

# What happens in Paris, does not stay in Paris: trade fairs and search and matching frictions

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- **Common way for firms to find trading partners: trade fairs**

- Difficult to evaluate: notorious selection bias, correlated with private and public efforts
- Hard to isolate policy effects from firms' unobserved search efforts
- What happens at trade fairs? Who meets whom?

- **Research question: Does technology fair lead to more exporting?**
  - Selection bias: firms that participate often intend to export anyways, are more successful
  - Historical context: limited private search efforts, as communication was costly and slow
- **Identification strategy: estimating causal bands**
  - Use trial-exhibition to get a proxy for unobserved firm export potential: award categories
  - Use space constraints in Paris plus political desire to represent all Hungarian industries and regions
  - Even within award categories, probably positive selection
  - Idea: compare untreated firms in better award category to treated firms in lower award category ⇒ should downward bias results, provides causal bands

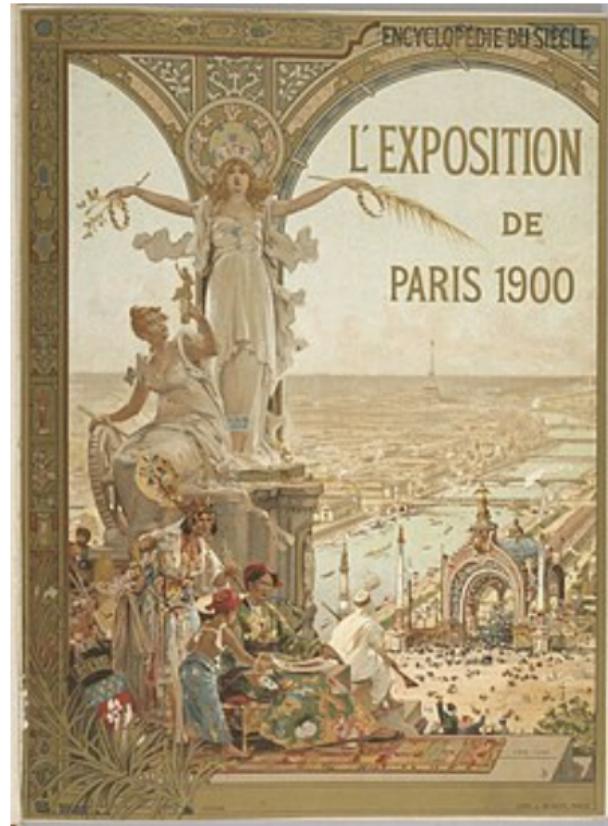
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- **Preliminary findings**
  - Indeed positive selection
  - Attending trade fair increases export propensity
  - Matching friction reduction for smaller product categories

- **International firm-to-firm trading patterns**
  - Who matches with whom: Rauch 2001; Rauch and Trindade 2002; Sugita et al. 2023; Bernard and Jensen 2004; Eaton et al. 2022a; Benguria 2021; Eaton et al. 2022b; Demir et al. 2024; Arkolakis et al. 2025; Miyauchi 2024
  - Reducing search frictions: Jensen 2007; Jensen and Miller 2018; Bernard et al. 2019; Cai et al. 2024; Verhoogen 2008
- **Export promotion policies:** Munch and Schaur 2018; Martincus and Carballo 2010; Carballo and Volpe Martincus 2008; Broocks and Van Bieseboeck 2017; Munch et al. forthcoming; Van Bieseboeck et al. 2015; Hiller 2012; Görg et al. 2008; Schminke and Van Bieseboeck 2013
- **Industrial Policies in the 19th century:** Juhász and Steinwender 2018; Juhász 2018; Donaldson and Hornbeck 2016; Romero 2023; Moser 2012, 2005; Hanlon 2020; Alfaro et al. 2022
- **Partial identification:** Manski 2003; Lee 2009; Manski and Pepper 2000; Tamer 2010; Ho and Rosen 2017; Blundell et al. 2007

## The Paris exhibition as policy tool for Hungary

# Paris exhibition as export promoting industrial Policy

- Paris exhibition – largest to celebrate modernity
  - Innovations
  - 48 million visitors,
  - 70 thousand businesses,
  - 56 countries
- It is a trade fair
  - Business showcase their products + meetings, networking
  - Price tags on products, wholesalers coming in



# Hungarian Kingdom treated Paris as policy tool for modernization

- First major exhibition when Hungary alone
- Hungary 3000 exhibitors, 4th largest outside of France
- Hungary prepared since 1887(!), established institutions, committees
- Budapest Millennial Exhibition in 1896 as a "rehearsal exhibition"



# Forming export connections as an explicit target ... from 1887

"... the 1900 Paris Exhibition... will be a meeting place for foreigners flocking there from all parts of the world, and thus a favorable opportunity for establishing commercial connections. The Hungarian Royal Commissioner, who ...is... organizing the representation of the countries of the Hungarian Crown ... will support the establishment of such commercial connections."

*Hungarian Industrial Journal 1897 ed. 2, by Baron Ernő Dániel, Hungarian Royal Minister of Commerce*



# Large effort from Hungarian government to promote firms in Paris

- Goal: Increase export market access by reducing information frictions
  - Lack of communication technologies prevented firms to learn about foreign markets (demand and preferences)
  - Globalization enabled faster shipping between remote locations
- Policy: selecting firms to present in Paris and covering costs of exhibiting
- Selection by serious jury that considered firm and products not exhibited as well.
- Selection based on innovativeness and diversity of the Hungarian exhibition

## From archives to a firm xt panel data

# Historical "panel data" set for Hungary 1896-1905

Combine data from several sources:

## ① Budapest Millenial Exhibition catalog 1896

- Baseline sample: only private enterprises (partnerships, corporations); dropped state/NGO/artisan
- Firm-level variables: export status, workers, horse power, output, patent, founding year

## ② Budapest Millenial Exhibition Brochure 1896

- Proxy for firm quality: awards

## ③ Paris Exposition Universelle catalog 1900

- Treatment: exhibitors

## ④ Firm survey by the Hungarian Museum of Commerce 1898, 1904

- Outcomes: export "capability" (incl sales to regions in Austria-Hungary, workers, horsepower

▶ more

## ⑤ Export Compass by the Austrian Ministry of Commerce 1905

- Outcomes: export status (outside Austria-Hungary)

# Data: Paris catalog – technical steps to extract data

## Digitization steps

- Source: *Guide to the 1900 Hungarian Exhibition in Paris: Introduction to Hungary*
- After scanning relevant pages, extract text using Google Document AI OCR
- Use Chat GPT AI to separate exhibitors from each other
- Human checks to correct mistakes and match addresses to exhibitors

9	1459	Mayer Nándor könyvkötész — Buchbindenstalt ...	Budapest IV, Királyi Pál utca 5.
10	1462	Riedl Ödön (Edmund) fésüs — Kammacher ... ... ...	Arad
11	1472	Táfler Jakab első orosházi olasz-czirokseprő — I. italienische Kehrbesen- und Bürstenfabrik	Oroszháza Budapest VIII, Népszínház-utca 13.
12	1652	Kratky Antal fésüsmester — Kammachermeister ... ...	Budapest IV, Kígyó-u. 6.
13	1683	Gröber Lajos ... ... ...	Budapest V, Váci-körut 6.
14	1684	Burg Ármin bőrdiszműáruagyáros — Ledergaleriewaarenfabrik	Maros-Vásárhely Budapest VI, Andrássy-n. 43
15	1720	Schnitzer Jakab könyvkötő és diszmükészítő — Buchbinder und Galanteriewaarenhersteller	Budapest VIII. Szentkirályi-u. B.-Hunyad
16	1980	Krausz Károly és József ... ...	
17	164	Leszik Károly könyvkötő — Buchbinder ... ...	
		Torday József ... ...	

# Data: Paris catalog – treated firms are exhibitors

## How to determine whether an exhibitor is a firm

- Drop 70%
  - non-profit exhibitor (e.g. museums)
  - government-owned firms
  - individual artist/professional/entrepreneur (can't match to company)

9	1459	Mayer Nándor könyvkötészeti — Buchbindenstalt —	Budapest IV, Királyi Pál utca 5.
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# Data: Firm registry 1904 – technical steps to extract data

## Digitization steps

- Source: *Export address book* by the Hungarian Museum of Commerce
- Based on a survey of factories and plants
- Scan + Google Document AI OCR
- numbered entries—observations easily separated
- extract columns, for example numbers before HP (horsepower) or munkas (worker)

1853. Károlyi György, Budapest. (V., Arany János-u. 1.) — 4 HP., 55 munkás. Folyóiratok, üzleti nyomtatványok, fekete és színes litografai térképek, építési tervezetek másolása és sokszorosítása, iskolai füzetek és rajztömbök.
1854. Keppeich Ferenc, Budapest. (VI., Dávid-u. 3.) — 2 HP., 40 munkás. Papírlemezből készült dobozok minden kivitelben, postadobozok.
1855. Kiss Valdemár, Budapest. (VIII., Üllői-út 18.) — 3 munkás. Könyvkötészeti díszmunkák, reklámcikkek.
1856. Kolba Mihály fiai, Diósgyőr. (Borsod vm.) — 150 HP. gőzgép, 100 HP. turbina, 80 munkás. Okmánypapír, értékekknek. Különlegesség: vízjegyű biztonsági papír, merített gyártmányok.
1857. Leszik Károly, Budapest. (VIII., Szentkirályi-utca 6.) — 10 HP., 80 munkás. Különféle egyszerű és díszes kötések. Tömeges könyvtári kötések.
1858. Lévai Mór, Ungvár. — 20 munkás. Imakönyvek magyar és rutén nyelven.
1859. Lévay Márton könyvkötészete, vonalozóintézete és üzleti könyvek gyára, Nagyvárad. (Fő-utca 20. Telefon: 49. Alapítottat: 1845. év.) — 8 HP., 44 munkás. Könyvkötészet, dobozgyártás, papírképeretek, imakönyvek, képes-

# Data: Firm registry 1904 – outcomes

- Collection of export status (export-ready) firms determined by a Hungarian institution
- Outcomes observed
  - Number of workers
  - Capacity of machine in horsepower (hp)
  - Products offered
  - Special products and patents
  - Industry

1853. Károlyi György, Budapest. (V., Arany János-u. 1.) — 4 HP., 55 munkás.

Folyóiratok, üzleti nyomtatványok, fekete és színes litográfiai térképek, építési tervek másolása és sokszorosítása, iskolai füzetek és rajztömbök.

1854. Kepich Ferenc, Budapest. (VI., Dávid-u. 3.) — 2 HP., 40 munkás.

Papírlemezből készült dobozok minden kivitelben, postadobozok.

1855. Kiss Valdemár, Budapest. (VIII., Üllői-út 18.) — 3 munkás. Könyvkötészeti díszmunkák, reklámcerék.

1856. Kolba Mihály fiai, Diósgyőr. (Borsod vm.) — 150 HP. gőzgép, 100 HP. turbina, 80 munkás.

Okmánypapír, értékcerék, Különlegesség: vízjegyű biztonsági papír, merített gyártmányok.

1857. Leszik Károly, Budapest. (VIII., Szentkirályi-utca 6.) — 10 HP., 80 munkás.

Különféle egyszerű és díszes kötések. Tömeges könyvtári kötések.

1858. Lévai Mór, Ungvár. — 20 munkás.

Imakönyvek magyar és rutén nyelven.

1859. Lévay Márton könyvkötészete, vonalozóintézete és üzleti könyvek gyára, Nagyvárad. (Fő-utca 20. Telefon: 49. Alapítatott: 1845. év.) — 8 HP., 44 munkás.

Könyvkötészeti, dobozgyártás, papírképeretek, imakönyvek, képes-

# Data: Budapest catalog 1896 and awards – technical steps to extract data

## Digitization steps

- Source: *General catalog of the 1896 Millennium National Exhibition ed.*  
Mudrony Soma, Ráth Károly, Micseh Endre.
- Scan, OCR, and regex used as for previous data sources
- Challenge: unstructured data, manual separation of fields were required for most observations
- Awards are processed similarly, matched to exhibitors by their names—fuzzy matching

46-tól	Papiripar, sokszorosítóipar	63-ig
46. Leszik Károly, könyvkötő, Budapest, Szent - Királyi-u. 13. sz.	Al. 1883. 32 szakm.; 1 1 e. vil- lam- és szakgépek, Evi forgalma 18,000 frt. Bekötött könyvek és kötési táblák.	55. Renner Mihály, könyvkötő, Besztercebánya. Bekötési könyvtábla.
47. Molnár Mihály, könyvkötő, Budapest, IV., hajó-u. 12. sz.	Al. 1836; 6 - 10 szakm., 1 napsz. Különféle bekötött könyvek.	56. Réthy A. József, diszmüké- szítő, aranyozó és könyvkötő, Miskolc. Al. 1891; 2 szakm.; a nyersanya- got belföldön, Ausztria- és Német- országból szerzi. Könyvkötő munkák.
48. Morzsányi József, Budapest, IV., Kígyó-u.	Diszseliratu táblák, diszszelekrenyek, fénykupkeretek, tánczrendek us disz- tárgyak.	57. Salzer Jakab, Budapest, IV., Hajós-u. 10. sz. Arany és ezüst lenyomások és rek- lamcikkek.
49. Müller György, könyvkötő, Budapest, V.		58. Schmidt Gyula, könyvkötő, Nagy-Várad.

# Data: Budapest catalog – pretreatment characteristics and sample

- List of attendees of the Budapest expo in 1896
- Outcomes observed
  - Number of workers (including skilled/unskilled)
  - Capacity of machine in horsepower (hp) \*
  - Products offered and exhibited
  - Special products and patents
  - Output measured in Hungarian forints
  - Export destinations
  - Year of firm establishment
  - Exhibition category (industry)

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	<b>48. Morzsányi József</b> , Budapest, IV., Kígyó-u. Diszfeliratu táblák, diszszekrények, fénykupkeretek, tánczrendek us disz- tárgyak.	<b>58. Schmidt Gyula</b> , könyvkötő, Nagy-Várad.
	<b>49. Müller György</b> , könyvkötő, Budapest, V., Vörösmarty-u. 10. sz.	

# Data: Use awards from 1896 Budapest exhibition to proxy firm quality

- Awards from 1896 Budapest expo – given by jury
- Outcomes observed
  - Name of awardee
  - Address
  - Exhibition category
  - Award category (class 1-4, 1 is "Gold")
  - Explanation for the award

Fischer Bertalan, Budapest. Jó munkáért.  
Fekete Sándor, fényképész, Nagyvárad. Jó munkáért.  
Geduldiger Hugó, vésnök, Budapest. Uj találmány, uj iparág meghonosítása és jó munkáért.  
Gyürky Pál, papírgyáros, Tiszaolcs. Versenyképességről.  
Hamburger és Birkholz, könyvnyomda, Budapest. Jó izlés, jó munkáért.  
Haus György, könyvkötő, Kolozsvár. Jó munkáért.  
Hohenlohe horczeg, faanyag és papírlémezgyár, Javornia. Uj iparág meghonosítása.  
Kossák József, fényképész, Temesvár. Jó munkáért.  
Kellner és Mohrlieder, könyomdai müintézet, Budapest. Jó muükáért.  
Kanitz C. és fiai, nyomda és üzleti könyvgyár, Budapest. Versenyképességről.  
Kiss Valdomár, könyvkötő, Budapest. Jó munka és haladásért.  
Leszik Károly, könyvkötő, Budapest. Jó izlés, jó munka és haladásért.  
Mohovich Emidio, könyvnyomda, Fiume. Jó izlésért.  
Müller György, könyvkötő, Budapest. Jó munka és jó izlésért.  
Molnár Mihály, könyvkötő, Budapest. Jó munka és jó izlésért.  
Mühlberg J. és társai, szivarkapipirgyár, Budapest. Versenyképesség, kivitelképesség és jó izlésért.  
Neumann Lipót, könyvkötő, Budapest. Jó munkáért.  
Preazburg Frigyes, könyv- és könyomda, üzleti könyvgyár, Budapest. Jó munkáért.  
Pleitz Fer. Pál, könyvnyomdász, Nagybecskerek. Jó munkáért..  
Pesti Lloyd-társulat, könyvnyomdatulajdonos, Budapest. Versenyképesség és jó munkáért.  
Pannónia-könyvnyomda, Győr. Jó izlés és jó munkáért.  
Pratchinger Ödön, könyvkötő Győr. Jó munkáért.

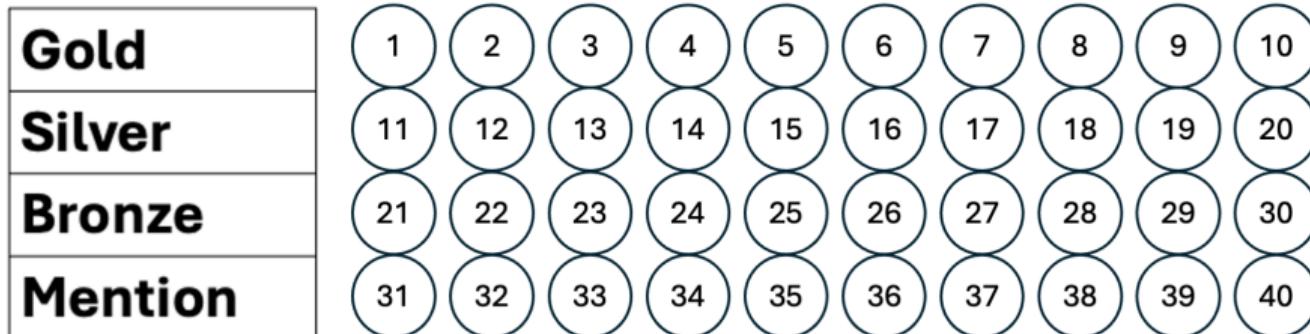
# Data: creating the panel by linking data tables

- Create a panel via entity resolution
  - Person name, incorporated : Kovacs bunda, Kovács és fia bunda, Kovács szőrme Rt ("bunda = " fur coat", "szőrme" = fur, "Rt" = joint stock):
  - Great deal of human work, check, identify.
- Create UID, link companies across datasets

## Empirical strategy: causal bands in details

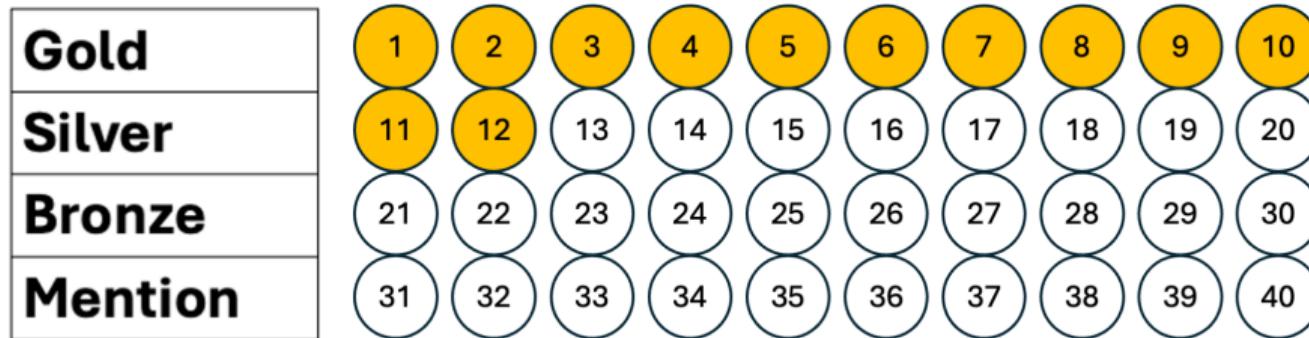
- **Preceding trial exhibition** helps us to get an objective measure of 'export potential' by using award classes given to Hungarian firms
  - Like binned running variable in RDD
- **Because of constraints**, government did not select only top firms for the treatment
  - Constraints: industrial representation, regional representation, space
  - Like fuzzy RDD
- **Obtain 'causal bands' of treatment effect:**
  - Upper bound: compare treated firms to untreated firms of slightly worse quality
  - Lower bound: compare treated firms to untreated firms of better quality
  - Additional identification test: upper bound estimate > lower bound estimate, if assumption on running variable is correct
  - Works when running variable is proxy (binned)

# Method for upper and lower bound estimate of treatment effect



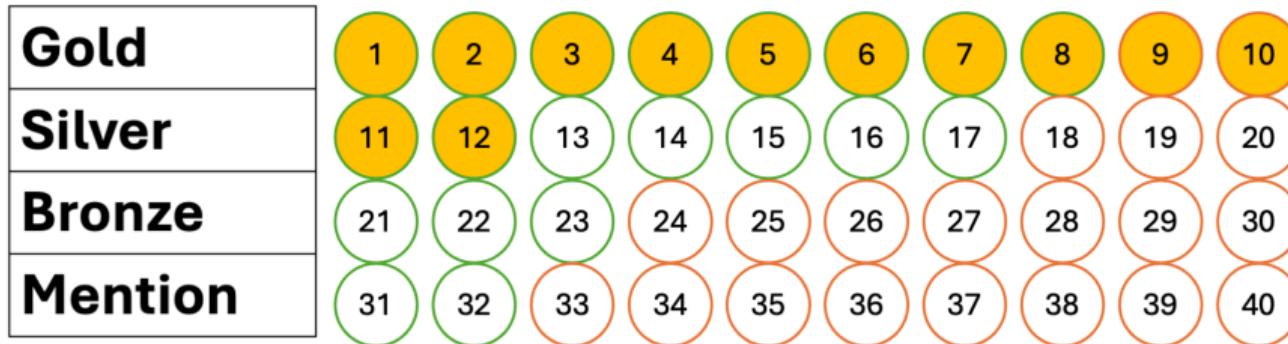
- Assume that numbers represent export potential
- Export potential is unobserved to us
- We only observe bins of export potential = awards

Example: government selects the firms with top export potential



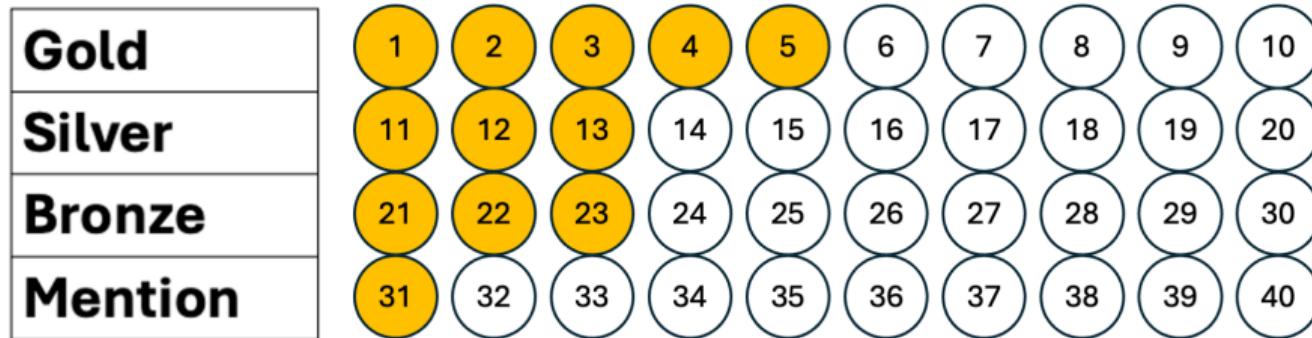
- Space constraints: suppose there are 12 places for Hungary in the 1900 Paris exhibition

# Is inconsistent with industrial representation



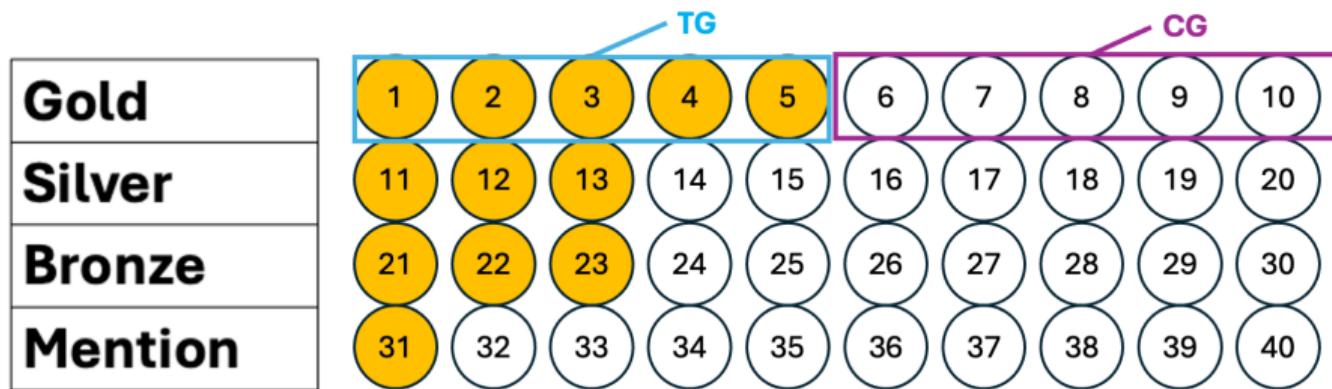
- Two industries: food (green) and textiles (red)
- If some industries have better export potential, they would be overrepresented
  - Example: food industry (green) had advanced milling technology

## Constraints: government also selected firms with less export potential



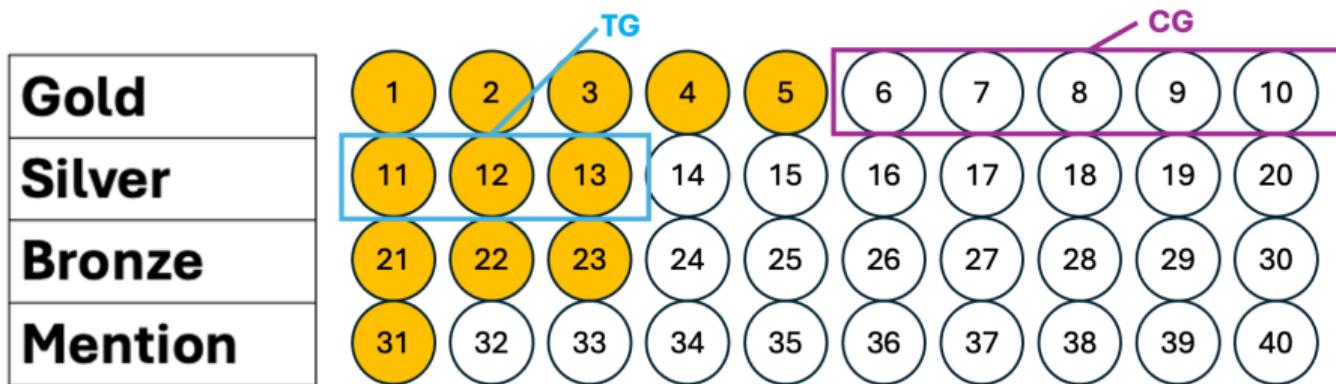
- As a result to ensure industrial representation and other constraints, government also selected firms with less export potential
- Reasonable to assume that they selected the best firms within an award group

## Within award categories: upwards biased treatment effect



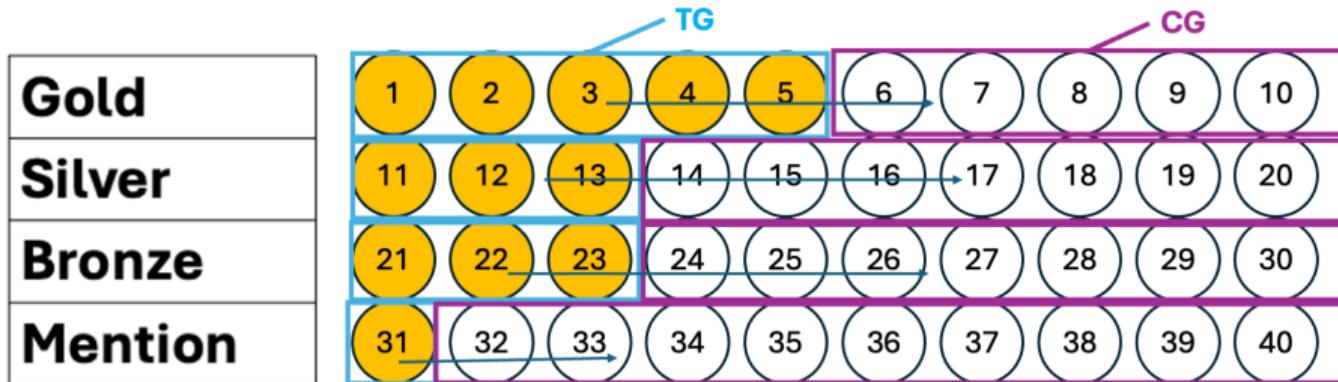
- Comparing firms within an award category: upwards bias = upper bound

# Downward biased treatment effect



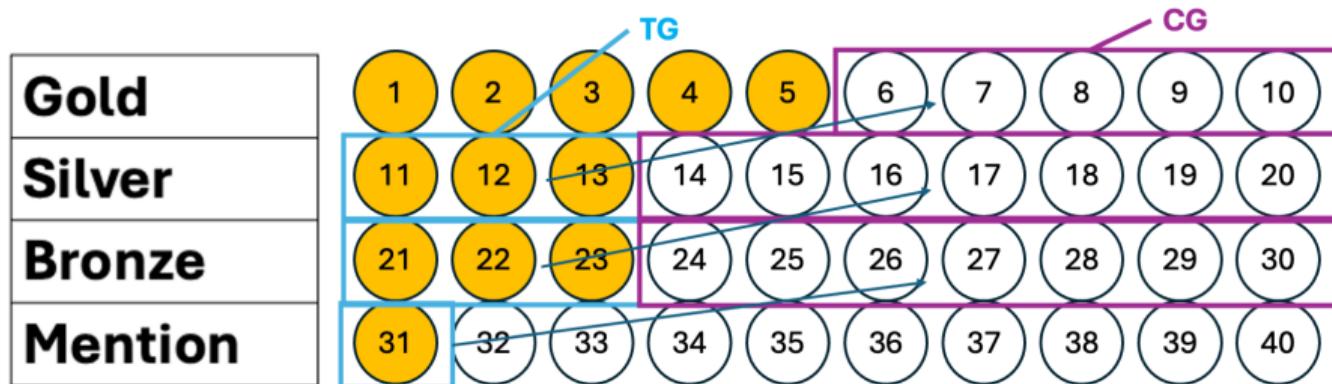
- Compare treated firms from lower award class to untreated firms from higher award class:  
downwards bias = lower bound

# Stacking comparisons: bound groups for upwards biased estimation



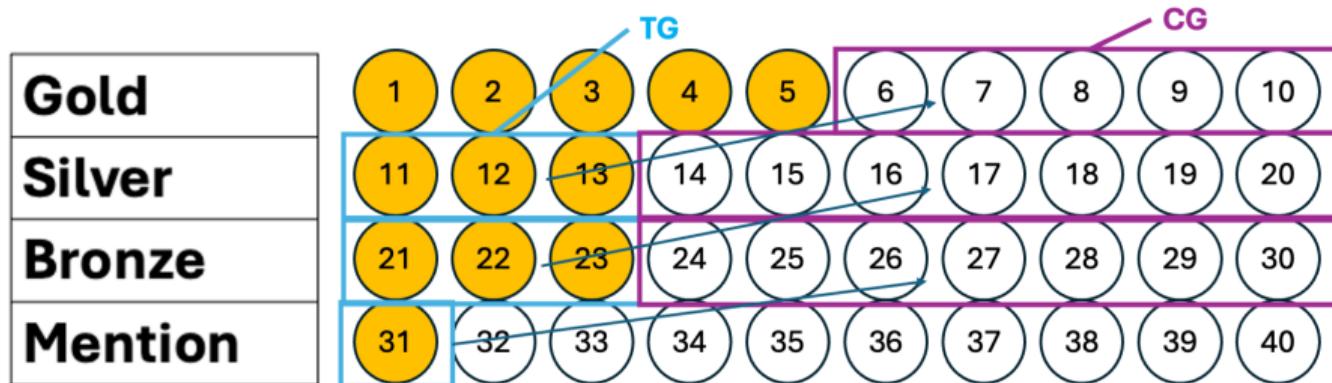
- "Upper bound sample": all firms
- Award group fixed effects ensure comparison within award groups

# Stacking comparisons: bound groups for downward biased estimation



- "Lower bound sample": drop treated firms from top category, and untreated firms from lowest category
- Fixed effects for each stacked comparison group
- Identifying assumption: export potential of control group in upper bound estimation > export potential of control group in lower bound estimation  
⇒ testable: upper bound estimate > lower bound estimate

# Identification assumptions



- Identifying assumptions:

- 1 export potential of treated firms < export potential of untreated firms with **better** award
  - 2 export potential of control group with better award > export potential of control group in worse
- ⇒ testable: upper bound estimate > lower bound estimate

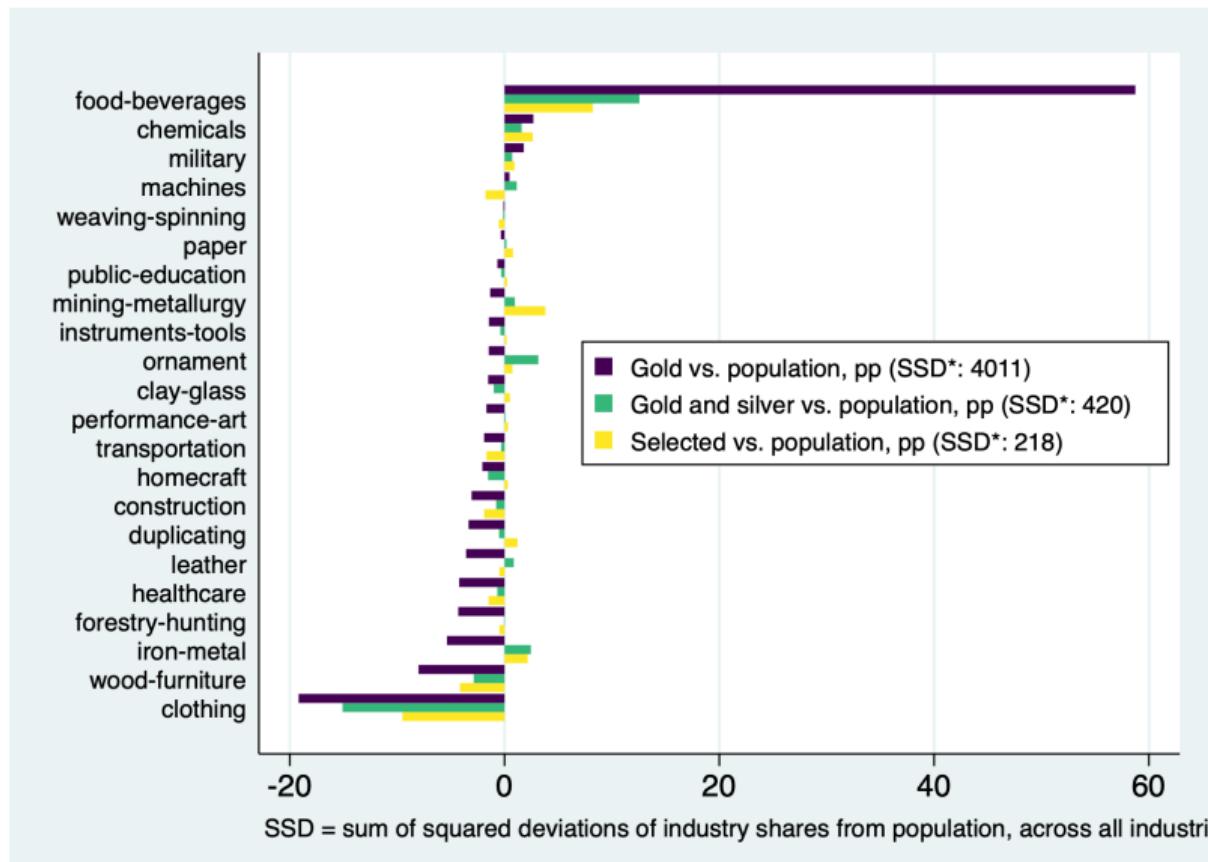
# Data and observations

- Panel:
  - 1896 Budapest (base)
  - 1900 Paris (treatment)
  - 1898 Export status before
  - 1904/05 Export status after
- In 1896: 3733 firms (base sample), for N employees: 1008 obs
- Firms born after 1896 excluded
- Firms that exit after 1896 are together with non exhibitors (in progress)

## Plausibility check: probability if going to Paris increases in award quality

Award category	Number of firms	Share of firms	
		Paris exhibitors	Non-Paris exhibitors
Gold medal	140	60%	40%
Silver medal	425	36%	64%
Bronze medal	1,034	16%	84%
Honorable mention	1,136	7%	93%
No award	928	7%	93%
Total	3,733	552	3,181
Total (%)	100%	15%	85%

# Paris exhibitors are more balanced across industries than Budapest awards



# Estimating equations for upper and lower bound I.

$$\Delta y_i = \beta \text{Paris\_exhibitor}_i + \text{BoundGroupFE}_j + D_{prod} + y_{i,pre} + \epsilon_i$$

- $\text{Paris\_exhibitor}_i$ : dummy if attending Paris exhibition in 1900
- $y_{i,pre}$  outcome in 1896
- $D_{prod}$  product category dummies
- **Outcomes**
  - Export status (broadly) - incl AHM, to other part
  - Export status (narrow) - outside of AHM only
  - Size – employment (smaller sample)
  - Horse power (smaller sample)

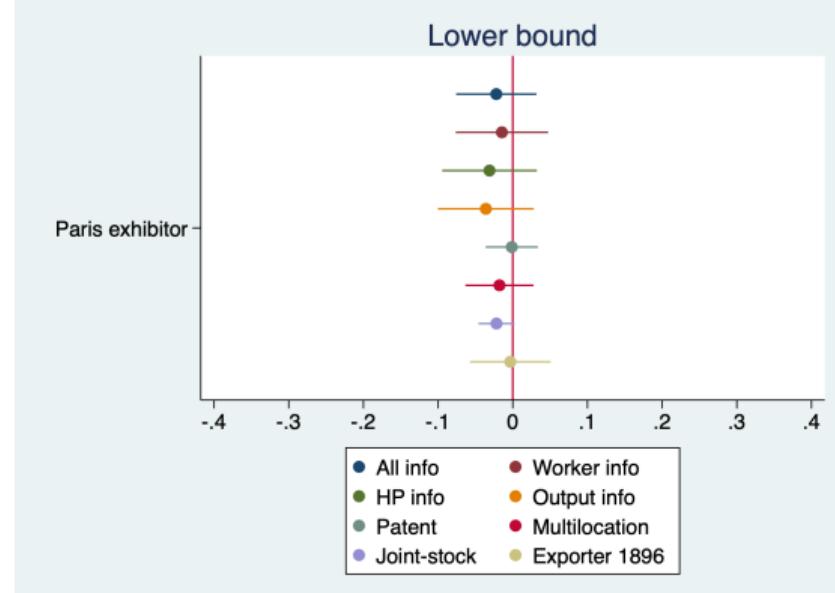
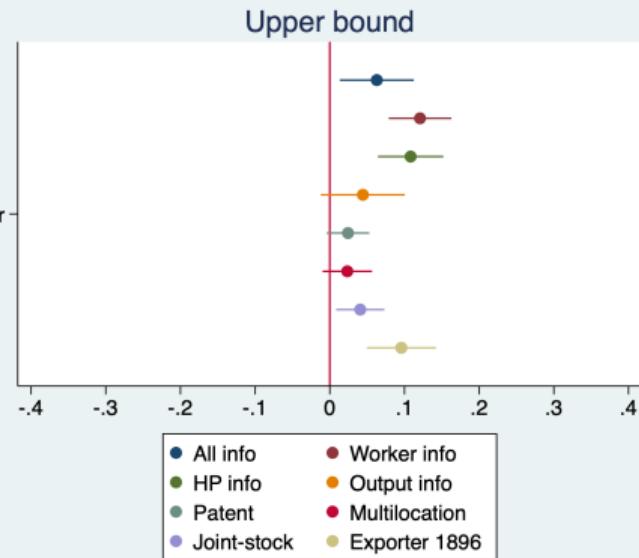
## Estimating equations for upper and lower bound II.

$$\Delta y_i = \beta \text{Paris\_exhibitor}_i + \text{BoundGroupFE}_j + D_{prod} + y_{i,pre} + \epsilon_i$$

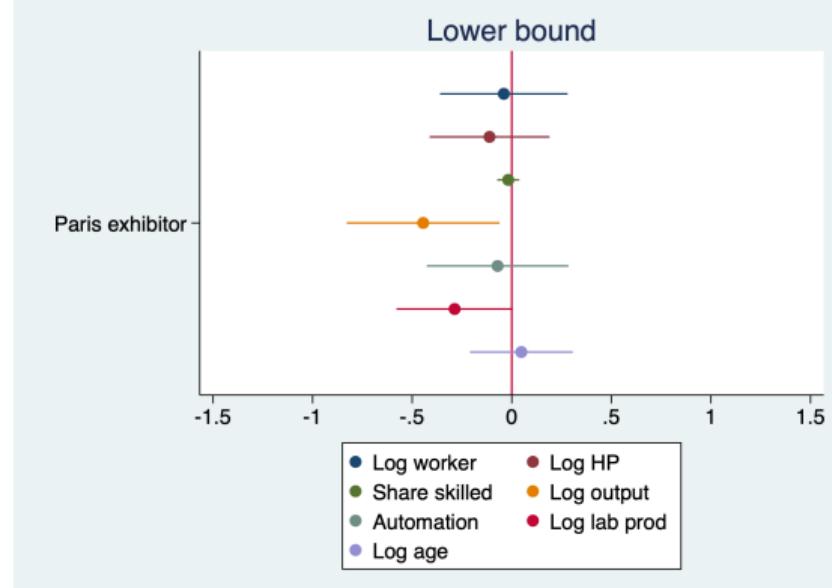
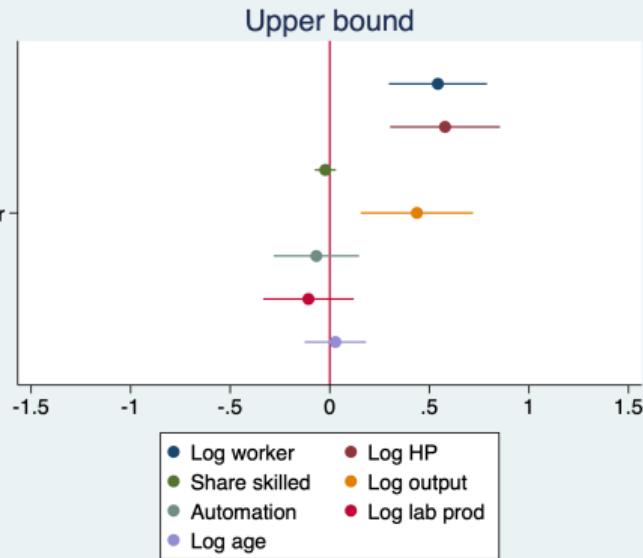
- $\text{Paris\_exhibitor}_i$ : dummy if attending Paris exhibition in 1900
- **Upper bound for  $\beta$ :**
  - $\text{BoundGroupFE}_j$  = dummies group untreated firms in same award class as treated firms
  - Sample: all firms
- **Lower bound for  $\beta$ :**
  - $\text{BoundGroupFE}_j$  = dummies group untreated firms in higher award class vs treated firms
  - Sample: only firms that belong to a lower bound group (drops treated firms in top award class and untreated firms in lowest award class)

# Results

# Balancing of pre-treatment characteristics



# Balancing of pre-treatment characteristics



# Treatment effect: more exporters (broad), 1904

Dep var:  $\Delta$  export capability = export capability 1904 - export status 1898

	(1)	(2) Upper bound	(3)	(4) Lower bound
Paris exhibitor	0.195*** (0.0266)	0.138*** (0.0228)	0.140*** (0.0262)	0.0851*** (0.0251)
Export status 1898	Yes	Yes	Yes	Yes
Product fixed effects	No	Yes	Yes	Yes
Bound group dummies	No	Upper	Upper	Lower
Observations	3,733	3,733	2,721	2,721
R-squared	0.254	0.323	0.325	0.325

# Treatment effect: More exporters, 1905 (narrow)

Dep var:  $\Delta$  export status = export status 1905 - export status 1896

	(1)	(2) Upper bound	(3)	(4) Lower bound
Paris exhibitor	0.178*** (0.0276)	0.101*** (0.0214)	0.116*** (0.0235)	0.0406* (0.0239)
Export status 1896	Yes	Yes	Yes	Yes
Product fixed effects	No	Yes	Yes	Yes
Bound group dummies	No	Upper	Upper	Lower
Observations	3,733	3,733	2,721	2,721
R-squared	0.403	0.482	0.491	0.489

# Treatment effect: Firms grow in size

Dep var:  $\Delta \ln(\text{workers})$ , 1896-1904

	(1)	(2) Upper bound	(3)	(4) Lower bound
Paris exhibitor	0.231*** (0.0531)	0.232*** (0.0571)	0.194*** (0.0668)	0.156** (0.0750)
$\ln(\text{workers})$ , 1896	Yes	Yes	Yes	Yes
Product fixed effects	No	Yes	Yes	Yes
Bound group dummies	No	Upper	Upper	Lower
Observations	624	624	518	518
R-squared	0.092	0.183	0.165	0.163

# Treatment effect: Small/ no change on mechanization

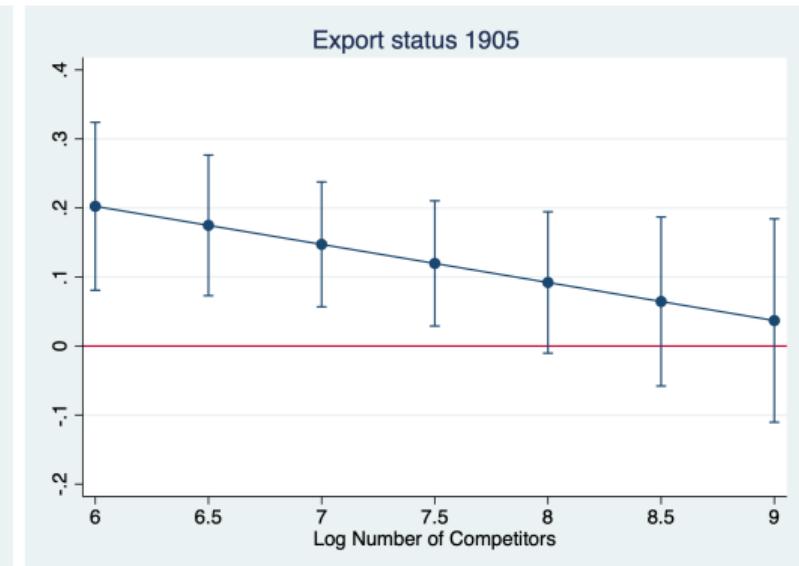
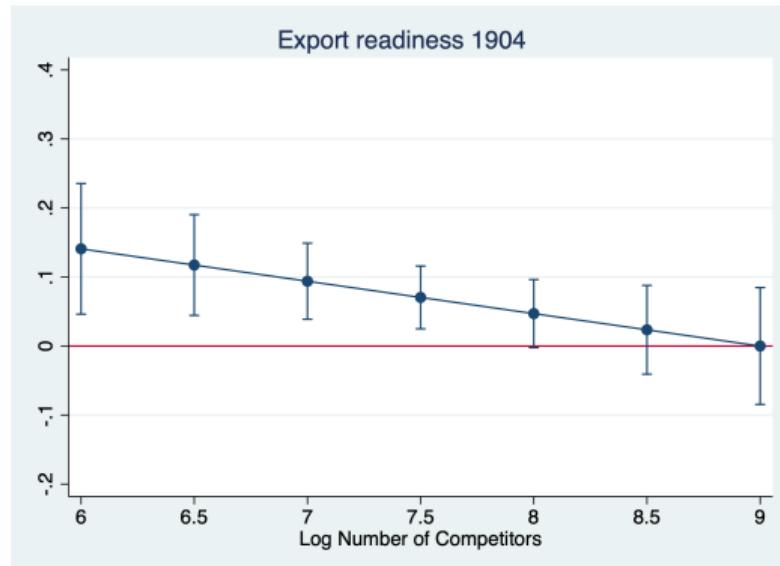
Dep var:  $\Delta \ln(\text{horse power})$ , 1896-1904

	(1)	(2) Upper bound	(3)	(4) Lower bound
Paris exhibitor	0.0748 (0.0970)	0.107 (0.106)	0.0353 (0.110)	0.0166 (0.0858)
In(horse power), 1896	Yes	Yes	Yes	Yes
Product fixed effects	No	Yes	Yes	Yes
Bound group dummies	No	Upper	Upper	Lower
Observations	404	404	320	320
R-squared	0.058	0.198	0.216	0.219

# Treatment heterogeneity: buyers vs. congestion

- Trade fairs – reduce matching frictions by pooling suitable "candidates"
- **Mechanism:** Matching success at the fair rises with the number of *buyers* present, but falls with the number of *competing exhibitors* (congestion)
- **Ex ante ambiguity:** Larger categories may attract more buyers *and* more rivals
- **Our findings:** No one loses, but congestion dominates: more competitors at the fair ⇒ lower conversion to exporter.

# Heterogeneity: the more competitors in Paris, the smaller the effect



- **Effect of export promotion**

- Increased export probability by 1904 grew by 4-10%
- Led to 15-23% employment growth, but no significant increase in mechanization (horse power)
- Export probability declines, the more competitors are at trade fair

- **Methodological contribution**

- 'Causal bands': in 'fuzzy RDD' setting, choose control group above and below treatment group to bound the estimate
- Compared to matching, which just focuses on 'close' observations, we exploit additional information on whether 'close' is 'close from above' versus 'close from below' to bound the estimates

# Comments welcome!

Comments welcome:

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LE PALAIS DES ILLUSIONS

C'est une salle hexagonale revêtue, sur ses six côtés, d'immenses glaces de Saint-Gobain, et couronnée par un plafond doré, sculpté dans le style mauresque par M. Alméras. Une série de lampes électriques, installées avec le plus grand art par M. Ficet et Barbin, éclairent de tous variés et changeants des colonnes, des appliques, des girouettes qui se reflètent à l'infini, et donnent l'illusion d'une éternité mésmerisante de cette ville feutrée.

# Export capability: definition

- Firm survey by the Hungarian Museum of Commerce 1904
- **Objective:** all factories “which only lacked a foreign order to become export companies”; not an “export,” but an “export-capable” directory of domestic manufacturers
- **Export capability:** industrial plants that exceed local consumption demands; are ready to ship abroad and engage with foreign importers
- Starting point: regular survey of the Hungarian industry 1899
- Updated with new firms and firms which ceased operations
- Information about export capability through
  - Sending questionnaires to more than 4,200 domestic manufacturing plants; 3 reminder letters
  - Business associations
  - Advertisements in more than 200 domestic newspapers

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