price:

$$p_{nij}^{ec}(\varphi) \; \& = \frac{\sigma}{\sigma - 1}\tau_{nij}^{ec}\frac{\tau_{nij}}{\varphi}$$

Firm EC-profit:

$$\pi_{nij}^{ec}(\varphi) = B_{nj}^{ec}\left(\tau_{nij}^{ec}\frac{\tau_{nij}}{\varphi}\right)^{1-\sigma} - f_{nij}^{ec}$$

$$B_{nj}^{ec} = \frac{(\sigma-1)^{\sigma-1}}{\sigma^{\sigma}}A_{nj}^{ec}, \qquad A_{nj}^{ec} = \beta_{nj}\, Y\left(P_{nj}^{ec}\right)^{\sigma-1},$$

$$B_{nj}^{ec} = B_{nj}, \qquad A_{nj}^{ec} = A_{nj}, \qquad P_{nj}^{ec} = P_{nj}$$

Traditional varieties: same as benchmark

Demand side & equilibrium

Benchmark (Melitz 2003)

Demand for firm variety:

$$q_{nj}^{b}(\omega) = A_{nj}\, p_{nj}^{b}(\omega)^{-\sigma_{nj}}$$

Productivity cut-offs (zero-profit conditions):

φ_{nij}^{b}

Market-entry condition:

$$\sum_{n} \int_{\varphi_{nij}^{*b}}^{\infty} \left[B_{nj} \left(\frac{\tau_{nij}}{\varphi} \right)^{1-\sigma} - f_{nij} \right] dG_i(\varphi) = f_{Eij}$$

Twin varieties extension (TVO)

Demand for firm varieties:

$q_{nj}^{ec}(\omega) = A_{nj}\, p_{nj}^{ec}(\omega)^{-\sigma_{nj}}$ &
$q_{nj}^{tr}(\omega) = A_{nj}\, p_{nj}^{tr}(\omega)^{-\sigma_{nj}}$

Productivity cut-offs (zero-profit conditions):

$\varphi_{nij}^{ec}, \varphi_{nij}^{tr}$

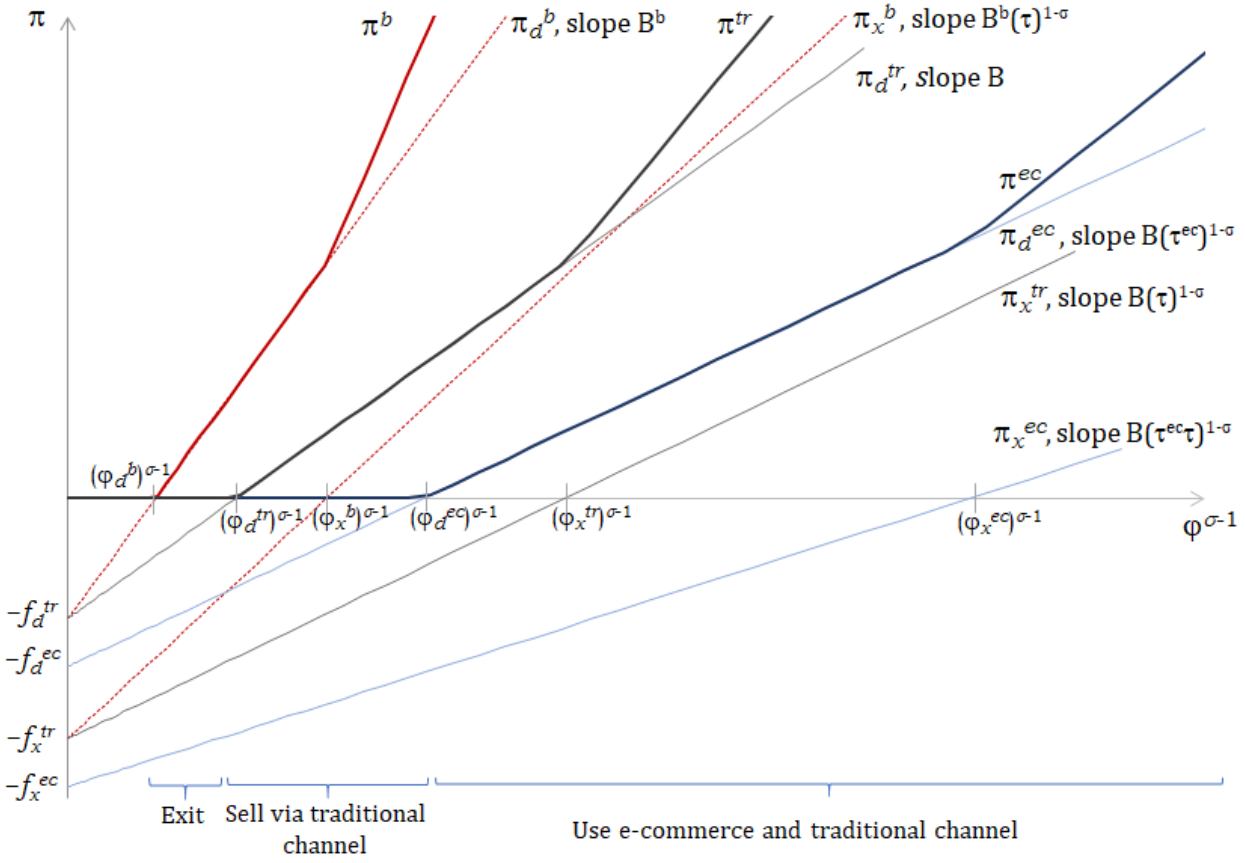
Market-entry condition:

$$\sum_{n} \int_{\varphi_{nij}^{*ec}}^{\infty} \left[B_{nj} \left(\tau_{nij}^{ec} \frac{\tau_{nij}}{\varphi} \right)^{1-\sigma} - f_{nij}^{ec} \right] dG_i(\varphi) + \sum_{n} \int_{\varphi_{nij}^{*tr}}^{\infty} \left[B_{nj} \left(\frac{\tau_{nij}}{\varphi} \right)^{1-\sigma} - f_{nij}^{tr} \right] dG_i(\varphi) = f_{Eij}$$

$$\leftrightarrow \varphi_{nij}^{tr} > \varphi_{nij}^{b}; B_{nj} < B_{nj}^{b}, P_{nj} < P_{nj}^{b}$$

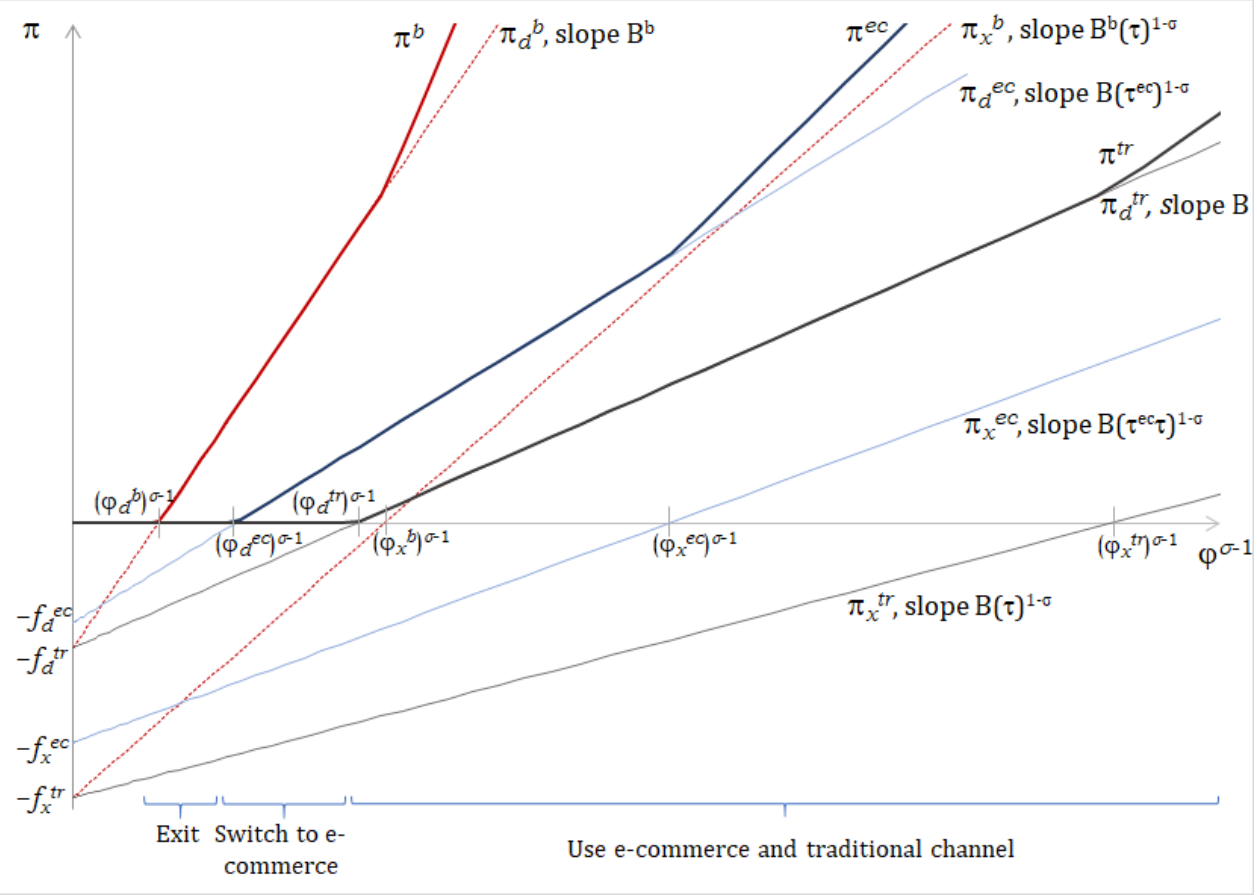
Scenarios of e-commerce impacts: 1/3

E-commerce is only attractive as a second channel for highly productive firms



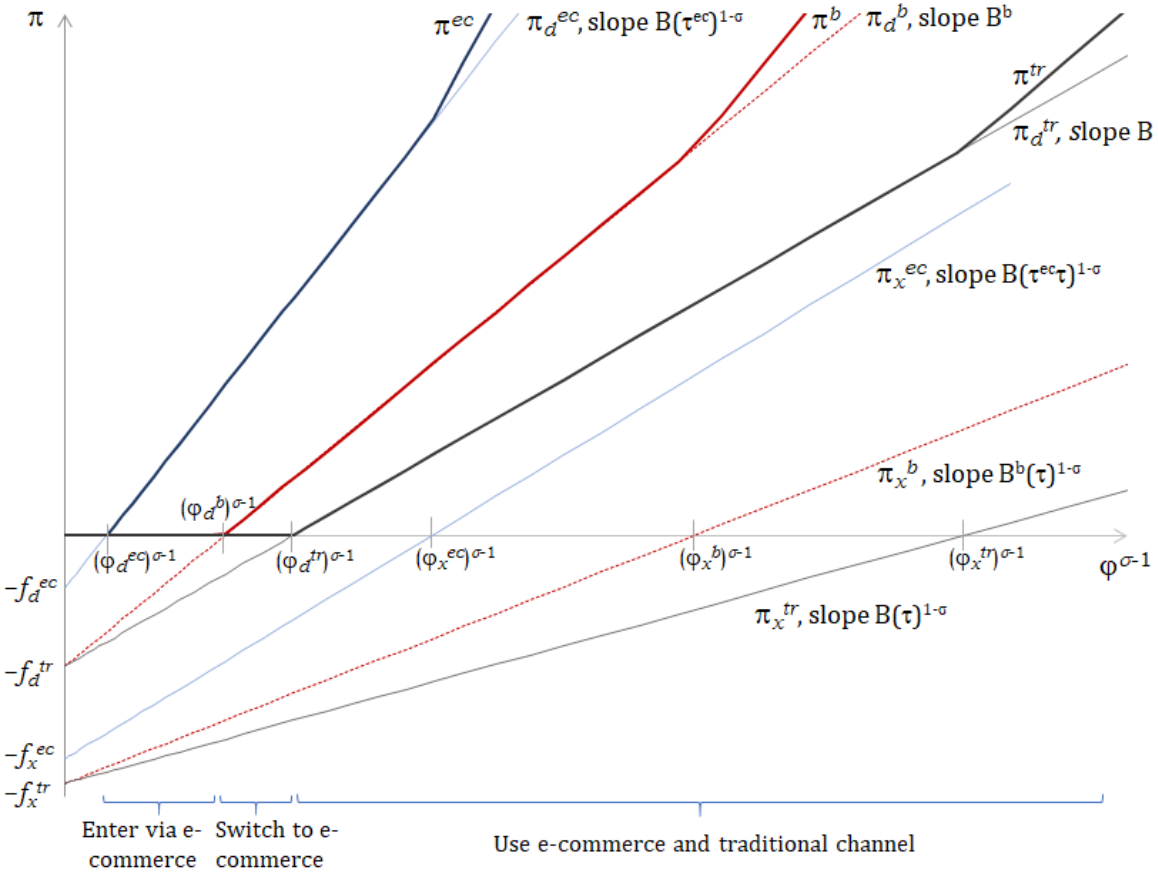
Scenarios of e-commerce impacts: 2/3

Switching to e-commerce will allow medium companies to stay in business



Scenarios of e-commerce impacts: 3/3

E-commerce will allow many small unproductive companies to enter business



Empirical hypotheses

Scenario I: *Markets with very high e-commerce costs are characterized by higher concentration and very large size of companies trading online.*

Scenario II: *Decreasing e-commerce costs lead to lower average productivity in ecommerce, thus, to smaller average firm size.*

Scenario III: *Markets with very low e-commerce costs are characterized by a large number of online-only firms and overall lower market concentration.*

Empirical approach (1/2)

Step 1: Determine proxies for e-commerce adoption

$$ec_{ijt} = \beta X_{ijt} + \alpha_{ij} + u_{ijt}$$

ec_{ijt} – e-commerce adoption, X_{ijt} – proxies of e-commerce costs, α_{ij} – country-sector fixed effects, u_{ijt} – error term

Potential proxies:

- consumers' ICT usage and online shopping behavior
- logistics and postal services
- sector characteristics (durability, complexity, bulkiness)
- income level, institutions (payment systems, contract enforcement, etc.)

Empirical approach (2/2)

Step 2: Relate e-commerce adoption to market concentration

$$mc_{ijt} = \beta_1 ec_{ijt} + \beta_2 ec_{ijt}^2 + \gamma Z_{ijt} + \alpha_{ij} + u_{ijt}$$

mc_{ijt} – market concentration, ec_{ijt} – e-commerce adoption, Z_{ijt} – controls, α_{ij} – country-sector fixed effects, u_{ijt} – error term

Step 3: Relate proxies from step 1 to market concentration

$$mc_{ijt} = \beta_1 X_{ijt} + \beta_2 X_{ijt}^2 + \gamma Z_{ijt} + \alpha_{ij} + u_{ijt}$$

mc_{ijt} – market concentration, X_{ijt} – proxies of e-commerce costs, Z_{ijt} – controls, α_{ij} – country-sector fixed effects, u_{ijt} – error term

Data

“ec-extra” sample

- 35 countries in EU & (potential) EU accession candidates
- 22 NACE Rev. 2 sector groups in manufacturing, trade & services (based on 2-digit classification)
- Data on e-commerce proxies, e-commerce adoption & market structure
- 2005-2017 (e-commerce adoption: 2009-2017)
- Steps 1-3

“full” sample

- 35 countries in EU & (potential) EU accession candidates
- 649 NACE Rev. 2 sectors in mining, manufacturing, trade & services (based on 2- to 4-digit classification)
- Data on e-commerce proxies & market structure
- 2005-2017
- Step 3

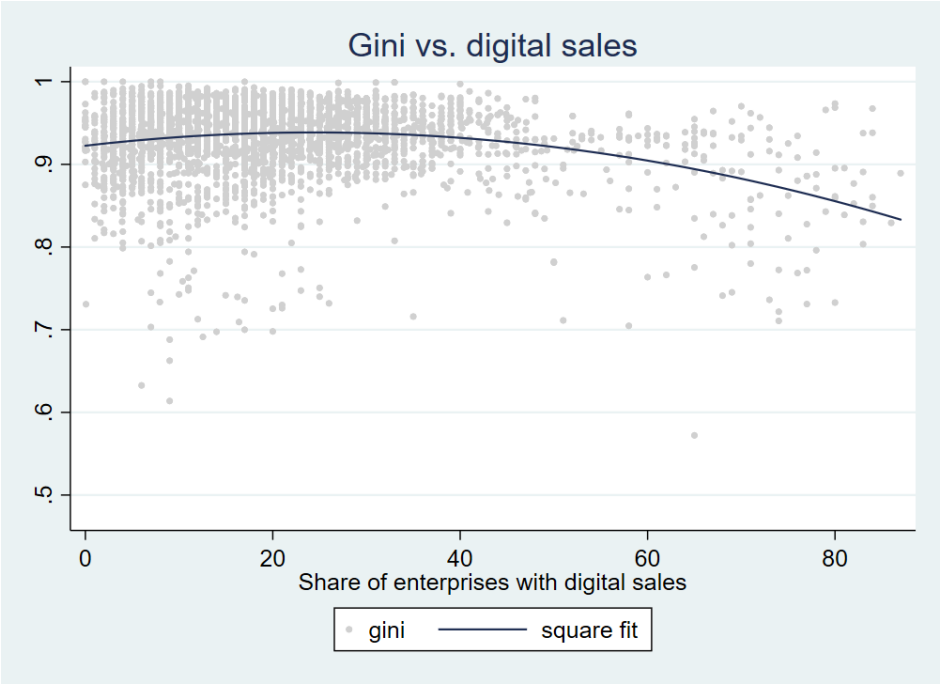
Results: Step 1

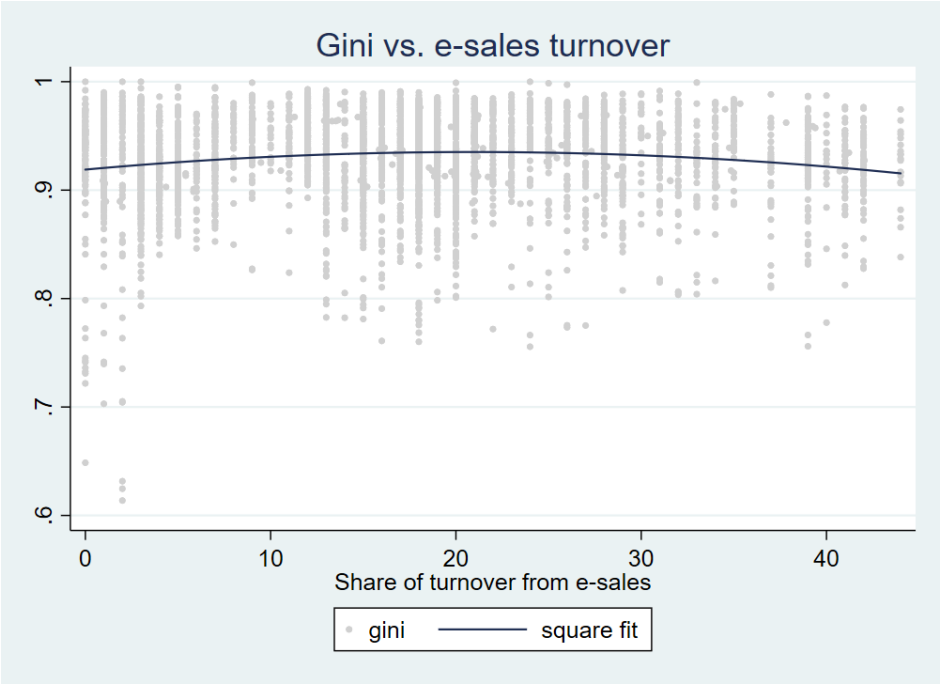
Best proxies for e-commerce:

- Online shopping behavior
  - Share of population buying online (+)
  - Online-shoppers reporting problems with fraud (-)
- Logistics
  - Number of post offices & daily urban deliveries (+)
  - Share of population not covered by post (-)
- Institutions
  - Time to build a warehouse (-)
  - Amount of card payments (+)
- Sector characteristics (enterprise side)
  - Capital R&D expenditure (-)
  - Share of foreign-owned enterprises (-)

Results: Step 2

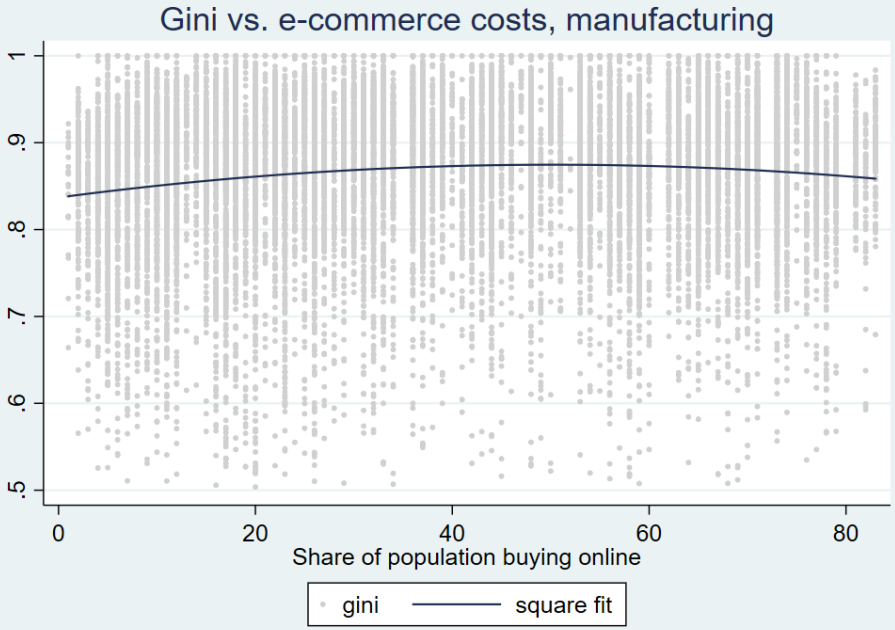
Hump-shaped relationship between e-commerce adoption & market concentration → hypothesis 1+3

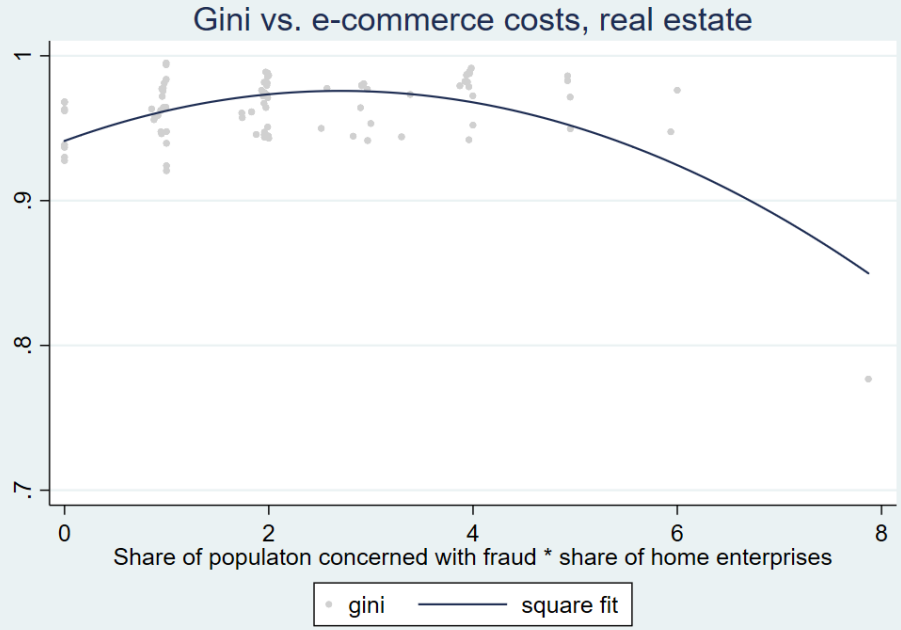




Results: Step 3

Hump-shaped relationship between e-commerce costs & market concentration → hypothesis 1+3





Conclusion

- Theory prediction:
  - E-commerce, like trade liberalization, increases competitive pressure but also opens opportunities for some firms to expand through access to new markets
  - Large, most productive firms will use e-commerce as a second channel
  - Unlike trade liberalization, depending on e-commerce costs, e-commerce can profit small & medium firms too
  - There are three potential scenarios of e-commerce impact on market structure

- Empirical result:
  - Relation between e-commerce costs is non-linear (hump-shaped)
  - In high-cost markets, large firms profit from e-commerce → market concentration rises
  - In low-cost markets, small firms can survive / enter the market → market concentration falls