Adjustment costs and factor demand: new evidence from firm's real estate

Antonin Bergeaud[a] Simon Ray[b]

[a]Banque de France & Paris School of Economics

[b]Banque de France & Aix-Marseille School of Economics

6th AMSE - BdF Labor market Conference ; December 1st, 2017

Plan

Plan

Introduction

- How important are the distorsive effects of the costs associated with the adjustment of premises' size on inputs dynamic?
- More generally: adjustment costs, factor demand and inputs' allocation.
  $\longrightarrow$ Land identified as playing an key role in the misallocation of production factors: Duranton et al. (2015)
- Empirically: heterogeneity in the relocation costs
  - Firms' tenure status
  - Tax on real estate capital gains as a friction on premises' size adjustment

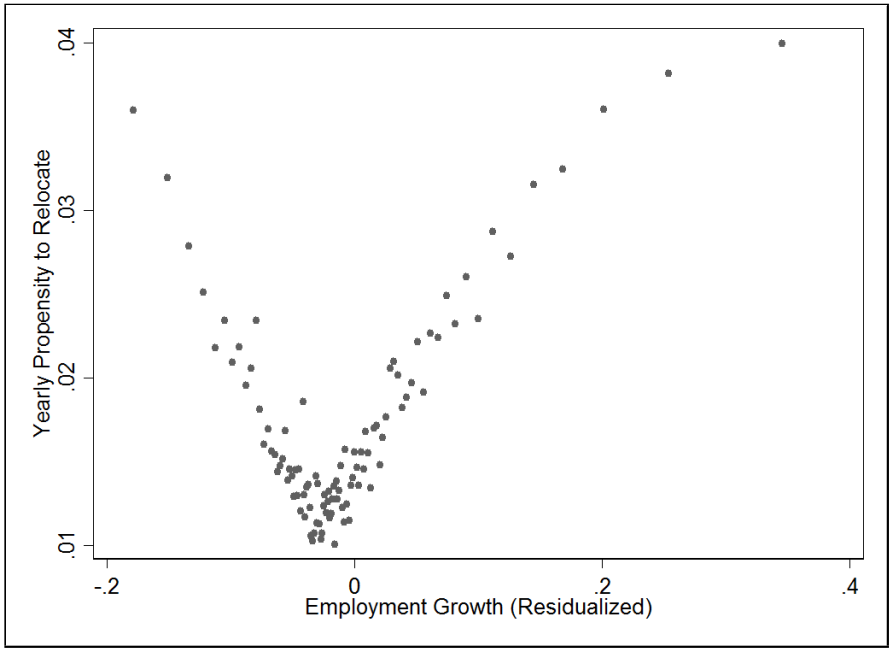
Introduction

Equivalence between adjustment of premises' size and local relocation of establishments:

- Relies on:
  - (i) no access to adjacent land or buildings
  - (ii) branching is costly
  - (iii) no sublease of unused premises
- Implies:
  - (i) costly adjustments
  - (ii) fixed-part: lumpy adjustments
  - (iii) adjustment costs vary across firms
- Allows empirical investigation of the effect of the adjustment costs

Stylized fact 1: employment growth and relocation

- Using a firm-level database: workforce growth and relocation of firms - more than $100K$ single-establishment firms

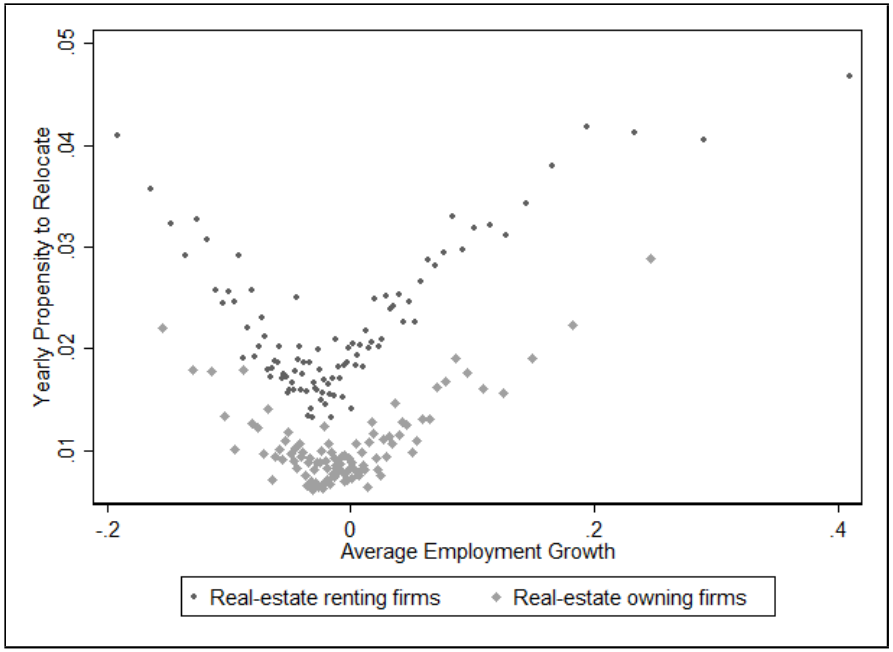


Notes: propensity to move (y-axis) against employment growth (x-axis)

- Suggests that:
  - Relocating is strongly associated with employment adjustments
  - Employment and premises size are highly complementary

Stylized fact 2: The impact of relocation costs

- Relocating : more costly for real estate owning firms (notably, taxes associated with real estate transactions)



Notes: propensity to move (y-axis) against employment growth distribution (x-axis) - owners vs renters

- Suggests that:
  - Adjustment costs alter the link btw reloc. and emp. dynamics: for a given propensity to move, owners exhibit higher growth rates

Contribution and findings

- What we do:
  - A general equilibrium model to formalize the effect of fixed adjustment costs of real estate on firms' reaction to idiosyncratic prod. shocks
  - Qualitative predictions on the consequences of such costs on relocation and moments of employment growth distribution
  - Test these predictions, notably using the tax on capital gains that introduces heterogeneity in the relocation costs faced by firms

Contribution and findings

- What we do:
  - A general equilibrium model to formalize the effect of fixed adjustment costs of real estate on firms' reaction to idiosyncratic prod. shocks
  - Qualitative predictions on the consequences of such costs on relocation and moments of employment growth distribution
  - Test these predictions, notably using the tax on capital gains that introduces heterogeneity in the relocation costs faced by firms
- What we find:
  - Confirm the relationship between relocation and employment dynamic
  - Document the negative impact of adjustment costs on relocation
  - Validate empirically the theoretical prediction on the negative effect of the real estate adjustment costs on emp. growth of growing firms:
    - A one s.d. deviation increase in a measure of the tax lowers yearly emp. growth of growing firms by .25 pp; but no significant effect of declining firms

A quick literature review

- Non-convex adjustment costs:
  - employment: Hamermesh, 1989, Caballero, Engel, and Haltiwanger, 1997, Cooper and Willis, 2009, Bloom, 2009, Elsby and Michaels, 2014
  - capital: Caballero, Engel, Haltiwanger, et al., 1995, Cooper and Haltiwanger, 2006 and Bloom, 2009
- Misallocation of production factors:
  - lower aggregate total factor productivity: Hsieh and Klenow, 2009
  - size-contingent regulation : Garicano, Lelarge, and Van Reenen, 2016
- Few papers on the determinant of firms' relocation :
  - descriptive statistic on firms' mobility in France: Delisle and Laine, 1998
  - determinants of firms relocation : Pellenbarg, Van Wissen, and Van Dijk, 2002 ; Brouwer, Mariotti, and Ommeren, 2004
- The literature on the effect of tax friction on real-estate transactions and households' mobility
  - Dachis, Duranton, and Turner, 2012; Best and Kleven, 2013; Hilber and Lyytikäinen, 2013

Plan

The model set-up (1/2)

- A simple two-period general equilibrium model
- A continuum of monopolistic firms producing differentiated products $i \in [0,1]$ using labor and real estate as inputs:

$$y(i) = \theta(i) \left(\frac{l(i)}{\alpha} \right)^{\alpha} \left(\frac{r(i)}{1-\alpha} \right)^{1-\alpha}$$

  - where $\theta(i)$ is firm prod. and α is the elasticity of production to labor
- A final good sector uses all products i as inputs to produce Y, with a CES aggregator, sold at price P
- Firm's i revenue is given by:

$$p(i)y(i) = \Omega(i) \left(\frac{l(i)}{\alpha} \right)^{\alpha(1-\varepsilon)} \left(\frac{r(i)}{1-\alpha} \right)^{(1-\alpha)(1-\varepsilon)},$$

  - where ε is the inverse of the elasticity of substitution and $\Omega(i) = \theta(i)^{1-\varepsilon} Y^{\varepsilon} P$ is the revenue productivity.

The model set-up (2/2)

- Firms face idiosyncratic unanticipated shocks on $\theta(i)$ in period 1
- Factors optimally allocated before unanticipated prod. shocks
- Factors' adjustment following the shocks:
  - Friction-less adjustment of labor
  - Adjusting real estate associated with fixed costs: $ar_0(i)$
- Firm i's profit maximization problem can be written:

$$\max_{z(i)\in\{0,1\}} \quad z(i) \max_{r(i)>0;l(i)>0} [\pi(i, l(i), r(i)) - ar_0(i)] + (1 - z(i)) \max_{l(i)>0} [\pi(i, l(i), r_0(i))]$$

  - where z denotes relocating choice, π denotes profit defined as $p(i)y(i) - wl(i) - ur(i)$, with w the wage and u the user cost of re
- General equilibrium effect: re and labor are in fixed supply and wages and re costs clear the markets

The relocation decision

- Frictionless case:
  - All firms relocate and optimally adjust premises size
  - Optimal allocation of factors

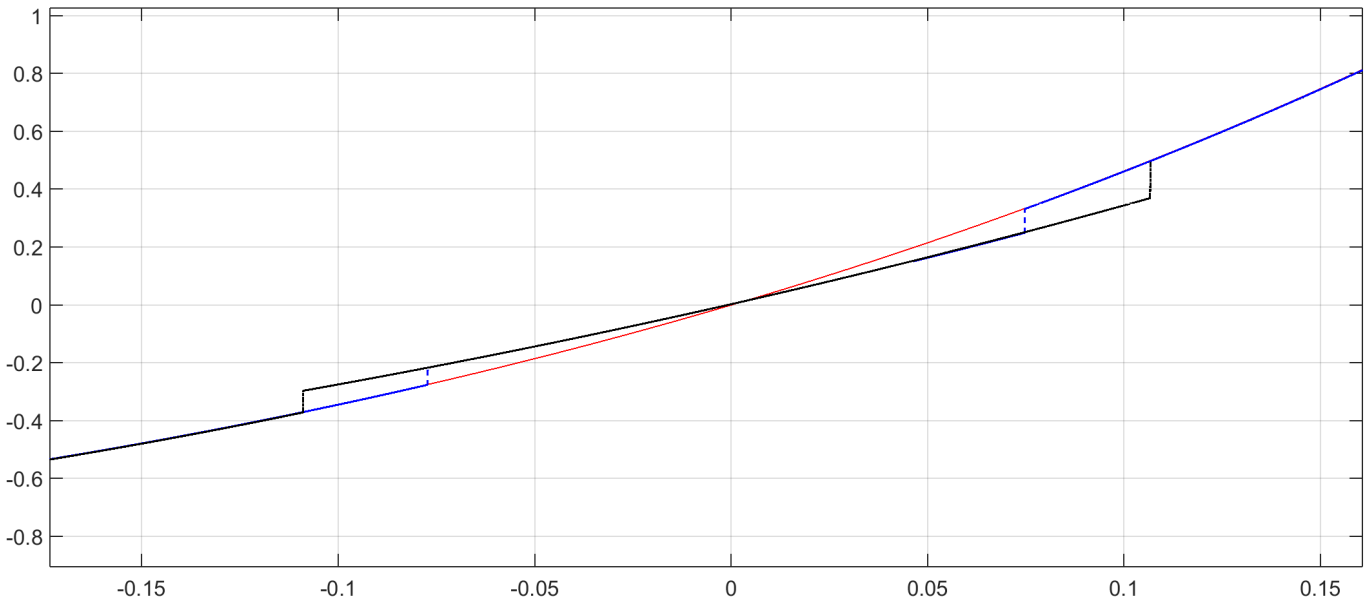
The relocation decision

- Frictionless case:
  - All firms relocate and optimally adjust premises size
  - Optimal allocation of factors
- Case with frictions:
  - Firms relocate only if induced changes in profits cover the relocation costs
  - Implies a non-relocating interval (NRI) in Δ_{re*}
  - The NRI widens with a
  - Non linearity implies that the NRI is not centered in 0 and $|\Delta^{+}_{re*}| > |\Delta^{-}_{re*}|$

The relocation decision

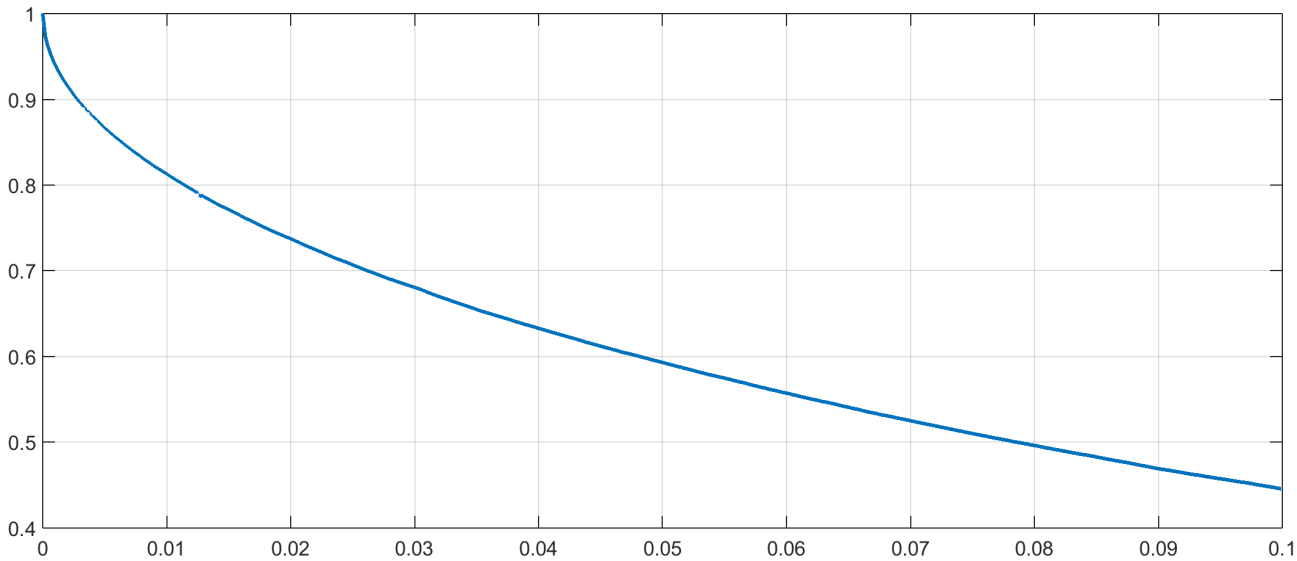
- Frictionless case:
  - All firms relocate and optimally adjust premises size
  - Optimal allocation of factors
- Case with frictions:
  - Firms relocate only if induced changes in profits cover the relocation costs
  - Implies a non-relocating interval (NRI) in Δ_{re*}
  - The NRI widens with a
  - Non linearity implies that the NRI is not centered in 0 and $|\Delta^{+}_{re*}| > |\Delta^{-}_{re*}|$
- Numerically solve the model for varying parameter values of a while keeping the same productivity shocks
  - 100,000 draws from $N(1, 0.1)$
  - $\varepsilon = 0.2$ and $\alpha = 0.925$

Firm level employment growth: employment growth as a function of prod. shocks - various *a*



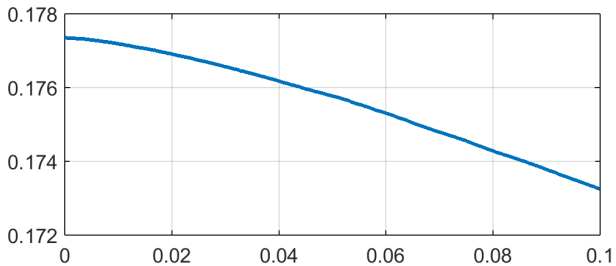
- (i) Relocating firms are characterized by larger employment growth
- (ii) Because of asymmetrical effect of adj. costs, the growth diff. is larger for growing firms

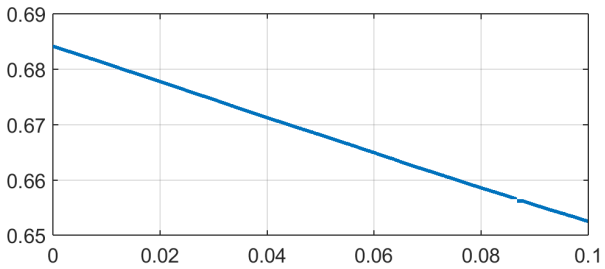
Frictions and share of relocating firms: share of relocating firms for different values of a

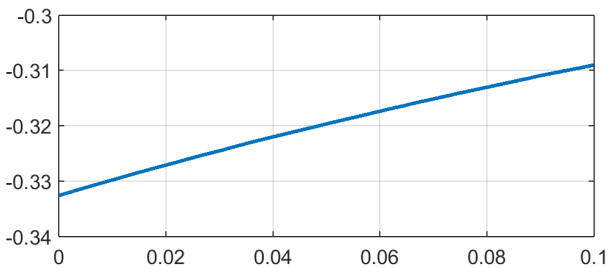


- For given prod. shocks, the share of relocating firms is decreasing with the level of the adj. costs

Frictions and moments in the employment growth distribution: mean emp. growth as a function of *a*







- (i) overall mean emp. growth decreases with the level of adj. costs
- (ii) mean emp. growth of growing firms markedly decrease with *a* whereas mean emp. growth of declining firm slightly increase

Plan

Data

- Firm-level database built by the Banque de France
  - panel data between 1993 and 2013 : $112K$ single-establishment firms over an average period of 9.75 years
  - location (*code commune*), workforce size in FTE, financial statements, sector

Data

- Firm-level database built by the Banque de France
  - panel data between 1993 and 2013 : $112K$ single-establishment firms over an average period of 9.75 years
  - location (*code commune*), workforce size in FTE, financial statements, sector
- We can identify inter-municipality relocations of a firm:
  - A relocation corresponds to a change in the *code commune*
  - Relocations are not so rare: almost $18K$ have relocated their activities (c.16%)
  - For 75% of the moves, the "as-the-crow-flies" distance is inferior to 15km

Data

- Firm-level database built by the Banque de France
  - panel data between 1993 and 2013 : $112K$ single-establishment firms over an average period of 9.75 years
  - location (*code commune*), workforce size in FTE, financial statements, sector
- We can identify inter-municipality relocations of a firm:
  - A relocation corresponds to a change in the *code commune*
  - Relocations are not so rare: almost $18K$ have relocated their activities (c.16%)
  - For 75% of the moves, the "as-the-crow-flies" distance is inferior to 15km
- Relocation cost 1 : BS data indicate firm's tenure status
- Relocation cost 2 : tax on real estate capital gains
  - Tax only paid if real estate transac. but latent level at a yearly freq
  - Firm level variations of $Tax_{i,t}$ driven by interaction of holding period and local price dynamics between acq. date and obs. date

I - Local relocations and employment dynamics: evidence of on asymmetric effect - Cross section

- How does the occurrence of a move interact with the employment growth?

$$\Delta l_i = \beta_1 z_i + X_i \beta_2 + \varepsilon_{i,s,d},$$

Dependent variable: Yearly average employment growth (in %)

	All	Growing	Declining
	(1)	**(2)**	**(3)**
Relocate	0.125***	0.209***	-0.063***
	(0.012)	(0.021)	(0.005)
Age	-0.078***	-0.116***	0.020***
	(0.004)	(0.008)	(0.001)
Size	-4.078*	-8.476***	4.334***
	(2.095)	(3.102)	(1.608)
R^2	0.059	0.110	0.158
Observations	118,980	56,983	46,605

I - Local relocations and employment dynamics: evidence of the asymmetric effect - Panel

	Dependent variable: Employment growth at t (in %)					
	Growing	Declining	Growing	Declining	Growing	Declining
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Relocate $_t$	3.663***	-1.706***				
	(0.674)	(0.369)				
Relocate $_{t-1}$			4.079***	-0.085		
			(0.694)	(0.328)		
Relocate $_{t-2}$					0.805	0.288
					(0.606)	(0.319)
Age	-0.259*	-0.199	-0.256*	-0.197	0.062	-0.118
	(0.145)	(0.150)	(0.145)	(0.150)	(0.146)	(0.159)
Size	-75.674***	-18.514**	-75.754***	-18.475**	-69.808***	-27.582**
	(23.791)	(8.272)	(23.852)	(8.266)	(23.326)	(11.486)
R^2	0.149	0.100	0.149	0.100	0.167	0.138
Observations	574,352	426,728	574,352	426,728	516,131	379,077

II - Relocation costs and mobility (1/3)

- How do the relocation costs affect the propensity to move?
- Moving costs as captured through the tenure status (col. 1):

$$z_i = \mu_1 Te_i + \mu_2 X_i + \varepsilon_{i,s,d},$$

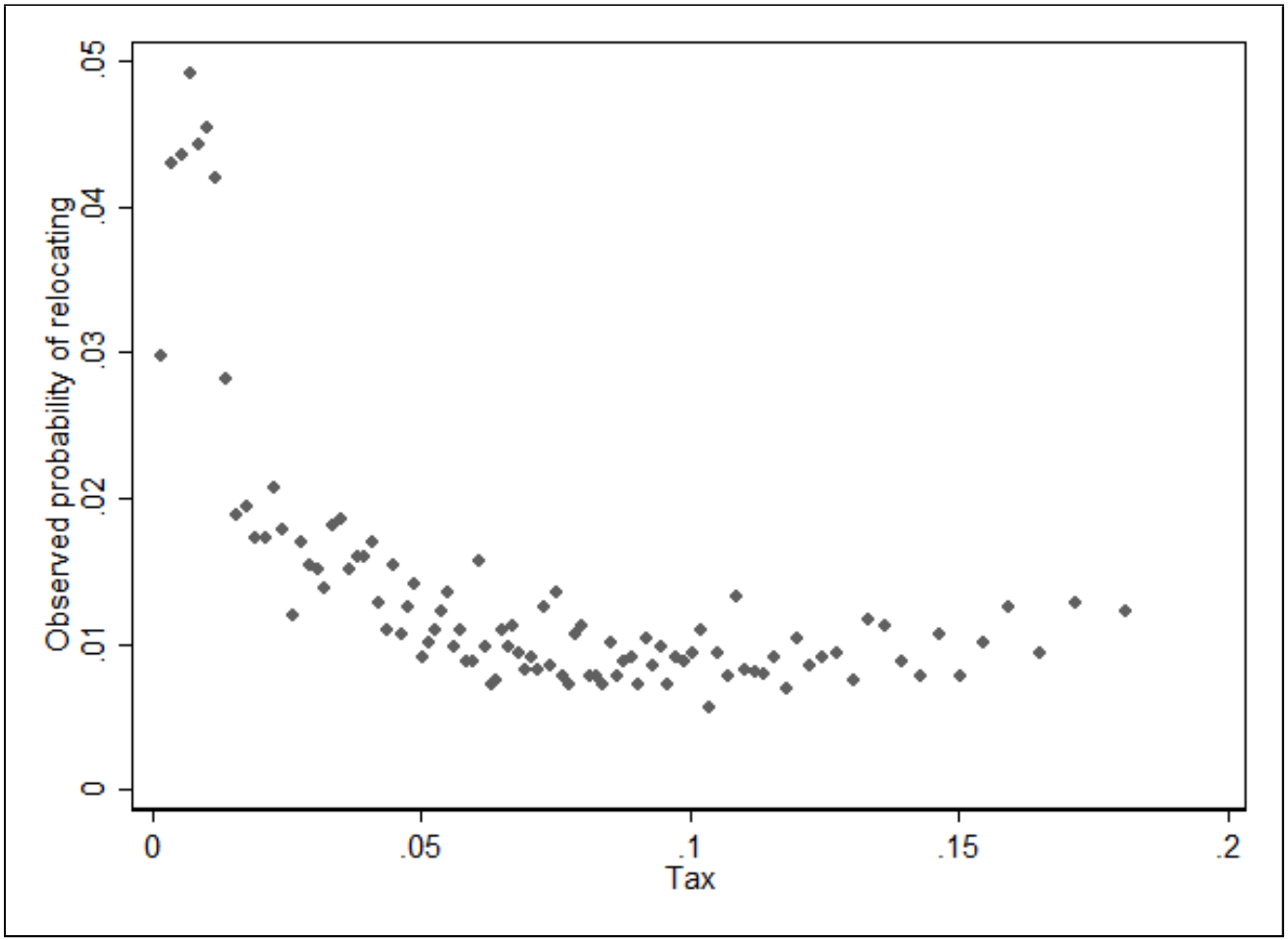
- Restricting the sample to owning firms (col. 2 to 6):

$$z_i = \beta_1 Tax_i + \beta_2 X_i + \varepsilon_{i,s,d},$$

II - Relocation costs and mobility (2/3)

	Dependent variable: Relocate					
	All	Owners				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Real Estate Owner	-0.597***					
	(0.036)					
Tax		-2.248***	-2.417***	-2.666***	-2.891***	-2.180***
		(0.491)	(0.498)	(0.561)	(0.579)	(0.588)
Age	-0.022***	-0.014***	-0.013***	-0.008***	-0.006***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	1.740	5.352*	5.314*	5.050*	5.041*	5.029*
	(1.746)	(2.899)	(2.902)	(2.986)	(2.857)	(2.863)
Volume Real Estate			-0.018***	-0.006	-0.004	-0.003
			(0.005)	(0.005)	(0.005)	(0.005)
Age Real Estate				-0.024***	-0.023***	-0.021***
				(0.005)	(0.005)	(0.005)
R^2	0.087	0.121	0.121	0.121	0.160	0.160
Observations	118,980	45,181	45,181	44,412	44,412	44,412

II - Relocation costs and mobility: the graphical impact of the tax (3/3)



Notes: propensity to move (y-axis) against the importance of the tax on capital gain

III - Direct effects of relocation costs on employment: evidence of a significant impact on growing firms

- What are the direct effects of relocation costs on the employment growth?
- Moving costs as captured through the tenure status (col. 1 to 2):

$$\Delta l_i = \mu Te_i + \mu_2 X_i + \varepsilon_{i,s,d},$$

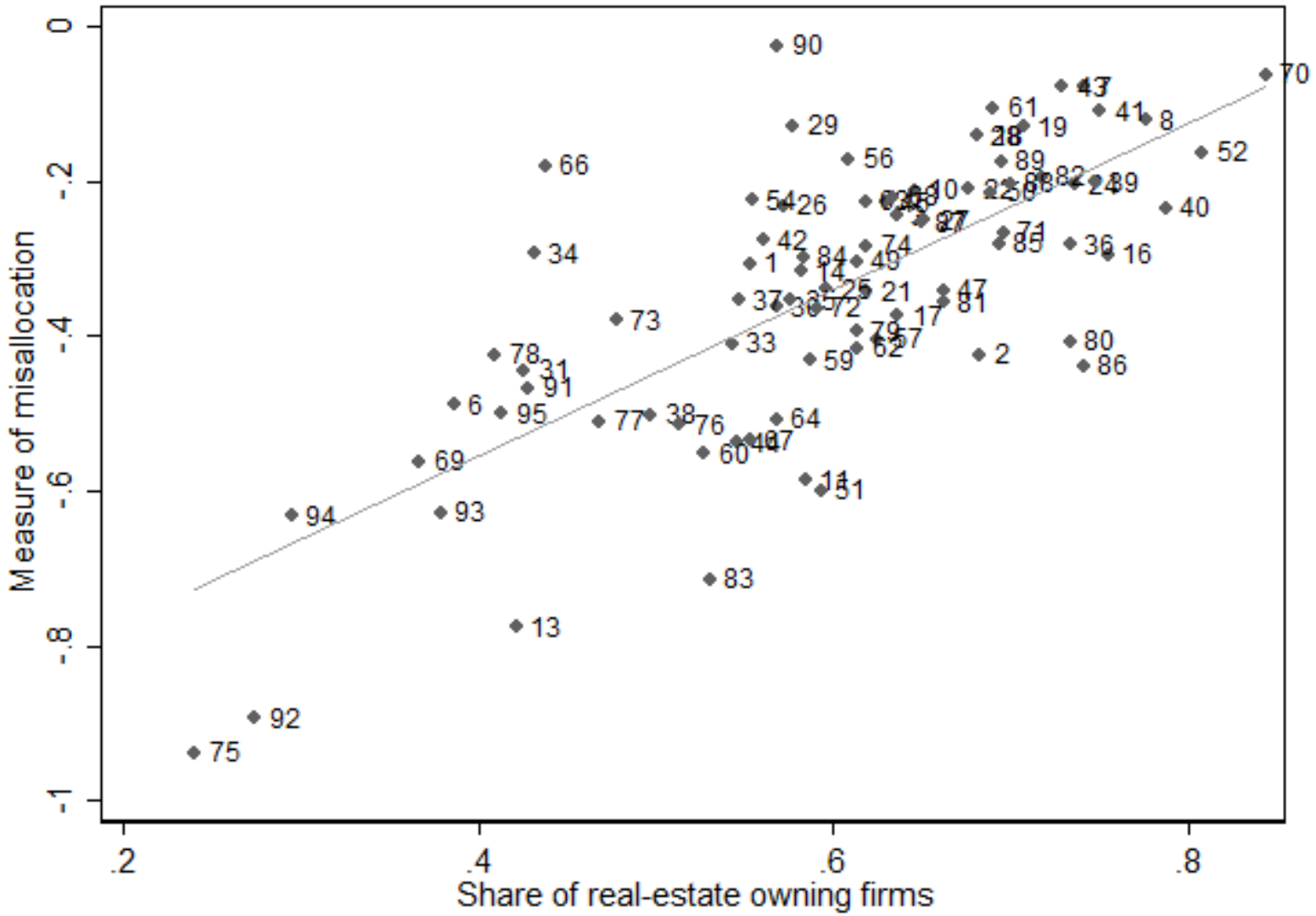
- Restricting the sample to owning firms (col. 3 to 6):

$$\Delta l_i = \beta_1 Tax_i + \beta_2 X_i + \varepsilon_{i,s,d}.$$

III - Direct effects of relocation costs on employment: evidence of a significant impact on growing firms

Dependent variable: Yearly average employment growth (in %)						
	Growing	Declining	Growing Owners	Declining Owners	Growing Owners	Declining Owners
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Real Estate Owner	-0.987***	0.228***				
	(0.149)	(0.046)				
Tax			-4.855**	-0.243	-5.260**	-0.127
			(2.309)	(0.767)	(2.390)	(0.737)
Age	-0.076***	0.010***	-0.035***	0.006***	-0.035***	0.006***
	(0.007)	(0.001)	(0.008)	(0.002)	(0.008)	(0.002)
Size	-3.309	4.187***	-2.680	9.785**	-2.732	9.785**
	(2.059)	(1.531)	(6.220)	(4.085)	(6.221)	(4.082)
Age Real Estate			-0.087***	-0.003	-0.089***	-0.003
			(0.024)	(0.007)	(0.024)	(0.007)
Volume Real Estate			0.078	-0.034**	0.079	-0.034**
			(0.055)	(0.017)	(0.055)	(0.017)
R^2	0.105	0.216	0.243	0.310	0.243	0.310
Observations	72,375	46,605	24,855	19,557	24,855	19,557

Misallocation



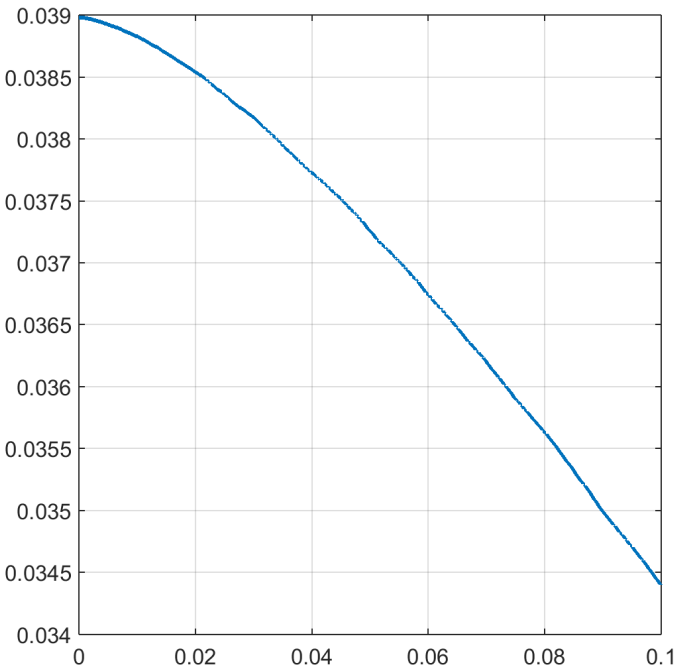
Plan

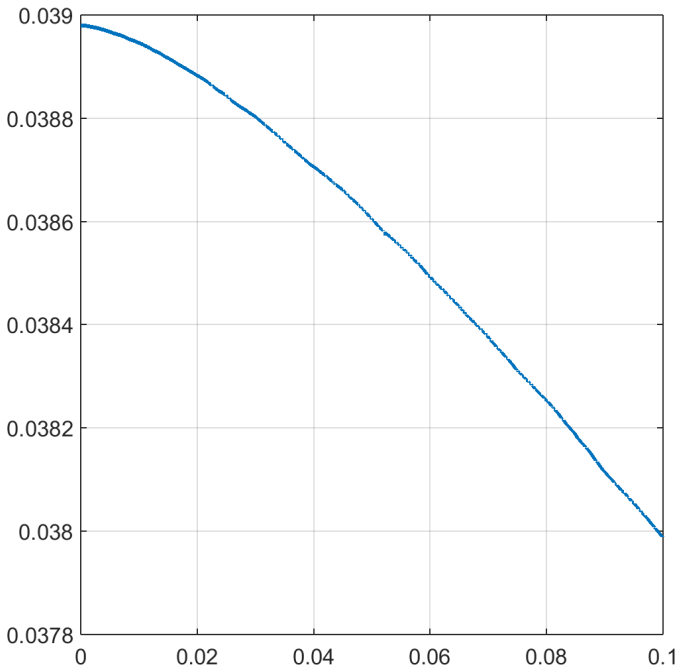
Concluding remarks

- This paper investigates the effect of fixed adjustment costs of real estate on inputs' dynamic, notably using firm level heterogeneity introduced by tax on cap. gains
- We build a general equilibrium model to derive the effect of the fixed adj. costs on moments of the workforce growth distribution
- We derive asymmetrical effects of adjustment costs: dampen the propensity to relocate and distort the emp. growth of growing firms
- A one s.d. deviation increase in a measure of the tax lowers yearly emp. growth of growing firms by .25 pp but no significant effect on declining firms
- An example of fixed adjustment costs, induced by taxes, that is non neutral on input distribution and affect optimal allocation of resources

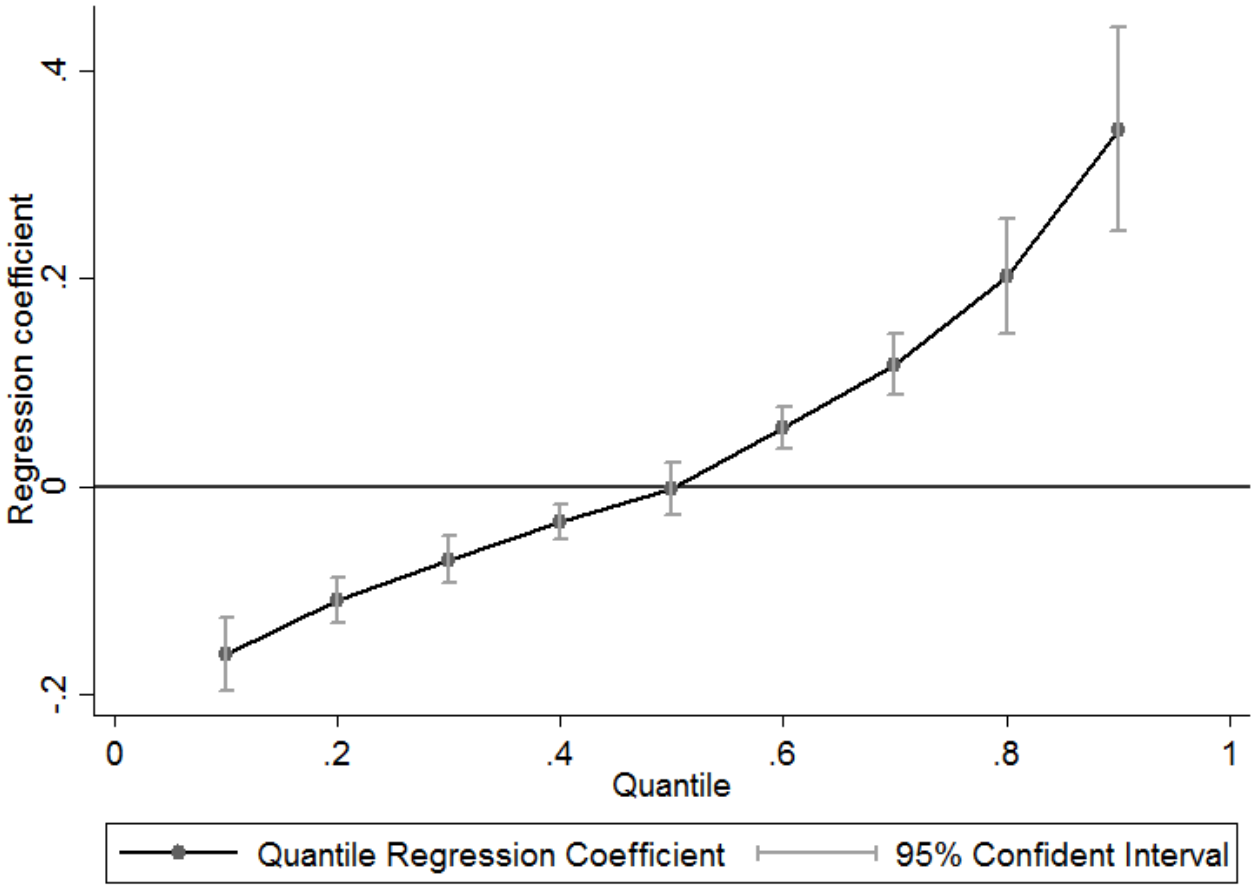
Plan

Co-variance between $r(i)$ and $\theta(i)$ as a function of a





Relocation and employment dynamics - Quantile regression results



Relocation costs and employment dynamics - Quantile regression results