

Taxes, Wage Bargaining and Migration: Evidence from Top-Income Foreigners in Denmark

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Motivation

- Many countries/states tempted to lower tax rates to keep/attract high-skilled labor
- Triggered two important debates:
 - ① **Migration:**
Are location decisions of high-skilled labor responsive to tax differentials?
 - ② **Incidence:**
Who benefits from lower tax rates on high-skilled labor?

Why do migration responses matter?

- Migration responses...
 - ① increase the efficiency cost of taxation
 - ② limit the redistributive ability of governments
 - ③ induce socially suboptimal labor tax competition between countries/jurisdictions
- Very scarce empirical research on migration responses to taxation compared to standard labor supply responses:
 - ▶ Lack of good micro data containing citizenship information
 - ▶ Issues about how to identify causal effects on migration

Why does incidence matter?

- Incidence of income taxes on high-skilled labor...
 - ① determines redistributive impact of such taxes
 - ② sheds light on functioning of labor market for high-skilled individuals
- Little empirical evidence on income tax incidence and impact of taxes on wage setting process
 - ▶ Lack of within ability-level variations in tax rates

This paper

- Use Danish Foreigners' Tax Scheme, with presence of large discontinuities in tax liability depending on:
 - ① Contract start date (before and after June 1, 1991)
 - ② Duration of stay (3-year rule)
 - ③ Earnings level (earnings eligibility threshold)
- Four main findings:
 - ① Large positive migration responses
 - ② Increase in gross earnings for stayers after 3 years
 - ③ Bunching just above scheme threshold
 - ④ No hole below scheme threshold
- Develop a simple matching frictions model to rationalize these findings

Outline

- ① Institutional background and data
- ② Theoretical framework
- ③ Migration
- ④ Incidence
- ⑤ Extensions

Foreigners' Tax Scheme in Denmark:

- Passed in 1992; applicable to contracts signed after 1 June, 1991
- Flat tax of 30% (25% after 1995) in lieu of the regular progressive income tax (top rate of above 60%)
- Up to 3 years after which taxpayer subject to ordinary income tax
- Eligibility requirements:
 - ▶ No tax liability in Denmark in the 3 years prior to going on the scheme
 - ▶ Annual earnings of at least 103,000 Euros (as of 2009, indexed):
≈ top .5% of the income distribution

Data:

- Administrative files for the full population living in Denmark:
 - ▶ Complete socio-economic info
- Complete tax data and researchers' tax scheme info
- Migration information:
 - ▶ Dates of entry and exit, country of in/out migration, citizenship

▶ Composition

▶ Take-up

① Institutional background and data

② Theoretical framework

③ Migration

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Standard Model vs. Matching Frictions Model

- Four main findings:
 - ① Positive migration responses
 - ② Increase in gross earnings for stayers after 3 years
 - ③ Bunching just above scheme threshold
 - ④ No hole below scheme threshold
- Standard model can explain 1 and 3
- Model with matching frictions can explain 1, 2, 3 and 4

Common features: Migration

- Individuals have productivity y
- **Reservation wage** y_0 for working in Denmark

$$y_0 = \frac{z_h(1 - \tau_h) + \nu}{1 - \tau} = \frac{y_0^{\tau=0}}{1 - \tau}$$

- ① z_h, τ_h wage and average tax rate in home country
- ② ν net cost of migrating
- ③ τ average tax rate in Denmark: $\tau^S < \tau^D$

■ Migration:

- ▶ Worker migrates in if and only if $y_0 \leq y$
- ▶ Scheme reduces y_0 and causes migration when $y_0^S \leq y < y_0^D$

Standard Model vs. Matching Model

- **Standard model**, workers paid their marginal product y
- **Model with matching frictions**
 - ▶ Workers and firms expend resources to create a match
 - ▶ When matched, surplus \Rightarrow band of acceptable wages (y_0, y)
- Pretax wage z splits the surplus:
 - ▶ Nash bargaining maximizes:

$$W = (y - z)^{1-\beta}((1 - \tau)z - y_0^{\tau=0})^\beta$$

- ▶ $\beta \in [0, 1]$, bargaining power of worker

$$z = \beta y + (1 - \beta)y_0$$

- Nests standard model: case $\beta = 1$

Bargaining theory predictions

■ Pretax wage increases with τ

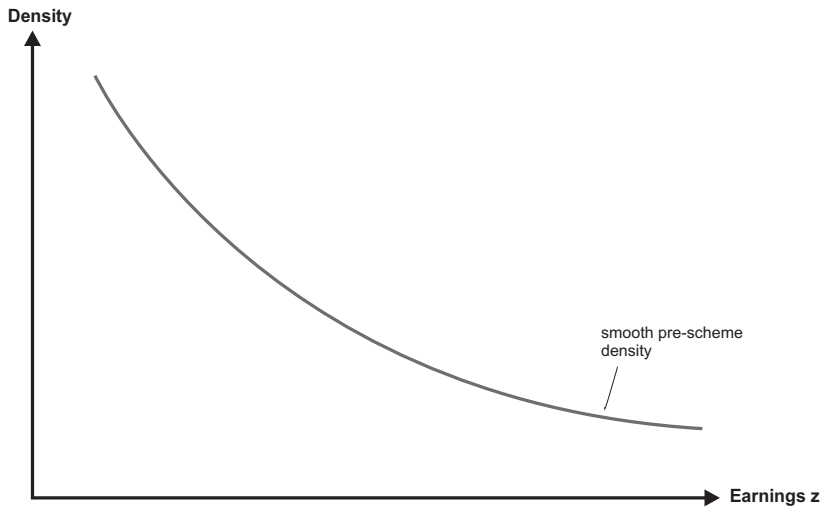
If $\beta < 1$, scheme **reduces** pretax wage z

$$\underbrace{z^S}_{\beta y + (1-\beta)y_0^S} < \underbrace{z^D}_{\beta y + (1-\beta)y_0^D}$$

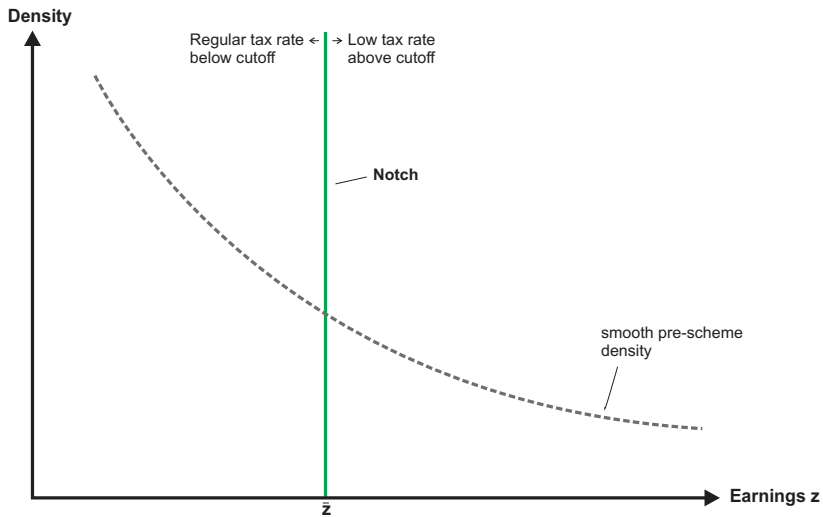
■ Bunching at \bar{z} :

- ▶ Bunching from above when bargaining power of firm $1 - \beta > 0$
- ▶ Bunching from below when bargaining power of workers $\beta > 0$

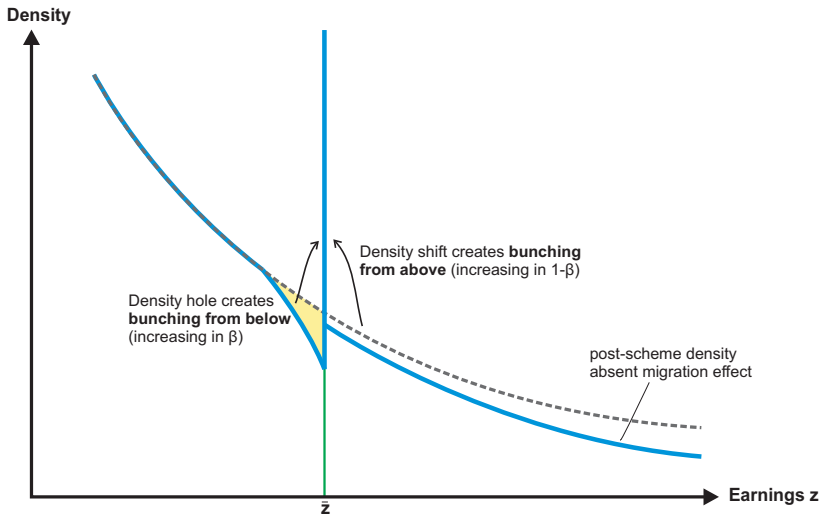
Panel A: Pre-Scheme Earnings Distribution for Foreigners



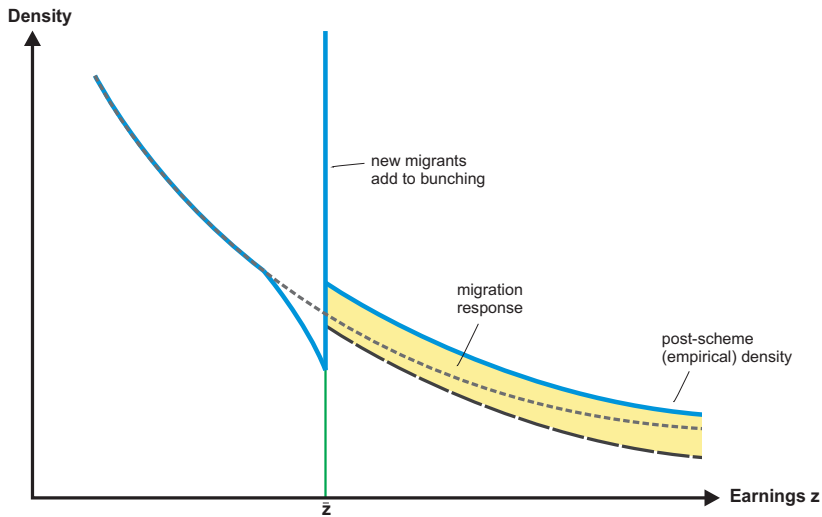
Panel B: Preferential Tax Scheme to High-Income Foreigners



Panel C: Intensive (Bargaining) Responses Conditional on Migration



Panel D: Intensive and Migration Responses



① Institutional background and data

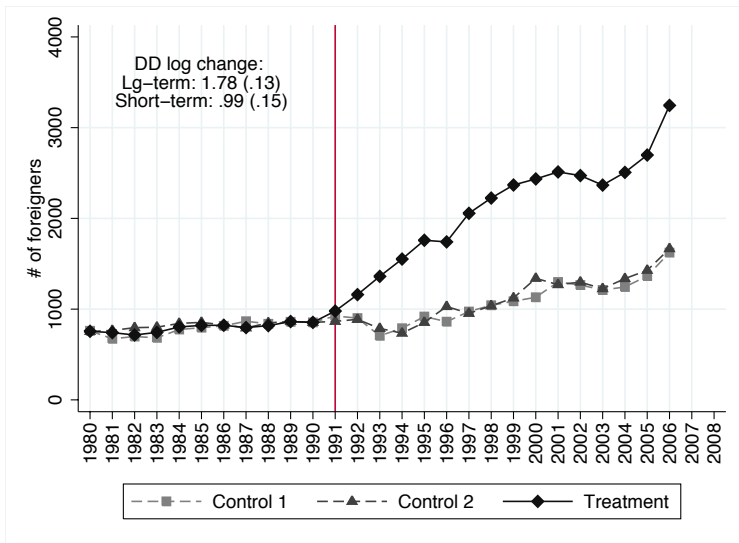
② Theoretical framework

③ Migration

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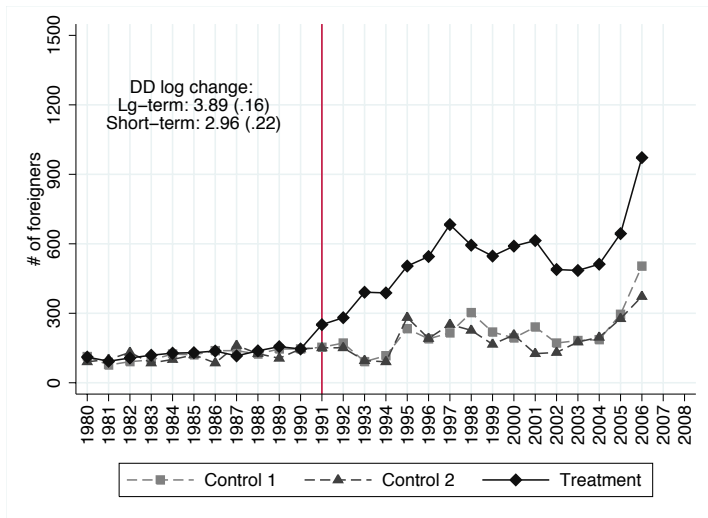
Figure 1 : Total number of foreigners in different income groups



Control 1= annualized income between .8 and .9 of threshold

Control 2= annualized income between .9 and .995 of threshold.

Figure 2 : Number of arrivals of foreigners in different income fractiles (1980-2005)

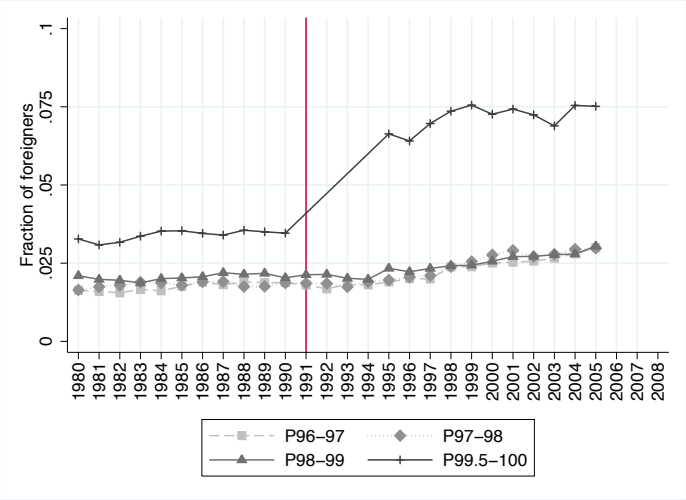


NOTE: Income fractiles are defined on the full population of tax filers above age 18 including individuals on the tax scheme. The income threshold for the scheme always lies between the 99.5th and the 99th percentile of the income distribution. All groups levels are adjusted to be equal in 1990 to the 1990 level for the P99.5-99.9 fractile.

Potential confounders

- DD identification assumption: parallel trend
- Confounder 1: **Fanning-out of income distribution**
 - ▶ High income increase faster than rest of the distribution
 - ▶ More foreigners cross the threshold \bar{z}
- Confounder 2: **Bunching from below** (Hole)
 - ▶ Bargaining with large β
 - ▶ Standard labor supply response

Figure 3 : Fraction of foreigners in different income fractiles (1980-2005)



Scheme threshold always between the 99.5th and the 99th percentile of the income distribution.

Figure 4 : Earnings Density for Foreigners

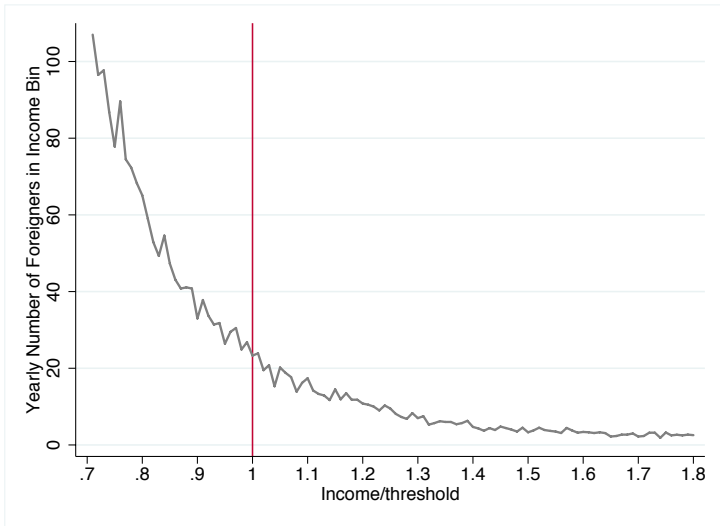


Figure 4 : Earnings Density for Foreigners

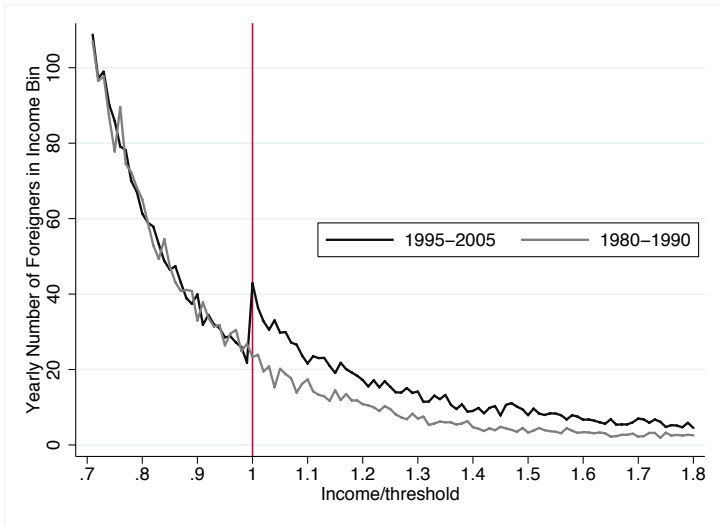
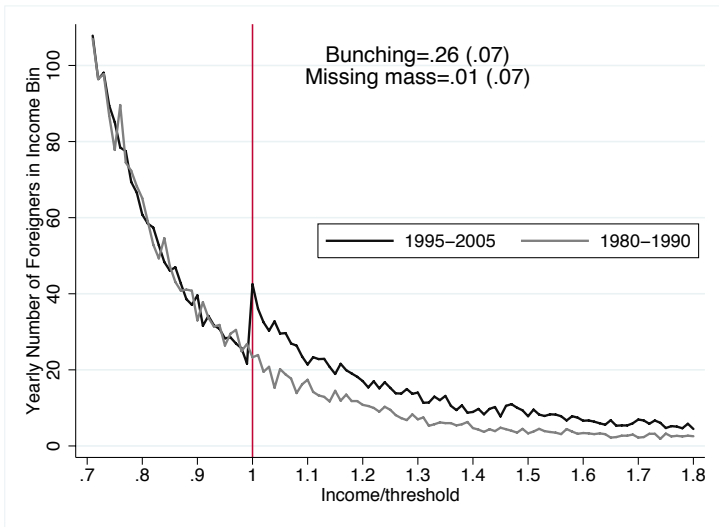


Figure 4 : Earnings Density for Foreigners



Total Elasticity Estimate

Number N of above threshold foreigners increases by 100% [relative to slightly below threshold foreigners]

Average tax rate τ in scheme is 25%, tax rate outside scheme is 55%
 \Rightarrow 67% increase in net-of-tax share of scheme

\Rightarrow Global elasticity:

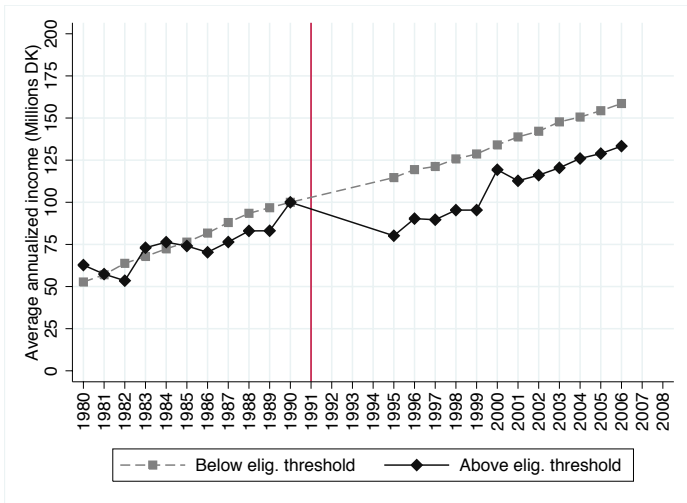
$$e = \frac{1 - \tau}{N} \frac{\partial N}{\partial(1 - \tau)} \simeq \frac{1}{0.67} = 1.5$$

Tax Revenue maximizing rate for foreigners in scheme:

$$\tau^* = 1/(1 + e) = 40\%$$

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Figure 5 : Average pretax earnings of eligible and non eligible foreigners over time



Sample: all individuals arrived in Denmark staying less than 3 yrs, with gross earnings in year 1 between .7 and 4 times the eligibility threshold

Empirical Test

- Previous graph potentially confounded by self-selection in the scheme
- More powerful test: migrants who stay 4+ years face increase from τ_S to τ_D in year 3
 - ▶ **Controls for individual f-e**
 - ▶ Under standard model: no change / decrease in z if standard labor supply response
 - ▶ Under bargaining model: increase in z

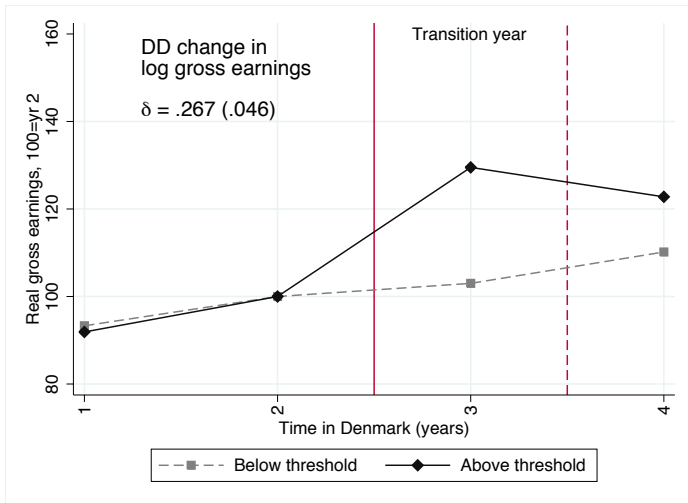
Empirical Test: Implementation

- Estimate for foreigners staying 4+ yrs DD individual f-e model:

$$z_{id} = \alpha_i + \sum_{d=0}^T \gamma_d + \delta(\mathbb{1}[z_{i,d=1} > \bar{z}] \cdot \mathbb{1}[d \geq 3]) + \varepsilon_{id}$$

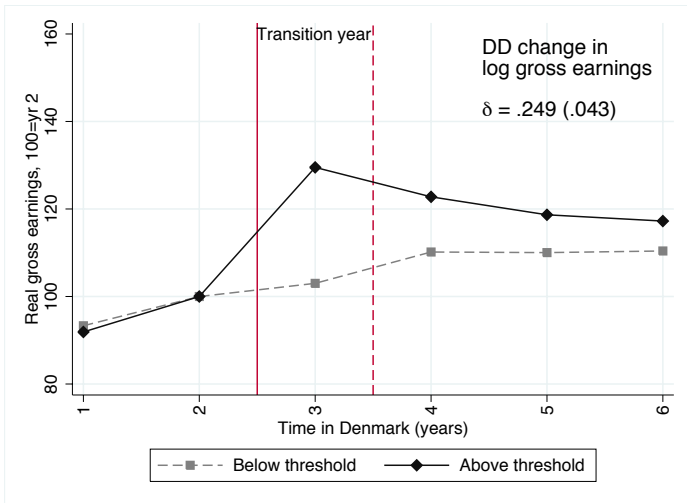
- ▶ d : year since arrival in Denmark
- ▶ $z_{i,d=1}$: earnings in year 1 in Denmark
- **Identifying assumption:** no unobservable correlated with both being in the scheme and earnings path in year 3
- Control groups:
 - ① Double-diff: migrants below scheme threshold
 - ② Triple-diff: migrants before reform

Figure 6 : Evolution of real gross earnings with time spent in Denmark (1995-2002): scheme is on



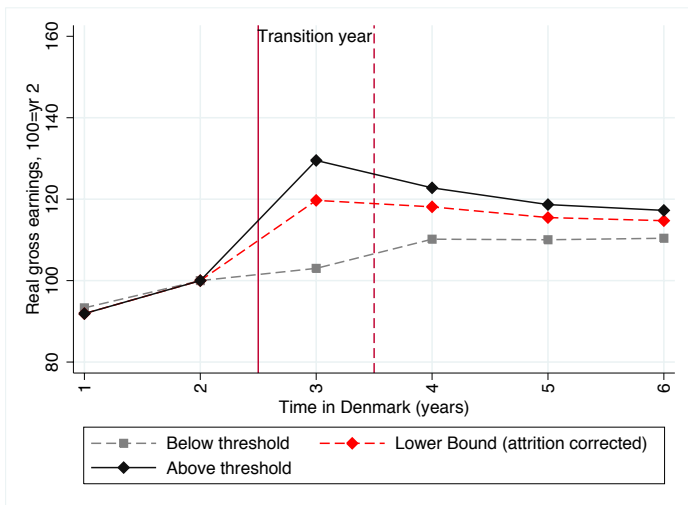
Sample: all individuals arrived in Denmark between 1995 and 2002 and staying at least 4 yrs or more in Denmark, with gross earnings in year 1 between .7 and 1.5 of the eligibility threshold

Figure 7 : Evolution of real gross earnings with time spent in Denmark (1995-2002): scheme is on



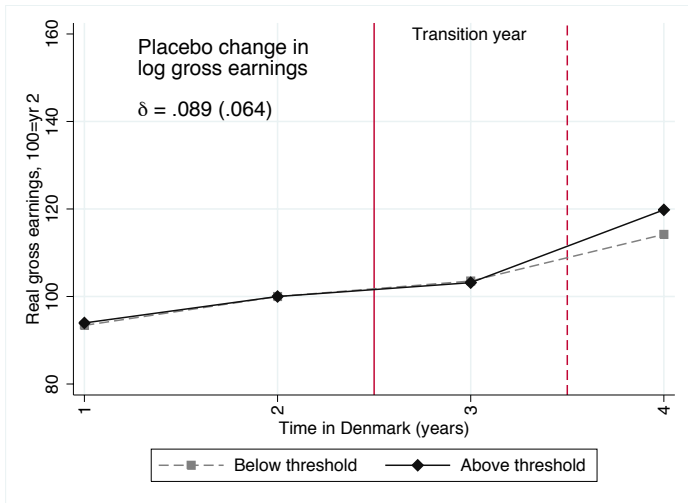
Sample: all individuals arrived in Denmark between 1995 and 2002 and staying at least 4 yrs or more in Denmark, with gross earnings in year 1 between .7 and 1.5 of the eligibility threshold

Figure 8 : Evolution of real gross earnings with time spent in Denmark (1995-2002): scheme is on



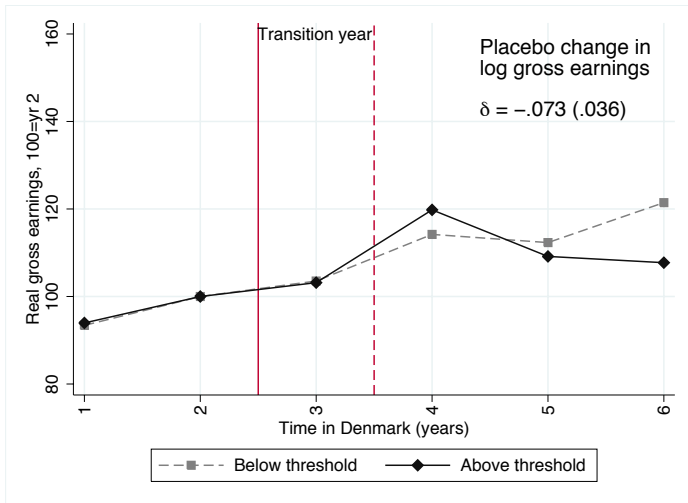
Note: Lower bound = correction under the assumption that all selective attrition due to people with zero incidence.

Figure 9 : Evolution of real gross earnings with time spent in Denmark (1980-1991): before scheme



Sample: all individuals arrived in Denmark between 1980 and 1991 and staying at least 4 yrs or more in Denmark, with gross earnings in year 1 between .7 and 1.5 of the eligibility threshold

Figure 10 : Evolution of real gross earnings with time spent in Denmark (1980-1991): before scheme



Sample: all individuals arrived in Denmark between 1980 and 1991 and staying at least 4 yrs or more in Denmark, with gross earnings in year 1 between .7 and 1.5 of the eligibility threshold

Conclusions

- Empirical findings:
 - ① Identification of migration response to net-of-tax rate
 - ② Positive correlation btw gross earnings and tax rate
 - ③ Bunching above scheme threshold and no hole below
- Theoretical implications:
 - Market-level incidence:** competitive markets
 - Micro-level incidence:** frictions and bargaining
- Policy implications:
 - ▶ Elasticities potentially larger for small countries / tax base (Kanbur and Keen, 1993)
 - ▶ Preferential tax schemes for skilled workers likely to generate severe tax competition in Europe

Figure 11 : Scheme migration elasticity and average wage growth by industry



Sample: all individuals who never enrolled in the scheme

BACK UP SLIDES

Figure 12 : Citizenship of Scheme Beneficiaries, 1991-2006

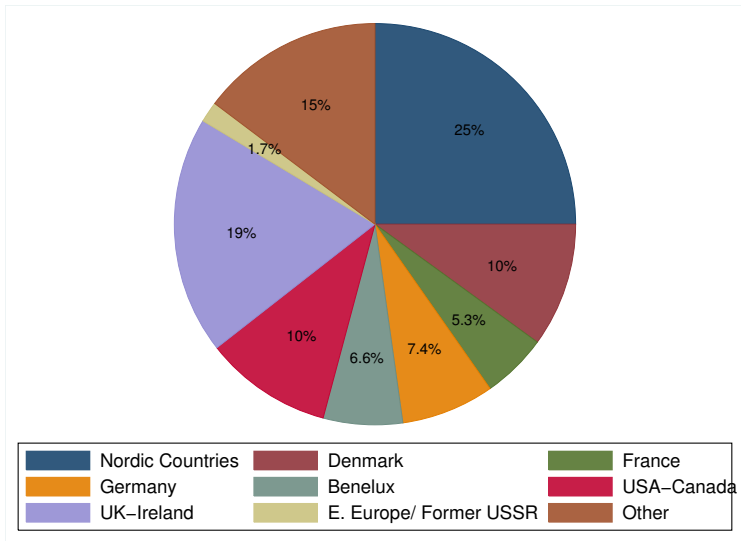
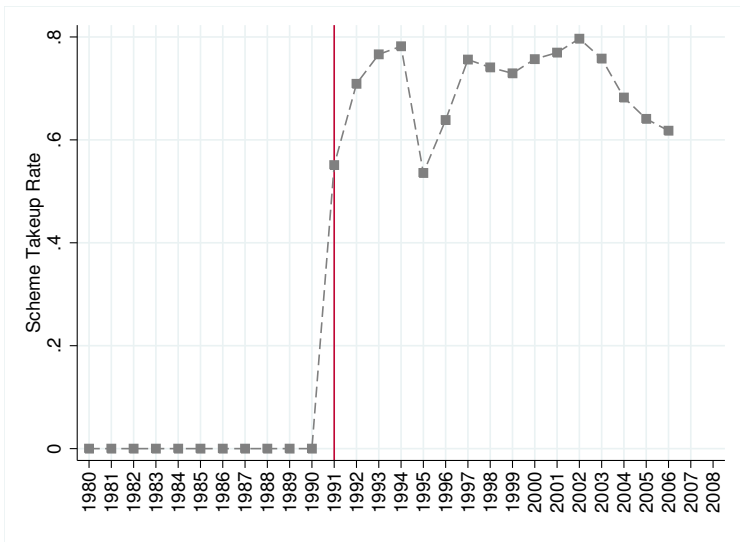


Figure 13 : Scheme Take-up rate for eligible foreigners upon arrival



Diff-in-Diff Estimation

$$Y_{it} = \alpha_0 + \alpha_{tr} \cdot \mathbb{1}[i = 1] + \alpha_{rf} \cdot \mathbb{1}[t > 1991] + \beta \cdot \mathbb{1}[i = 1] \cdot \mathbb{1}[t > 1991] + \nu_{it}$$

■ Identification Assumption:

Absent the reform, number of foreigners has same trend in the control ($i = 0$) and treatment ($i = 1$) group

■ Percentage increase in the total number of foreigners:

$$\frac{\beta}{\alpha_0 + \alpha_{rf} + \alpha_{tr}}$$

Specifications of bunching estimates

- Estimate models of the form:

$$c_j = \sum_{i=0}^p \beta_i^-(z_j)^i + \sum_{i=0}^p \beta_i^+(z_j)^i \mathbb{1}[z > \bar{z}] + \sum_{i=l}^u \gamma_i \mathbb{1}[z_j = i] + \nu_j$$

where $[l, u]$ is the excluded range around the notch point

- Compute counterfactual distribution:

$$\hat{c}_j = \sum_{i=0}^p \widehat{\beta}_i^-(z_j)^i + \sum_{i=0}^p \widehat{\beta}_i^+(z_j)^i \mathbb{1}[z > \bar{z}]$$

- Missing mass:

$$\widehat{M} = \frac{\sum_{i=l}^{\bar{z}} (c_j - \hat{c}_j)}{\widehat{C}_{\bar{z}}}$$

- Bunching:

$$\widehat{B} = \frac{\sum_{i=\bar{z}}^u (\hat{c}_j - c_j)}{\widehat{C}_{\bar{z}}}$$