Business Taxation and Economic Development

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Motivation

- We will focus on mobile firms that can all freely move from one city to another if they wish.
- This means that a city must be able to "meet the competition," i.e. it must be optimal for a firm to locate in a given city.
- To understand these issues we need to model firms' entry and exit decision.
- How does business taxation affect firms' location decisions?
- How can a city use its tax policies to promote economic development?

Locational Choices of Firms

- Agglomeration economies help a city to attract firms because agglomeration makes firms more productive.
- If the city government provides inadequate services or provides its services at too high a tax rate, then firms will leave.
- Exiting firms reduce agglomeration advantages which only encourages further exit.
- If the city is efficient it may attract other firms from inefficient cities.
- As a consequence, there is little scope for aggressive taxation of mobile firms unless the city offers some unique locational advantages.

Concentration of Employment in Central Business Districts

MSA Name	Total Employment not CBD	Total Employment CBD	Average Employment not CBD	Average Employment CBD
Atlanta	1,115,398	229,002	15.79	29.25
Boston	1,728,075	531,349	15.66	39.01
Chicago	3,070,387	528,529	15.86	24.47
Houston	1,720,625	286,574	16.38	28.47
Los Angeles	4,257,269	974,693	15.02	19.39
Philadelphia	1,921,626	196,428	15.91	27.66
Seattle	1,260,335	179,230	14.55	20.33
Washington	1,930,848	303,770	15.42	21.68

Evidence of Firm Sorting

- Most large cities in the U.S., such as Los Angeles, Chicago, Boston, Washington, and Philadelphia have a significant fraction of firms concentrated in central business districts.
- Firms in the CBD are larger than firms outside the CBD
- Larger firms tend to have higher levels of productivity.
- CBDs thus often serve as hubs for a variety of different service sector industries such as finance, legal and professional services, health care, education, etc.
- Large cities tend to attract more productive firms than small cities, largely due to differences in agglomeration externalities and other amenities.

A Model of Firm Location Choices

- We consider a model with two distinct cities, denoted by $j = 1, 2$.
- Locations differ by agglomeration externalities, denoted by e_j.
- For simplicity, we will treat the agglomeration externality as exogenous.
- The output price, p, is independent of location
- All firms behave as price takers and compete in the same product market.
- There are no transportation costs.
- Wages, w_j, however, depend on the location.

Firm's Productivity

- Firms differ by productivity denoted by ϕ.
- Each firm produces a single output good y using labor l as input factor.
- Suppose that the production function is Cobb-Douglas and can be written as:

$$y_j = \phi \, e_j \, l^{\alpha} \tag{1}$$

  with $\alpha < 1$. Why do we need this assumption?
- To simplify the algebra, let us assume that $\alpha = 0.5$.
- Note that productivity depends on own productivity ϕ as well as a location specific externality e_j.

Profit Maximization

- The firm determines labor input after it has observed its productivity shock.
- Firms maximize profits given by:

$$\pi_j \;=\; p\,\phi\,e_j\,l^{0.5} \;-\; w_j\,l \;-F_j \tag{2}$$

- F_j denotes fixed costs in location j.
- In summary, wages, fixed costs and agglomeration externalities depend on location, while output prices do not.

Optimal Labor Demand

- The first order condition for optimal labor demand is given by:

$$p \, \phi \, e_j \, 0.5 \, l^{-0.5} \; - \; w_j \;\; = \;\; 0 \tag{3}$$

- Hence, labor demand satisfies:

$$l_j(\phi, e_j, p, w_j) \;\; = \;\; \left(\frac{0.5 \, \phi \, e_j \, p}{w_j} \right)^2 \tag{4}$$

- Note that labor demand is increasing in the productivity ϕ, the externality e_j, and the output price p, and decreasing in the local wage w_j.

Profits

- Substituting the optimal labor demand into the production function we obtain the supply function:

$$y_j(\phi, e_j p, w_j) \quad = \quad \frac{0.5\ \phi^2\ e_j^2\ p}{w_j} \tag{5}$$

- Finally, the profit function is given by:

$$\begin{aligned} \pi_j(\phi, e_j, p, w_j) \quad &= \quad p\ y_j(\phi, e_j, p, w_j)\ -\ w_j\ l_j(\phi, e_j p, w_j)\ - F_j \\ &= \quad \frac{1}{4}\frac{\phi^2\ e_j^2\ p^2}{w_j}\ -\ F_j \end{aligned} \tag{6}$$

- Profits are increasing in the productivity ϕ, the externality e_j, and the output price p.
- Profits are decreasing in the local wage w_j and fixed costs F_j.

A Necessary Condition for Entry: Positive Profits

- A necessary condition for a firm to operate in location j is that it must make positive profits, i.e. that the following condition holds:

$$\pi_j(\phi) \quad \geq \quad 0 \tag{7}$$

which implies that:

$$\phi^2 \quad \geq \quad 4\frac{w_j}{e_j^2 \; p^2} \; F_j \tag{8}$$

- Hence, the firm's productivity ϕ has to be sufficiently high given output prices, wages and externalities.

A Cut-off Rule and Firm Entry

- We can define for each market a cut-off value $\underline{\phi}_j$ such that

$$\underline{\phi}_j = \sqrt{4 \frac{w_j}{e_j^2 \; p^2} \; F_j} \tag{9}$$

- Firms with low productivity

$$\phi < \underline{\phi}_j \tag{10}$$

  do not make positive profits in market j and cannot enter this market.
- This lower threshold is market specific. Draw a picture.

A Sufficient Condition for Market Entry

- The existence of positive profits is not a sufficient condition for firm entry.
- For example, a high productivity firm will typically make positive profits in both locations.
- In that case, it will naturally move to the location in which profits are higher.
- A sufficient condition for a firm with productivity ϕ to located in city 1 is then the following

$$\begin{aligned} \pi_1(\phi) &\geq 0 \\ \pi_1(\phi) &\geq \pi_2(\phi) \end{aligned} \tag{11}$$

- Firms will sort among locations based on differences in externalities and costs, i.e. wages and fixed costs.

Which City is Optimal?

- Let's consider the second inequality.
- For a firm with productivity ϕ to prefer city 1 over city 2 we need that profits are larger in city 1 than city 2:

$$\frac{1}{4}\frac{\phi^2\ e_1^2\ p^2}{w_1} - F_1 \geq \frac{1}{4}\frac{\phi^2\ e_2^2\ p^2}{w_2} - F_2 \tag{12}$$

- which implies that

$$\phi^2\ \frac{p^2}{4}\left(\frac{e_1^2}{w_1} - \frac{e_2^2}{w_2}\right) \geq F_1 - F_2 \tag{13}$$

Another Cut-off Rule

- Lets assume that city 1 is the high-externality, high-cost location relative to city 2.
- In particular, let us assume that

$$\frac{e_1^2}{w_1} - \frac{e_2^2}{w_2} \geq 0 \tag{14}$$

and that

$$F_1 - F_2 \geq 0 \tag{15}$$

- Then there exists a a cut-off value $\bar{\phi}$ such that $\phi \geq \bar{\phi}$ implies that profits are higher in city 1 than city 2.

Optimal Entry in Equilibrium

- There are a number of different cases that can arise.
- One interesting case is characterized by the following inequalities

$$\bar{\phi} \geq \underline{\phi}_1 \geq \underline{\phi}_2 \geq 0 \tag{16}$$

- In that case high productivity firms enter in city 1, medium productivity firms enter in city 2, and low productivity firms cannot enter either market.
- Note that this equilibrium has a similar sorting structure as the household mobility equilibrium we derived in chapter 9 of the model.

Incentive Effects of Business Taxation

- Taxation affects firms decisions in at least two important ways.
- First taxes overall reduced the profitability of firms in the location that imposed the tax.
- For example, if one community uses a profit tax and a second community does not, the after-tax profits are lower in the first community even if before-tax profits are identical.
- Second, taxes on inputs or outputs also affect relative prices distorting production decisions.
- As a consequence, they will cause additional inefficiencies.

A Profit Tax

- Let us consider the case in which city 1 taxes profits at the rate t_1 while city 2 does not tax profits $t_2 = 0$.
- Note that a pure profit tax does not affect the optimality condition for labor demand and hence it does not affect the supply function.
- However, it does affect overall profitability and hence location choice.

A Profit Tax

- The new conditions for a firm with productivity ϕ to locate in city 1 is now given by:

$$\begin{aligned} (1-t_1)\,\pi_1(\phi) &\geq 0 \\ (1-t_1)\,\pi_1(\phi) &\geq \pi_2(\phi) \end{aligned} \tag{17}$$

- As a consequence, there are some firms that would have located in city 1 in the absence of the profit tax, that will not locate in the city after the imposition of the tax.
- We can show that $\bar{\phi}$ shifts up while $\underline{\phi}_1$ and $\underline{\phi}_2$ are both unaffected.
- The reason for that is that after-tax profits are lower than pre-tax profits in location 1, however the zero profit conditions are the same.
- When firms are mobile, it difficult to tax profits.

A Wage Tax

- Next consider a wage tax or more generally a tax on labor earning.
- Define the after-tax wage rate as

$$\tilde{w}_j = (1 + \tau_j)\, w_j \tag{18}$$

- If we replace w_j in the analysis above by $\tilde{w}_j$, then we can derive the profit function as before.

Optimal Labor Demand under A Wage Tax

- If we replace w_j in the analysis above by $\tilde{w}_j$, then we can derive the optimal labor demand under a wage tax:

$$l_j^{\tau}(\phi, e_j, p, w_j) = \left(\frac{0.5\ \phi\ e_j\ p}{(1+\tau_j)\ w_j} \right)^2 \tag{19}$$

- Note that the higher the tax rate τ, the higher the after-tax wage and the lower the labor demand.
- As a consequence, we find that wage distorts the firm's optimal labor input decisions.

Additional Distortions of A Wage Tax

- Moreover, convince yourself that the after-tax profit function is now given by:

$$\pi_j^{\tau}(\phi, e_j, p, w_j) \quad = \quad \frac{1}{4}\frac{\phi^2\, e_j^2\, p^2}{(1+\tau_j)\, w_j} \; - \; F_j \qquad (20)$$

- Hence a wage tax has two effects:
  1. It makes labor more expensive and thus distorts the factor demand. Lower labor demand also implies lower output supply.
  2. It reduces overall profitability and hence reduces the attractiveness of a city that relies on a wage tax.
- Suppose city 1 introduces a wage tax and city does not. We can show that both $\bar{\phi}$ and $\underline{\phi}_1$ increase while $\underline{\phi}_2$ stays the same.

Summary of Theoretical Predictions

- We thus conclude that a pure profit tax is more desirable than a wage tax, a tax on capital, a tax on office space, or a sales tax.
- Overall, there is limited scope for cities to finance themselves using business taxes.
- Local business taxes can only be sustained if the after-tax profits of firms are sufficiently high so that firms will not have strong incentives to relocate and move to a different city that imposes much lower taxes.
- Note that the analysis above only applies for firms that produce tradable goods. If the firm produces non-tradable goods or local services or if transportations costs are high, the firm typically does not have the option to move to a different location.

Business Taxation in Select U.S. Cities

City	Profits Net Income	Sales Gross Receipts	Profits of Partner-ships	Capital per $1000
Columbus	2.50%		2.50%	
Detroit	2.00%			$86.79
Los Angeles		0.1-0.5%		2.81%
Memphis		0.3%		3.40%
Nashville		0.3%		1.35%
New York	8.85%		4.00%	
Philadelphia	6.41%	0.15%	3.92%	
San Francisco		0.16%		1.18 %
Seattle		0.15 -0.43 %		2.62%
Wash	9.40%		9.4%	$34

Evidence from Philadelphia

- To gain a perspective on the magnitude of city taxes, we can examine the 2010-12 Philadelphia business and gross receipts tax.
- The collected revenue averaged $392 million a year, while property tax revenue - commercial and residential - averaged nearly $1.1 billion a year.
- Meanwhile, the wage tax brought in the the greatest share of total revenue at an average of $1.53 billion.
- Hence, these taxes are not negligible, but they are relatively small compared to the taxes that are imposed on households.

Tax Increment Finance

- Economic development requires a city to provide firms some incentives to relocate to the city or expand the scale of operation within the city.
- Tax increment financing (TIF) is a public financing method that is commonly used by many cities as a subsidy for redevelopment, infrastructure, and other community-improvement projects.
- TIF districts fund improvements by issuing special municipal bonds that are backed by commercial property or sales tax revenues that are supposed to be created by the district.
- For example, the City of Chicago had 131 districts in 2006 generating tax receipts totaling upwards of $500 million.

A Case Study: The Relocation of UBS

- UBS was located in Manhattan and relocated to Stamford, Connecticut, in 1994.
- Connecticut agreed to provide tax breaks and interest-free loans that could amount to $120 million (or $60,000 per worker) over 10 years.
- This was more than twice as much as New York City offered in incentives.
- Despite these large subsidies, employment in Stamford has shrunk and UBS has shifted employment back to Manhattan.

Conclusions

- Cities need to be competitive to attract firms and businesses.
- That means that a successful city needs to efficiently provide goods and services at a low tax price. Business taxation is a double-edged sword to finance city expenditures.
- It does raise important revenues that can be used to invest into a better business infrastructure and to provide important goods and services to the business community.
- However, these taxes also undermine the attractiveness of the city.
- To minimize the potential damages from local tax competition, a strong regional government or, at least, successful coordination of local policies seems to be desirable.