Economic Spillovers and Political Payoffs in Government Competition for Firms: Evidence from the Kansas City Border War

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Abstract

When jurisdictions use business incentives to compete for firms, the political payoffs of winning firms are privately derived by the politicians of the winning jurisdictions but the economic payoffs such as new jobs can spill over to the residents of non-winning jurisdictions. I propose a model of government competition and firm location choice incorporating the economic and political benefits of winning firms and explore when regional coordination among jurisdictions such as a ceasefire on incentive provision can improve welfare. In the context of competition between the states of Kansas and Missouri for firm relocation in Kansas City during 2009-2019, I use a bounding strategy to learn about the size of political payoffs that can explain the observed amounts of incentives paid to the relocating firms. The lower bounds indicate that both Kansas and Missouri derived sizable political payoffs from attracting existing firms away from each other.

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1 Introduction

When individual state and local governments use business incentives to compete for firms, the political payoffs of winning, such as higher reelection chances, are privately derived by the elected officials of the winning jurisdictions. On the other hand, the economic payoffs of winning such as new job opportunities can spill over to the residents of the neighboring, non-winning jurisdictions.

The presence of economic spillovers would, in theory, lead governments to lower their incentive offers to freeride on the wins of nearby jurisdictions, suggesting that governments in a region may be able to improve their collective welfare through coordination that internalizes the positive externalities. On the other hand, the presence of political payoffs would work in the opposite direction, escalating the bidding competition as governments try to derive the private returns to winning.

Anecdotal evidence suggests that government competition is more fierce in settings where economic spillovers are likely present and that inter-jurisdictional coordination is difficult to achieve. The heated bidding war between the states of Kansas and Missouri to lure existing firms from each other's side of the state border in Kansas City has received much criticism. Numerous attempts in the last decade to end this bidding war did not materialize until August 2019 when the two states agreed to stop paying incentives to firms that relocate within Kansas City without net job creation.

How high were Kansas and Missouri's political gains from relocating existing firms from across the state border in Kansas City? More generally, how do economic spillovers, political payoffs, and firm profits affect governments' potential gains from regional coordination? Answers to these questions are important for evaluating the efficacy of business incentives for local economic development. For example, relocation of existing firms within a metro may generate large private gains for local politicians but low economic gains for the residents. In this case, residents' welfare can increase if jurisdictions stop competing for firm relocation within metro and focus on competing for firms from outside the metro.

To answer these questions, I present a model of government competition and firm location choice as a variant of a first-price scoring auction in which governments compete for firms with unobserved profit heterogeneity. I distinguish economic and political payoffs of winning firms, assuming that the two types of payoffs are comonotonic. Governments derive economic spillovers when other governments in the same metro area attract firms, but the political payoffs are derived only by the winning governments. Governments compete to attract firms by offering incentives that maximize the expected payoffs from winning firms. Firms then choose locations that maximize their total profits which depend on both the incentive offers and unobserved profitability.

In this model, governments in a metro can improve their joint expected welfare through coordinating on incentive provision. There are two sources of gains from coordination. First, governments can internalize competitive externalities and pay less for their wins. This type of welfare gain is increasing in the correlation of within-metro firm profits which intensifies within-metro competition and cannibalization, but is decreasing in economic spillovers, which lead to freeriding. Second, governments can internalize economic spillovers and increase their joint probability of winning firms through raising incentive offers. This type of welfare gain is increasing in spillovers but decreasing in the correlation of within-metro firm profits, which lowers the probability of firms being diverted away from other metros.

In the context of Kansas City – Kansas (KCKS) and Kansas City – Missouri (KCMO) fighting for relocation of existing firms within Kansas City, coordination between KCKS and KCMO would deliver collective welfare gains through the first source, as the two locations likely are close substitutes for firms. The current agreement to stop incentive provision to existing firms in the metro captures this effect. However, model analysis shows that such agreements can break down when there are large political payoffs relative to economic spillovers. This result sheds some light on why it is difficult for jurisdictions in a metro to stop competing for firms already in the metro despite public support.

To learn about the size of KCKS and KCMO's political payoffs from relocating firms, I use Hall Family Foundation's data on incentives accepted by firms that relocated across the state border in Kansas City during 2009-2019. Data show that KCKS paid more to firms relocating from KCMO than outside KCMO conditional on firm attributes. This observed pattern suggests that KCKS had higher political payoffs of relocating firms within metro, as KCKS would otherwise bid lower to these firms both due to freeriding motive and firms having lower moving cost. KCKS's incentive spending also peaks in the early years of Kansas Governor Brownback's first term, when the governor pushed for major tax cuts to promote job growth especially in KCKS, further suggesting that the border war in Kansas City was driven by political considerations.

I then use the data and the model's first-order condition for optimal incentive offers to quantify the lower bounds on KCKS and KCMO's political payoffs. The first-order condition implies that a location's incentive offers and strategic markdowns must be explained by higher political payoffs when higher economic spillovers can be derived.

For intuition, consider a simple example of KCKS competing for a firm's relocation from KCMO. Suppose the firm is only choosing between KCKS and KCMO. The firm generates total economic payoffs of v for the two locations, and $(1-\gamma)v$ is derived by the winning location. In this case, for a given bid and profit differential between KCKS and KCMO, I can infer different values of KCKS's political payoffs depending on γ which governs how much of v spills over to the losing location:

1. $\gamma = 0.5$. Winning and losing deliver the same economic payoffs. There is no reason to bid except due to political payoffs. KCKS's political payoff must equal its bid plus the strategic markdown.

2. $\gamma = 0.4$. Winning delivers $0.2v$ more economic payoff than losing. Economic payoff component of KCKS's bid plus strategic markdown is thus $0.2v$. KCKS's political payoff must equal $0.2v$ less than its bid plus the strategic markdown.

3. $\gamma = 0$. Only the winning location derives both economic and political payoffs. Economic payoff component of KCKS's bid plus strategic markdown is thus the entire v. KCKS's political payoff must equal v less than the bid plus the strategic markdown.

This example illustrates that a location freerides more when the spillover is larger (higher γ) and the share of the location's bid plus strategic markdown attributed to political payoff increases. This idea is captured in the first-order condition:

$$\underbrace{\text{Economic payoff from winning}}_{(1-\gamma)v} + \text{Political payoff from winning} =$$
$$\text{Bid} + \text{Strategic markdown} + \underbrace{\text{Freeriding markdown}}_{\gamma v}.$$

When taking this approach to infer KCKS and KCMO's political payoffs for firm relocation, I take three steps to address the fact that the variables in the first-order condition are not directly observed. First, I estimate the equilibrium bid distributions using data on winning bids and assumptions on the profit differential between KCKS and KCMO. Strategic markdown is a function of equilibrium bid distribution and profit differential. Hence, in this step, I am able to compute the bid plus strategic markdown. Second, I approximate the ratio between economic payoff of winning and spillover, $\frac{\gamma}{1-\gamma}$, using observed commuting flows between KCKS and KCMO. I also consider the case when there are no spillovers, $\gamma = 0$. Third, I take the difference of KCKS and KCMO's bids plus strategic markdowns, assuming that the relationship between KCKS and KCMO's distributions of economic payoffs are known. This approach obviates the need to quantify economic payoffs. For example, if KCKS and KCMO have identical economic payoffs from winning and spillovers, the difference between their bid plus strategic markdown would reveal the minimum difference in their political payoffs.

Results show that Kansas derived at least 1.37 million dollars worth of political payoffs from attracting 42 firms with less than 50 jobs away from Missouri; this lower bound accounts for about 8% of Kansas's observed incentive payments to those firms. On the other hand, I find that Missouri derived at least 20.98 million dollars worth of political payoffs from attracting 22 firms with more than 50 jobs away from Kansas; this lower bounds accounts for about 20% of Missouri's observed incentive payments to those firms. Both states' sizable political payoffs implied by my estimates likely reflect the political landscape in the region during the sample period, when Kansas implemented the "Kansas Experiment," consisting of aggressive tax cuts and economic development policies, which escalated the border war between the two states.

Related literature

This paper contributes to the literature studying the effects of government policies and firm entry on local welfare (e.g., Neumark and Kolko (2010), Kline and Moretti (2014), Billings (2009), Moretti and Wilson (2017), and Patrick (2016)) by theoretically studying the welfare impacts of governments bidding for firms in presence of local economic spillovers and political payoffs from winning firms. I explore different channels through which jurisdictions that share economic benefits of winning firms can improve their joint expected welfare by coordinating on incentive provision. The auction framework used to study these welfare consequences is similar to the approaches taken by Mast

(2020), Slattery (2020), and Kim (2020). In contrast to these earlier studies, this paper explicitly distinguishes economic and political payoffs of winning firms and also provides a new approach of partially learning about the size of political payoffs using available data on accepted incentives and the equilibrium relationships between the latent payoffs and the optimal incentive offers.

This paper is related to the broader public economics literature studying fiscal competition in presence of externalities.[1] Case et al. (1993) find positive interdependence in state expenditures among states that are similarly situated in various observable dimensions, implying the existence of competitive externalities in government expenditures. Besley and Case (1992) present a model of yardstick competition in which voters judge incumbent politicians by comparing policies proposed by the incumbent politicians of different jurisdictions. They provide empirical evidence of tax policies being strategic complements, again suggesting the existence of competitive externalities when jurisdictions set taxes. More recently, Agrawal et al. (2020a) find that the tax competition is less fierce among French municipalities that voluntarily agree to finance joint projects, suggesting that the municipalities internalize competitive externalities when entering inter-municipal cooperation with shared policy goals. My paper complements this line of literature by incorporating two types of externalities in an increasingly important context of governments bidding for individual firms: competitive externalities and positive economic spillovers such as shared job opportunities. These two types of externalities exert opposing effects on the potential gains from inter-jurisdictional coordination in my model. Specifically, the gains from internalizing economic spillovers are achieved when jurisdictions jointly raise incentive offers to address the freeriding problem. On the other hand, the gains from internalizing competitive externalities are achieved when jurisdictions jointly lower incentive offers and collectively pay less for the wins.

This paper is also related to the literature studying the importance of political factors in shaping government policies. Besley and Case (1995) find that taxes and government expenditure respond to whether a governor's term limit is binding. Similarly, Slattery (2020) and Slattery and Zidar (2020) find that incentive spending is highly correlated with whether the incumbent governor can run for reelection and whether it is an election year. Jensen et al. (2014) provide evidence using internet surveys that politicians benefit from offering tax incentives by taking credit for investment inflows, and Jensen et al. (2015) provide empirical evidence that elected mayors provide larger incentives and enjoy more lax oversight of incentive projects than non-elected city managers. These earlier studies show that political factors play an important role in determining government policies and incentive spending. My paper contributes to this literature by quantifying the bounds on political payoffs in dollar values using available data on observed incentive spending and the equilibrium relationships implied by the model.

This paper's empirical focus on the local competition between Kansas and Missouri for firm relocation within Kansas City is related to prior studies that provide empirical evidence on the importance of government competition in local settings. For example, Stokan and Deslatte (2019) find that incentive usage is increasing in the proliferation of local governments. Similarly, Mast

[1] See Agrawal et al. (2020b) for an overview of this literature.

(2020) finds that the Industrial Development Agencies (IDA) in New York State increase firm-specific tax breaks when other IDAs are nearby, which would intensify the local competition for firms.

2 Model

In this section, I present a model of government competition and firm location choice incorporating governments' economic and political benefits of winning firms.

2.1 Setup

Metros are denoted by $m \in \mathcal{M} := \{1 \cdots M\}$, and states are denoted by $s \in \mathcal{S} := \{1 \cdots S\}$. A metro is a part of at least one and possibly multiple states (e.g., Kansas City – Kansas (KCKS) and Kansas City – Missouri (KCMO)). $\mathcal{S}_m$ denotes the set of states that metro m is a part of. In this geography, governments, interchangeably used with locations hereafter, are defined at the metro-state level and denoted by $ms \in \mathcal{L} := \{\{m\} \times \mathcal{S}_m\}_{m \in \mathcal{M}}$. Firms are denoted by $j \in \mathcal{J} := \{1 \cdots J\}$.

Each firm $j \in \mathcal{J}$ chooses a location for its establishment. Each location $ms \in \mathcal{L}$ offers to pay incentives to j if choosing ms. The timing of ms's incentive offer and j's location decisions is:

1. Each $ms \in \mathcal{L}$ offers incentives b_{jms} to firm $j \in \mathcal{J}$.

2. j chooses a location ms that maximizes firm profit π_{jms}.

2.2 Firm profits

Firm j's profit from choosing location ms is specified as:

$$\pi_{jms} = b_{jms} + \overline{\pi}_{jms},$$

where b_{jms} is the amount of incentives offered by ms to j, and $\overline{\pi}_{jms}$ is the base profit that j can derive from locating in ms. The distribution of $\overline{\pi}_{jms}$ is assumed to be common knowledge, but the realization of $\overline{\pi}_{jms}$ is assumed to be j's private information.

2.3 Economic and political payoffs of winning firms

Location ms derives payoff V_{jms} from attracting firm j to ms. V_{jms} is additively separable in economic and political components:

$$V_{jms} = V^e_{jms} + V^p_{jms}.$$

Economic payoffs V^e_{jms} are social benefits to ms's residents (e.g., new employment opportunities), while political payoffs V^p_{jms} are private benefits to ms's elected officials (e.g., increase in approval ratings). This distinction between social and private nature of economic and political payoffs motivates why a location's economic payoffs can spill over to other locations in the same metro.

While I do not explicitly model the micro-political foundations of V^p_{jms}, I interpret V^p_{jms} as political returns in terms of reelection chances for the elected administration officials of ms when they win j.

(V^e_{jms}, V^p_{jms}) is independently drawn from the joint distribution of ms's economic and political payoffs, $F_{(V^e_{ms}, V^p_{ms})}(\cdot,\cdot)$, on bounded support $[0, \overline{v}^e] \times [0, \overline{v}^p]$. $F_{(V^e_{ms}, V^p_{ms})}(\cdot,\cdot)$ is common knowledge but the realization of (V^e_{jms}, V^p_{jms}) is ms's private information.

Economic and political payoffs have perfect positive dependence:

$$(V^e_{jms}, V^p_{jms}) = (F^{-1}_{V^e_{ms}}(U), F^{-1}_{V^p_{ms}}(U)) \quad U \sim \mathcal{U}(0,1).$$

One interpretation of the assumed comonotonicity of (V^e_{jms}, V^p_{jms}) is that political gains are increasing in economic benefits to residents. For example, a governor's approval rating likely increases by more when she attracts more jobs for her constituents.

2.4 Economic spillovers

Location ms derives economic spillover benefits, $\tilde{V}^{ms'}_{jms}$, when firm j chooses state $s' \neq s$ in metro m. For example, when a firm chooses KCKS, KCMO would derive $\tilde{V}^{\text{KCKS}}_{\text{KCMO}}$. $\tilde{V}^{ms'}_{jms}$ captures the economic benefits generated by j's entry to ms' that are non-excludable to the residents of ms such as additional labor demand. $\tilde{V}^{ms'}_{jms}$ is specified to be proportional to the economic benefits that ms derives if it wins firm j:

$$\tilde{V}^{ms'}_{jms} = \gamma^{ms'}_{ms} V^e_{jms}$$

where $\gamma^{ms'}_{ms}$ is a coefficient that determines the share of V^e_{jms} that ms derives when ms' wins. I assume $0 \leq \gamma^{ms'}_{ms} \leq 1$ so that ms's spillover benefits are non-negative and not greater than the economic benefits of winning. I refer to $\gamma^{ms'}_{ms}$ as the "spillover coefficient." This model does not allow possible negative spillovers such as congestion to dominate the positive spillovers.

Political payoffs may be decreasing in the economic spillovers if V^p_{jms} is decreasing in $\gamma^{ms'}_{ms}$; I do not make any restrictions on this relationship. For instance, politicians may derive lower political payoffs from winning firms if many of the jobs created in their jurisdictions are taken by the residents of other jurisdictions.

2.5 Equilibrium incentive offers

Given a draw of political and economic payoffs, (v^p_{jms}, v^e_{jms}), location ms optimally chooses incentives b_{jms} to maximize expected total payoffs:

$$\max_{b_{jms}} \underbrace{(v^p_{jms} + v^e_{jms} - b_{jms}) \Pr(ms \text{ wins } j \mid b_{jms})}_{\text{Net benefit if } ms \text{ wins } j} + \underbrace{\sum_{s' \in \mathcal{S}_m \setminus s} \gamma^{ms'}_{ms} v^e_{jms} \Pr(ms' \text{ wins } j \mid b_{jms})}_{\text{Spillover benefit if } ms' \text{ wins } j}.$$

First-order condition of this problem is:

$$b = v_{jms} \underbrace{- \frac{\Pr(ms \text{ wins } j \mid b_{jms})}{\frac{\partial}{\partial b} \Pr(ms \text{ wins } j \mid b_{jms})}}_{\text{Strategic markdown}} + \underbrace{v^e_{jms} \sum_{s' \in \mathcal{S}_m \setminus s} \gamma^{ms'}_{ms} \frac{\frac{\partial}{\partial b} \Pr(ms' \text{ wins } j \mid b_{jms})}{\frac{\partial}{\partial b} \Pr(ms \text{ wins } j \mid b_{jms})}}_{\text{Freeriding markdown}}. \tag{1}$$

Hereafter, I use $D_{jms}(b) = -\frac{\Pr(ms \text{ wins } j \mid b_{jms})}{\frac{\partial}{\partial b} \Pr(ms \text{ wins } j \mid b_{jms})}$ and $\tilde{D}_{jms}(b) = \frac{\frac{\partial}{\partial b} \Pr(ms' \text{ wins } j \mid b_{jms})}{\frac{\partial}{\partial b} \Pr(ms \text{ wins } j \mid b_{jms})}$. $D_{jms}(b)$ is analogous to the strategic markdown in standard first-price sealed-bid auctions. On the other hand, $v^e_{jms} \sum_{s' \in \mathcal{S}_m \setminus s} \gamma^{ms'}_{ms} \tilde{D}^{ms'}_{jms}(b)$ is an additional bid shading that results from ms's freeriding motive; by lowering bid, ms can raise the probability of ms' winning, in which case ms derives spillover benefits. $\tilde{D}^{ms'}_{jms}(b)$ is analogous to the diversion ratio in the optimal pricing condition of a multi-product oligopolist. It measures the rate at which ms is diverting firms away from ms' when ms marginally increases its bid. Intuitively, higher magnitude of diversion ratio leads ms to freeride more by shading its bid, since ms faces higher probability of deriving spillover benefits by letting ms' win instead of escalating a within-metro bidding war. The magnitude of the diversion ratio is increasing in the correlation of firm profits in ms and ms'.

Let $\tau_{ms} : [0, \overline{v}^p] \times [0, \overline{v}^e] \to [0, \overline{b}]$ denote ms's equilibrium bid function that maps the vectors of political and economic payoffs into optimal bids. I assume $\frac{\partial \tau_{ms}}{\partial v^p_{ms}} > 0, \frac{\partial \tau_{ms}}{\partial v^e_{ms}} > 0$ so that the equilibrium bids are strictly increasing in political and economic payoffs. Let $G_{B_{ms}}(\cdot)$ denote the distribution of ms's equilibrium bids.

2.6 Welfare of firms and locations

Welfare of firms and locations, denoted by W^π and W^v respectively, are defined as:

$$W^\pi \equiv \sum_{j \in \mathcal{J}} \sum_{ms \in \mathcal{L}} \mathbb{1}[d(j) = ms] \pi_{jms}$$

$$W^v \equiv \sum_{j \in \mathcal{J}} \sum_{ms \in \mathcal{L}} \mathbb{1}[d(j) = ms] \left(v_{jms} - b_{jms} + \sum_{s' \in \mathcal{S}_m \setminus s} \tilde{v}^{ms}_{jms'} \right),$$

where $d(j)$ denotes the location chosen by firm j. W^π is equal to the sum of realized firm profits, and W^v is equal to the sum of: (1) realized benefits of the winning locations; and (2) realized spillover benefits of locations in same metros as the winning locations.

3 Inter-jurisdictional coordination at metro-level

The idea of regional coordination of incentive policies has received considerable public attention.[2] In the model, locations in a metro can expect to benefit from two sources of welfare gains by coordinating their incentive offers.

Internalization of competitive externalities. Coordinating locations can pay less for their wins.[3] This type of welfare gain is increasing in the correlation of firm profits among coordinating locations (i.e., higher $\left|\tilde{D}_{jms}^{ms'}\right|$), as competition is more fierce among more substitutable locations, but decreasing in the size of spillovers. For example, locations that are substitutable only among themselves (i.e., $\sum_{s' \in \mathcal{S}_m} \tilde{D}_{ms}^{ms'} = -1$) would coordinate to offer close to zero incentives to avoid cannibalization.[4] However, if locations are indifferent between winning and losing due to large spillovers (i.e., $\tilde{v}_{jms}^{ms'} = v_{jms}$), locations would offer zero incentives even without coordination.

Internalization of economic spillovers. Coordinating locations can jointly win more by raising incentive offers. This type of welfare gain is increasing in the size of spillovers which worsen the freeriding problem under competition but decreasing in the correlation of firm profits among coordinating locations. For example, when locations are substitutable only among themselves, any attempt to increase the joint winning probability through offering higher incentives would fail as these locations are unable to divert firms away from outside the metro.

Model simulations showing changes in the size of the two types of welfare gains with respect to the correlation of firm profits and spillovers are included in the appendix.

3.1 Ceasefire on competition for firms relocating within metro

One particular type of metro-level coordination is a ban on incentive provision ("ceasefire") to existing firms that are already in and will remain in the metro even without incentives (i.e., $\sum_{s' \in \mathcal{S}_m \setminus s} \tilde{D}_{ms}^{ms'} = -1$). A ceasefire in this case can deliver welfare gains only through the first channel described above. Can these gains be distributed across the locations in a way that they would all agree to a ceasefire? I consider a hypothetical metro with two locations.

Ceasefire on bidding for a single firm. Suppose metro m has two locations competing for firm j currently in ms. If j is set on remaining in m, then ms is better off under ceasefire by keeping the firm without payment. On the other hand, ms' is worse off under ceasefire as

[2] Besides the Kansas City example, metro-level coordination has also been recently discussed among jurisdictions in the Washington D.C. metropolitan area during the competition for Amazon HQ2 (`https://www.forbes.com/sites/bisnow/2017/09/15/amazon-hq2-could-finally-bring-d-c-region-together-but-divides-run-deep/?sh=60996f136f52`). A ceasefire was also proposed by New Jersey legislators to New York and Pennsylvania. (`https://njbiz.com/nj-lawmakers-back-idea-tax-break-deal-border-states/`)

[3] This effect is analogous to profit gain for competing firms that raise prices after a merger (unilateral effect).

[4] These locations would still offer positive incentives under coordination if they draw different payoffs of winning firms; it may be optimal for the metro to attract firms to locations that drew high payoffs.

its expected welfare under competition is necessarily larger than the guaranteed spillover under ceasefire.[5] Hence, without transfers, ms' would not agree to stop competing for j.[6]

Ceasefire on bidding for multiple firms. Let $\mathcal{J}_{ms}$ denote the set of firms currently in ms and also set on remaining in m. ms would agree to a ceasefire if:

$$\underbrace{\sum_{j \in \mathcal{J}_{ms}} \Pr(ms \text{ wins } j \mid b_{jms}) b_{jms} + (1 - \Pr(ms \text{ wins } j \mid b_{jms}))(v_{jms} - \tilde{v}_{jms}^{ms'})}_{\text{Welfare gain under ceasefire}} > \underbrace{\sum_{j' \in \mathcal{J}_{ms'}} \Pr(ms \text{ wins } j' \mid b_{j'ms})(v_{j'ms} - \tilde{v}_{j'ms}^{ms'} - b_{j'ms})}_{\text{Welfare loss under ceasefire}} .$$

Derivation of this inequality and an analysis of a metro with more than two locations are in the appendix. This inequality shows that ms would not benefit from a ceasefire if: (1) there are many firms in ms' that ms can potentially attract (i.e., $|\mathcal{J}_{ms'}| > |\mathcal{J}_{ms}|$); and (2) a large portion of ms's payoff does not spillover from ms' (i.e., large $v_{j'ms} - \tilde{v}_{j'ms}^{ms'} = v_{j'ms}^{p} + (1 - \gamma_{j'ms}^{ms'}) v_{j'ms}^{e}$). Importantly, ms would not want a ceasefire if it derives large political payoffs from relocating firms from ms'.

Above analysis suggests that political payoffs may have played a role in intensifying competition and hindering a ceasefire agreement between KCKS and KCMO.[7] I next apply the model to data on KCKS and KCMO's incentive payments to learn about the size of their political payoffs from relocating firms.

4 Data and suggestive evidence on political payoffs

Data on KCKS and KCMO's incentive spending during 2009-2019 are obtained from the Hall Family Foundation. Data include 76 incentives provided by Kansas to firms relocating from KCMO to KCKS and 35 incentives provided by Missouri to firms relocating from KCKS to KCMO.

Additional data from the same source include 24 incentives provided by Kansas to firms relocating from outside KCMO to KCKS and 173 incentives provided by Kansas to firms with expansion, job retention, or new operations in Kansas. These additional data are used to gather suggestive evidence on the size of political payoffs.

[5] ms''s freeriding markdown is equal to its spillover since $\tilde{D}_{jms'}^{ms} = -1$. Hence, ms' stands to gain more than the spillover under competition.

[6] Governments may find it difficult to arrange transfers in reality for at least three reasons. First, the governments do not have an incentive to truthfully report their private payoffs of winning firms to each other. Second, high political payoffs may hinder the elected officials from committing to a ceasefire to the detriment of residents as predicted by the theory of social conflict. Third, costs of bargaining between governments may be prohibitive. See Acemoglu (2003) for discussion of political Coase Theorem and theory of social conflict.

[7] `https://www.goodjobsfirst.org/blog/first-ever-binding-end-border-war-missouri-kansas`

Summary statistics

Table 1 provides the summary statistics. First two columns show that KCKS and KCMO each spent roughly $200 million to attract firms away from each other during the sample period. KCKS attracted over twice as many firms as KCMO, but the total number of jobs won do not differ as much. KCKS spent considerably more per job and attracted about three times as many small firms (fewer than 150 jobs) as KCMO. On the other hand, KCMO was more successful in attracting larger firms by spending more per job than KCKS. Table 2 shows that the accepted incentive amount and firm size have significant positive correlation. The wage variable, which is only available for firms that relocated to KCKS, is also positively correlated with the incentive amount.

Table 1: Summary statistics

	Relocation			Expansion, retention, & new ops. in KS	
	From KCMO to KCKS	From KCKS to KCMO	From outside KCMO to KCKS	KCKS	Outside KC
Total incentives ($ mil)	198.57	211.76	95.98	172.81	60.27
Total jobs	7,449	6,565	4,053	13,107	9,880
Frequency (share)	76	35	24	102	71
$0 < \text{jobs} < 10$	0 (0.000)	0 (0.000)	0	4	7
$10 \leq \text{jobs} < 20$	12 (0.003)	3 (0.001)	3	3	15
$20 \leq \text{jobs} < 50$	30 (0.010)	8 (0.003)	7	30	18
$50 \leq \text{jobs} < 100$	15 (0.015)	6 (0.007)	5	30	14
$100 \leq \text{jobs} < 250$	10 (0.018)	12 (0.024)	6	22	8
$250 \leq \text{jobs} < 500$	7 (0.042)	4 (0.025)	1	10	8
$500 \leq \text{jobs} < 1000$	2 (0.048)	0 (0.000)	1	2	0
$\text{jobs} \geq 1000$	0 (0.000)	2 (0.015)	1	1	1
Avg. incentives/job ($ mil)	0.021	0.023	0.013	0.012	0.007
$0 < \text{jobs} < 10$	NA	NA	NA	0.011	0.006
$10 \leq \text{jobs} < 20$	0.035	0.010	0.011	0.012	0.004
$20 \leq \text{jobs} < 50$	0.014	0.024	0.008	0.013	0.007
$50 \leq \text{jobs} < 100$	0.017	0.016	0.008	0.010	0.006
$100 \leq \text{jobs} < 250$	0.025	0.021	0.017	0.012	0.010
$250 \leq \text{jobs} < 500$	0.030	0.037	0.014	0.013	0.008
$500 \leq \text{jobs} < 1000$	0.034	NA	0.040	0.019	NA
$\text{jobs} \geq 1000$	NA	0.041	0.031	0.010	0.000

Notes: Data from the Hall Family Foundation. I exclude three firms whose information on jobs are missing; these firms relocated from KCKS to KCMO and received incentives worth $0.35, $0.15, and $0.26 million. Share of firm relocation is computed as the observed frequency of firm relocation to KCKS (KCMO) divided by the number of firms in KCMO (KCKS) for each job bin. 2018 County Business Patterns data is used for the number of firms data. Prior locations of firms that relocated from outside KCMO include: PA, MO (3), MN (3), IN (3), NY (2), OH, AR, MI, TX, GA, CO, NJ, UT, OK & IL, MI & Canada, Canada, India.

Kansas PEAK and Missouri Works Programs

The incentives paid by Kansas in the sample are part of the Kansas Promoting Employment Across Kansas (PEAK) Program, and the incentives paid by Missouri are part of the Missouri Works and Quality Jobs Program (the former replaced the latter in 2013).[8] Kansas PEAK and Missouri Works are the two states' main job creation incentive programs that allow firms to retain part

[8] Sample includes nine incentives provided under the Quality Jobs Program.

of withholding income taxes. My analysis is limited to the political components of the incentives provided under these programs and exclude additional benefits the firms may have received.

Kansas PEAK program allows firms to retain up to 95% of the payroll withholding taxes generated by at least 10 (100) new employees for up to 7 (10) years. According to state documents, the Secretary of Commerce has discretion over the final benefit amount, as long as it does not exceed the set maximum levels:[9]

> *"The Secretary of Commerce has sole discretion in determining a PEAK benefit based on PEAK Business Facility jobs, wages and other economic impact information provided to Commerce by the company either prior to or during the application stage. If a PEAK benefit is approved by the Secretary, the benefit cannot exceed the "up to" maximum benefit terms as listed below for various wage levels."*

Missouri Works allows firms to retain 100% of the state withholding taxes of at least 10 new jobs for 5-6 years and 6-7% of new payroll of at least 100 new jobs for 5-6 years. According to state documents, the Department of Economic Development has discretion to provide benefits exceeding the predetermined amounts:[10]

> *In addition to the Benefit indicated above, the Statewide Works or Mega Works projects may be considered for discretionary benefits, including Deal Closing Fund. The criteria for the discretionary benefits include:*
>
> - *The least amount necessary to obtain the company's commitment;*
> - *The amount of the project's projected net fiscal benefit to the state and the period in which the state would realize such net fiscal benefit;*
> - *The overall size (number of jobs, payroll, new capital investment) and quality (average wages, growth potential of the company, multiplier effect of the industry) of the project;*
> - *The financial stability and creditworthiness of the company;*
> - *The level of economic distress of the project area;*
> - *The competitiveness of alternative locations; and*
> - *The percentage of local incentives committed to the project.*

Kansas and Missouri may use the discretionary aspects of Kansas PEAK and Missouri Works programs to offer larger incentives to firms that generate larger payoffs to locations or when there is more competition for those firms.

Suggestive evidence on political payoffs from firm relocation

The third column of Table 1 shows that the number of firms KCKS attracted from outside KCMO is about a third of what it attracted from KCMO. It is unclear whether this difference is explained by KCKS having higher payoffs for firms relocating from KCMO or it being more difficult to attract

[9] `https://www.kansascommerce.gov/wp-content/uploads/2020/10/PEAK-GuidelinesApplication-2020-1-1.pdf`.

[10] `https://ded.mo.gov/sites/default/files/programs/flyers/MoWorks-ProgramSummary%202019_updated_0.pdf`.

firms from outside KCMO. However, Figure 1a and the last two columns of Table 2 show that KCKS paid substantially more to firms that relocated from KCMO than outside KCMO conditional on firm characteristics. Why did KCKS pay more to firms that likely were already strongly attached to Kansas City and also likely to hire some KCMO residents even if it relocated to KCKS? Suppose economic payoffs (v^e_{jms}) do not depend on firms' previous locations and that firms prefer relocating to physically closer locations. Since, in the model, KCKS would bid lower to firms from KCMO both due to freeriding motive and the firms' geographic preferences, the observed pattern suggests that KCKS had higher political payoffs from relocating firms from KCMO.[11]

Table 2: Correlation between incentive amount and firm characteristics

	Dependent variable: log incentives			
	Relocation from KCKS to KCMO or from KCMO to KCKS		All relocation to KCKS	
	(1)	(2)	(3)	(4)
Jobs	0.006***	0.008***	0.006***	0.006***
	(0.0005)	(0.001)	(0.0005)	(0.0005)
Wage ($)		0.017***		0.018***
		(0.004)		(0.005)
From KCKS to KCMO	0.126			
	(0.201)			
From outside KCMO to KCKS			−0.560**	−0.379*
			(0.214)	(0.209)
Constant	13.185***	12.310***	13.157***	12.538***
	(0.120)	(0.176)	(0.114)	(0.212)
Observations	111	75	100	99
R^2	0.568	0.753	0.592	0.639

Notes: *p<0.1; **p<0.05; ***p<0.01. Wage variable is missing for one of the firms that relocated to KCKS and all firms that relocated to KCMO.

During most of the sample period (2009-2019), Sam Brownback (Republican) served two terms (2011-2019) as the Governor of Kansas, and Jay Nixon (Democrat) served two terms (2009-2017) as the Governor of Missouri. Backed by Republican state control, Governor Brownback implemented a large tax cut in 2012 and other competitive economic development policies, as part of what was known as the "Kansas Experiment."[12]

Spurred by the development in Kansas, Republican state legislators in Missouri also pushed for corporate tax cuts to compete for jobs, but Governor Nixon vetoed the bill due to concerns over reduced funding for public services. This partisan battle in Missouri exerted political pressure on Governor Nixon to fight for job growth as his opponents framed his veto as detrimental to Missouri's competitiveness against other states:[13]

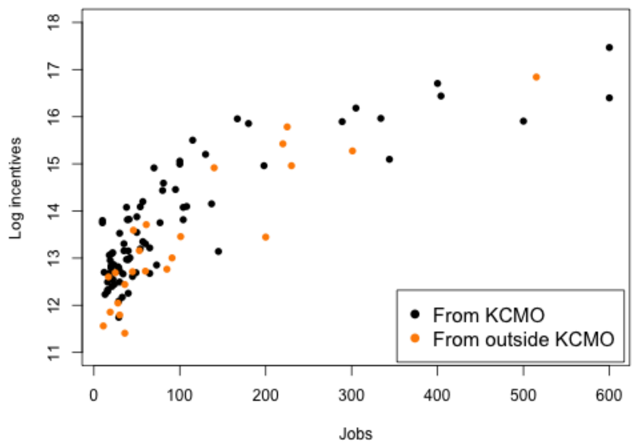
[11] The magnitude of KCKS's strategic markdown would be higher for firms from KCMO if these firms are more likely to choose locations in Kansas City than firms from outside KCMO. The magnitude of KCKS's freeriding markdown would also be higher for the same reason, as the diversion ratio, $\tilde{D}^{KCMO}_{KCKS}$ would be close to −1.

[12] The tax cut consisted of elimination of pass-through income and reduction of individual income tax rate. `https://www.nytimes.com/2015/08/09/magazine/the-kansas-experiment.html`.

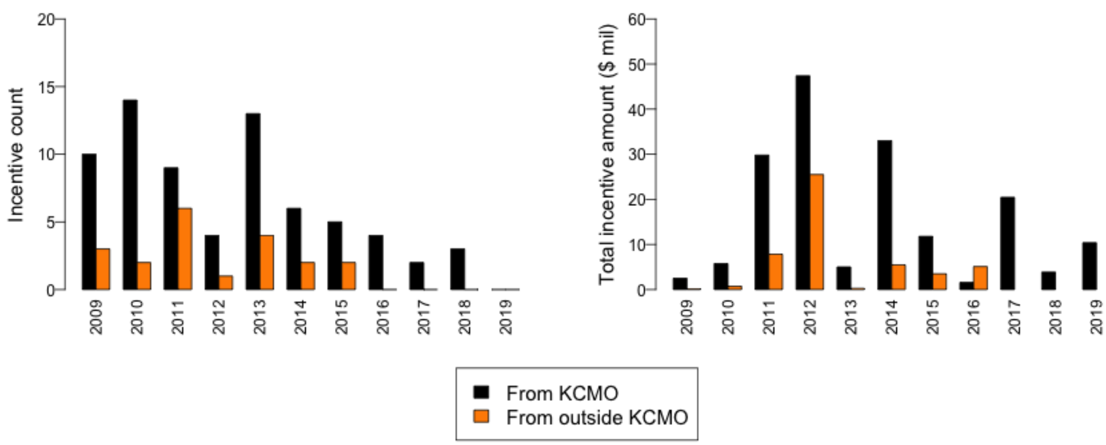
[13] This statement was made by the Missouri Chamber of Commerce which supported overriding Governor's veto.

Figure 1: KCKS's incentive provision to firms relocating from KCMO versus outside KCMO

(a) Individual incentive amount and firm size



(b) Frequency of incentive provision and total incentive amount over the sample period



Notes: These figures show incentives provided by KCKS to firms relocating to KCKS from KCMO and outside KCMO. The latter subsample consists of 24 firms that relocated from the following locations: PA, MO (3), MN (3), IN (3), NY (2), OH, AR, MI, TX, GA, CO, NJ, UT, OK & IL, MI & Canada, Canada, India. Years indicate contract dates. Nine observations with missing contract dates are omitted.

"Competition with other states for Missouri jobs is nothing new to us. [...] Our two largest economic engines in the state sit on borders. Our hope is that we can continue to improve Missouri in order to keep Missouri at the top in the competition for those businesses."

Reflecting this political landscape in Kansas and Missouri, the border war in Kansas City also escalated during the sample period and received national attention. In an interview with the *Wall Street Journal* in 2014, Governor Brownback pointed out job growth in KCKS as a key indicator of whether the Kansas Experiment is working:[14]

Interviewer : What are your results so far in Kansas?

Brownback : Good but tentative. We've had a record number of new business filings in the state of Kansas last year. Higher than we've ever had before. We've had good job growth on the Kansas side of Kansas City. We've had about 7300 new jobs this past year. There wasn't a comparable growth on the other side. So that's I think probably as good a comparison area even though I don't think it's fair to compare what takes place. Our unemployment numbers are 12th best in the country. But it's early. These things take really several years to get a real feel for what happens.

Interviewer : And as that unfolds, what are you going to be watching most closely to see how it's working? What are the indicators from your point of view?

Brownback : Job growth's really going to be the key. This is about creating a growth environment. So that job growth, attraction of capital into the state, attraction of people into the state because we got job growth is going to be one of the key things we are going to be watching.

In 2013, Governor Nixon proposed a ceasefire on incentive provision to firms relocating within Kansas City, but Governor Brownback did not agree. A ceasefire was finally reached in 2019 by new Kansas Governor Laura Kelly (Democrat) and Missouri Governor Mike Parson (Republican) amid growing public criticism against the border war and waning support for economic policies initiated by Governor Brownback.

Using KCKS's observed contract dates, Figure 1b shows the annual variation in KCKS's frequency of incentive provision and total incentive amount. Incentive provision was more frequent during 2009-2013, and the total incentive amount is particularly high during 2011-2014. These sharp increases in incentive spending during Governor Brownback's first term is consistent with his platform and suggests that political considerations drove the incentive spending especially if the economic impacts of firm relocation and firms' geographic preferences were stable during the sample period. The observed sensitivity of incentive spending to politics is also consistent with the findings of Slattery (2020), Slattery and Zidar (2020), and Jensen et al. (2015).

Comparison of Kansas's spending in KCKS versus outside KCKS on firms with expansion, retention, and new operations does not contradict political payoffs being higher in KCKS. The last

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https://www.ksdk.com/article/news/nixon-blasts-mo-chamber-for-hosting-rick-perry/63-308627890. The partisan battle in Missouri intensified as the Texas Governor Rick Perry (Republican) visited the Missouri Chamber of Commerce and publicly spoke in favor of the tax cut. Governor Nixon responded to Governor Perry in an interview with the *New York Times* by saying: "The challenge for jobs that we're in, if you're thinking it's between Texas and Missouri and Kansas, you're missing the whole picture. The competition for jobs for us is, like, between us and China and us and Russia. I mean, it's a worldwide economy." https://www.nytimes.com/2013/09/10/us/in-missouri-governor-turns-tax-cut-debate-against-gop.html?hp=&_r=0x%25x

[14]Full interview is available at https://www.wsj.com/video/seib-wessel-full-sam-brownback-interview/10C71929-281B-47C6-A595-663CB6EBBE7B.html. Transcribed portion starts from 6:35.

two columns of Table 1 show that Kansas provided incentives to roughly three times as many firms for expansion, retention, and new operations in KCKS than outside KCKS. This pattern itself is likely driven by more firms being located in KCKS compared to other parts of the state. Table A2 and Figure A2 show that Kansas provided larger incentives to firms in KCKS, conditional on firm characteristics. Although this pattern may be explained by Kansas's political payoffs being higher in KCKS, it could also be that Kansas's economic payoffs are higher in KCKS or that firms in KCKS are more likely to be lured by KCMO.

Comparison of KCKS and KCMO's characteristics is shown in Table A4. KCMO is larger than KCKS in population (1.3 versus 0.9 million) but other observables such as unemployment rate and income are roughly similar. Kansas and Missouri do not have reciprocity tax agreements.

5 Political payoffs from firm relocation: bounding strategy

In the rest of this paper, I use the proposed model and data to learn about the magnitudes of KCKS and KCMO's political payoffs from relocating existing firms from each other's side of the state border.

KCKS and KCMO's payoffs depend on the firms' default locations, which are included as firm characteristics. For example, suppose firm j's default location is KCMO. V^e_{jKCKS}, V^p_{jKCKS} would then represent KCKS's economic and political payoffs from relocating j to KCKS. On the other hand, V^e_{jKCMO}, V^p_{jKCMO} would represent KCMO's economic and political payoffs from retaining j in KCMO. I focus on learning about the size of locations' political payoffs from relocating firms, as opposed to retaining firms, for two reasons. First, data on retention are missing for KCMO and conflated with expansion and new operation for KCKS. Second, political payoffs from relocation may have impeded the ceasefire agreement between KCKS and KCMO as discussed in Section 3.

My empirical strategy utilizes the first-order condition for optimal bids:

$$b - D_{jms}(b) = v^p_{jms} + v^e_{jms}(1 + \gamma_{ms}\tilde{D}_{jms}(b)), \tag{2}$$

where with slight abuse of notation, I use γ_{ms} and $\tilde{D}_{ms}$ to denote $\gamma^{ms'}_{ms}$ and $\tilde{D}^{ms'}_{ms}$ respectively, as the primary application is for Kansas City with only two locations.

It is immediate from Equation 2 that $b - D_{jms}(b)$ is an upper bound on ms's political payoff that led ms to bid b in equilibrium. Suppose this upper bound, which is a function of distributions of equilibrium bids and firm profits, is estimated using data on winning bids. Is there a way to learn about the lower bound on political payoff? Does the presence of freeriding motive help?

Allowing a restricted form of heterogeneity in economic payoffs, I assume a constant ratio z of ms and ms''s economic payoff quantiles:

$$z = \frac{F^{-1}_{V^e_{ms}}(q)}{F^{-1}_{V^e_{ms'}}(q)} \quad q \in [0, 1]. \tag{3}$$

Using assumed comonotonicity of payoffs and equilibrium bids and substituting Equation 2 into Equation 3 yields[15]

$$v_{ms}^{p(q)} \geq \left\{ b_{ms}^{(q)} - D_{ms}(b_{ms}^{(q)}) \right\} - \left\{ 1 + \gamma_{ms} \tilde{D}_{ms}(b) \right\} \underbrace{\left[\frac{z \left\{ b_{ms'}^{(q)} - D_{ms'}(b_{ms'}^{(q)}) \right\}}{(1 + \gamma_{ms'} \tilde{D}_{ms'}(b))} \right]}_{\text{Upper bound on } v_{ms}^{e(q)}}, \tag{4}$$

where $v_{ms}^{p(q)} = F_{V_{ms}^p}^{-1}(q)$ and $b_{ms}^{(q)} = G_{B_{ms}}^{-1}(q)$. The last term in brackets is an upper bound on ms's economic payoff that generated equilibrium bid $b_{ms}^{(q)}$.[16]

Inequality 4 provides conservative lower bounds on the quantiles of ms's political payoffs. For intuition, suppose ms and ms' have identical economic payoff distributions (i.e., $z = 1$) and compete for firms that choose only between ms and ms' (i.e., $\tilde{D}_{ms} = \tilde{D}_{ms'} = -1$). Suppose ms derives maximum spillovers from ms' (i.e., $\gamma_{ms} = 1$). In this case, Inequality 4 simply yields $v_{ms}^{p(q)} = b_{ms}^{(q)} - D_{ms}(b_{ms}^{(q)})$ so that $v_{ms}^{p(q)}$ is point identified at the upper bound. Since ms is indifferent between winning and losing in terms of economic payoff, all of ms's bid and strategic markdown is attributed to political payoff.

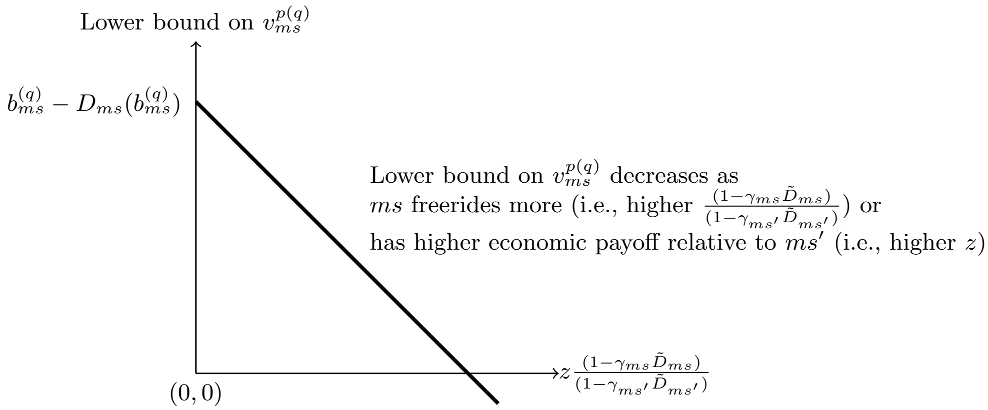
Suppose now, all else equal, ms derives smaller spillovers from ms' so that $\gamma_{ms} < 1$. In this case, Inequality 4 shows that the lower bound on ms's political payoff quantile decreases by $\left\{ \frac{1+\gamma_{ms}\tilde{D}_{ms}(b)}{1+\gamma_{ms'}\tilde{D}_{ms'}(b)} \right\} \left[b_{ms'}^{(q)} - D_{ms'}(b_{ms'}^{(q)}) \right]$, which is the maximum non-freeriding share of ms's economic payoff quantile. When ms strictly prefers winning to losing in terms of economic payoff, the non-freeriding part of ms's economic payoff starts to contribute to ms's bid and strategic markdown. In result, the minimum possible contribution from ms's political payoff shrinks.

Figure 2 illustrates the above argument that the lower bound on ms's political payoff quantile is increasing in ms's freeriding amount, $\left| \gamma_{ms} \tilde{D}_{ms} \right|$. On the other hand, the lower bound on ms's political payoff quantile is decreasing in ms''s freeriding amount, $\left| \gamma_{ms'} \tilde{D}_{ms'} \right|$, which raises the upper bound on ms's economic payoff quantile. Finally, it is clear that if ms has higher economic payoffs relative to ms' (i.e., higher z), then the lower bound on ms's political payoff quantile decreases.

[15]The model assumes that political and economic payoffs are comonotonic, and that equilibrium bids are strictly increasing in payoffs, implying $(V_{ms}^p, V_{ms}^e, B_{ms}) = (F_{V_{ms}^p}^{-1}(U), F_{V_{ms}^e}^{-1}(U), G_{B_{ms}}^{-1}(U)) \quad U \sim \mathcal{U}(0,1)$.

[16]It is immediate from Equation 2 and the comotonicity of payoffs and equilibrium bids that $\frac{b_{ms'}^{(q)} - D_{jms'}(b_{ms'}^{(q)})}{1+\gamma_{ms'}\tilde{D}_{jms'}(b_{ms'}^{(q)})}$ is an upper bound on $v_{ms'}^{e(q)}$. Plugging this into Equation 3 yields $\frac{z\left\{b_{ms'}^{(q)} - D_{jms'}(b_{ms'}^{(q)})\right\}}{1+\gamma_{ms'}\tilde{D}_{jms'}(b_{ms'}^{(q)})}$ as an upper bound on $v_{ms}^{e(q)}$.

Figure 2: Hypothetical lower bound on ms's political payoff quantile ($v_{ms}^{p(q)}$)



Notes: This figure illustrates hypothetical construction of lower bound on ms's political payoff quantile using Inequality 4. Metro m is assumed to have two locations, ms and ms'. The black line indicates that when $\frac{z(1-\gamma_{ms}\tilde{D}_{ms})}{(1-\gamma_{ms'}\tilde{D}_{ms'})} = 0$, all of ms's bid plus strategic markdown is attributed to political payoff. The lower bound decreases as: (1) ms freerides less (i.e., lower $\left|\gamma_{ms}\tilde{D}_{ms}\right|$); (2) ms' freerides more (i.e., higher $\left|\gamma_{ms'}\tilde{D}_{ms'}\right|$); and (3) ms has higher economic payoffs relative to ms' (i.e., higher z). The figure is drawn assuming $\left\{b_{ms}^{(q)} - D_{ms}\right\} - \left\{b_{ms'}^{(q)} - D_{ms'}\right\} > 0$.

6 Implementation

In this section, I apply the proposed bounding strategy and quantify the lower bounds on KCKS and KCMO's political payoffs from relocating firms within Kansas City.

6.1 Equilibrium bid distributions and strategic markdowns

The proposed bounding strategy requires estimation of $b_{ms}^{(q)} - D_{ms}(b_{ms}^{(q)})$ for KCKS and KCMO. To that end, I estimate KCKS and KCMO's equilibrium bid distributions ($G_{B_{jms}}$) and strategic markdowns using the data on accepted incentives and the following assumptions.

Restriction on location choices

I assume that the location choices of firms in the sample are limited to KCKS and KCMO: $\tilde{D}_{KCKS} = \tilde{D}_{KCMO} = -1$. This assumption is plausible if firms with existing operations in Kansas City have prohibitive costs of moving outside the metro. The fact that many firms in the sample moved only a few counties across the state border suggests that the firms were simply pitting KCKS and KCMO against each other. However, the fact that the firms relocated at all may also suggest that they are a selected sample of firms that have considered moving outside the metro. In this case, KCKS and KCMO would have faced more competition than what I assume, leading to overestimation of the magnitudes of strategic and freeriding markdowns and hence locations' payoffs.

Distribution of firm profits in default locations

I assume that the profit of a firm in its default location, $\pi_{jms} = \overline{\pi}_{jms} + b_{jms}$, is independently drawn from a log-normal distribution with log mean, μ^{π}_{jms}, and log standard deviation, σ^{π}. On the other hand, profit in a new location is assumed to be independently drawn from the new location's equilibrium bid distribution, normalizing base profit in new location to zero. For a firm whose default location is ms, π_{jms}, thus represents the minimum level of compensation necessary for the firm to be willing to relocate to ms'. Distribution of firm profits in default and new locations are both conditional on firm size, implying that firms of same size draw their profits from common distributions. In sum,

$$\log(\pi_{jms}) = \begin{cases} Z \sim \mathcal{N}\left(\mu^{\pi}_{jms}, (\sigma^{\pi})^2\right) & \text{if } ms \text{ is } j\text{'s default location} \\ \tilde{B} \sim G_{\tilde{B}_{jms}} & \text{otherwise,} \end{cases} \tag{5}$$

where $\tilde{B}_{jms} = \log(B_{jms})$ denotes the equilibrium log incentives offered by ms to j for whom ms is the new location. Note that selected bids (winning bids) from $G_{\tilde{B}_{jms}}$ are observed when ms is not j's default location.

If a firm is observed to have relocated from ms to ms', it must have been the case that $\pi_{jms} \leq b_{jms'}$. It follows that, conditional on firm size, default profits of firms that relocated from ms to ms' must be less than the maximum incentives accepted by those firms:

$$\mu^{\pi}_{jms} \leq \log(\overline{b}_{jms'}) - \Phi^{-1}(\tau_{jms'})\sigma^{\pi}, \tag{6}$$

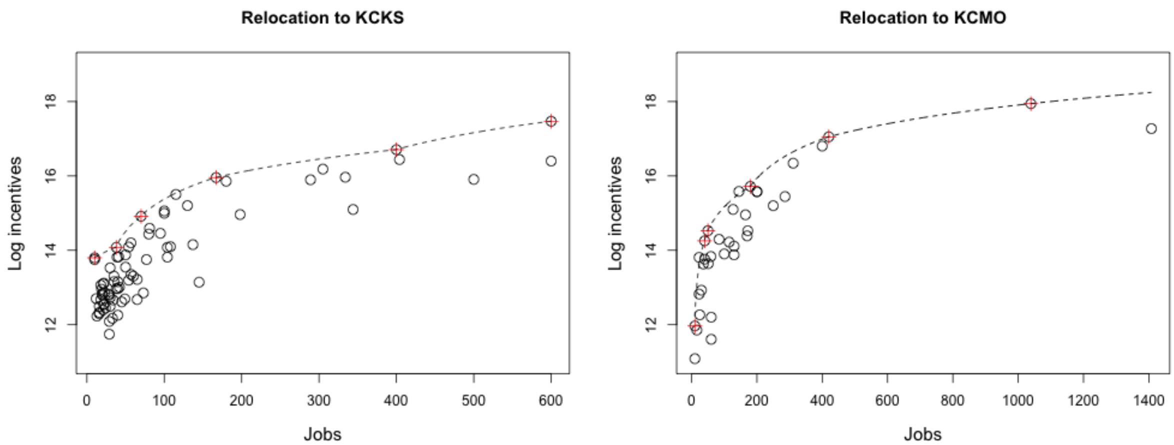
where $\overline{b}_{jms'}$ is the maximum incentives accepted by type j firms for relocation to ms', $\tau_{jms'}$ is the observed share of type j firms in ms that relocated to ms', and Φ^{-1} is the quantile function of the standard normal distribution.

I assume μ^{π}_{jms} is equal to the upper bound provided in Inequality 6 and compute the upper bound using values of $\overline{b}_{jms'}, \tau_{jms'}$, and σ^{π} as described in Table 3.

Table 3: Firm profit distribution parameter settings

Parameter	Description
$\tilde{D}_{ms}$	Definition: $\frac{\frac{\partial}{\partial b}\Pr(ms' \text{ wins } j \mid b_{jms})}{\frac{\partial}{\partial b}\Pr(ms \text{ wins } j \mid b_{jms})}$. Diversion ratio. Value: -1
μ^{π}_{jms}	Definition: Mean of log profits in default locations. Value: $\mu^{\pi}_{jms} = \log(\overline{b}_{jms'}) - \Phi^{-1}(\tau_{jms'})\sigma^{\pi}$. Upper bound from Inequality 6.
σ^{π}	Definition: Standard deviation of log profits in default locations. Values: $\{0.25, 0.5, 1\}$.
$\overline{b}_{jms'}$	Definition: Maximum incentives accepted by type j firms for relocation to ms'. Value: Computed using linear interpolation of observed maximum incentives paid by ms' to firms in each job bin. Predicted values shown in Figure 3.
$\tau_{jms'}$	Definition: Share of type j firms in ms that have default log profits lower than $\overline{b}_{jms'}$. Values: (i) Observed share of firms in ms and in the same job bin as j that relocated to ms', as shown in Table 1; and (ii) 0.5, which is higher than the values in (i).

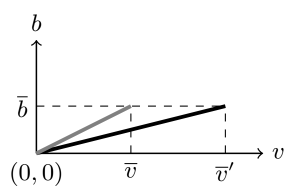
Figure 3: Observed maximum accepted incentives by job bins



Notes: These figures show the observed incentives accepted by firms for relocation to each location. Red cross indicates the maximum amount observed in each job bin as defined in Table 1. Dashed line shows the linear interpolation using these maximum amounts.

Relative to the first specification of $\tau_{jms'}$, the second specification assumes that a much higher share of firms in ms have default profits lower than $\bar{b}_{jms'}$, capturing the possibility that not all firms whose default profits are lower than $\bar{b}_{jms'}$ may have relocated from ms to ms'. Hence, I refer to the first and second specifications of $\tau_{jms'}$ as the "high" and "low" default profit specifications respectively. The range of locations' payoffs that rationalizes the observed range of accepted incentives is wider under the low default profit specification. Figure 4 illustrates the downward shift of the hypothetical bid function under the low default profit specification, where new locations bid lower in response to firms having lower average default profits. As a result, a given level of bid maps into a higher payoff.

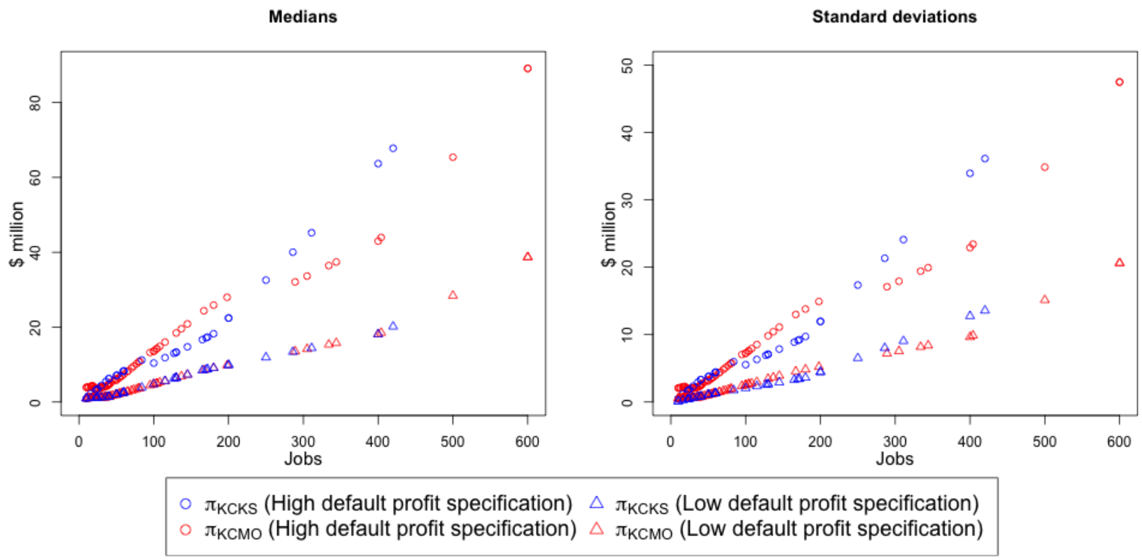
Figure 4: Illustration of hypothetical equilibrium bid functions



Notes: This figure illustrates two hypothetical bid functions. The black line indicates lower bids conditional on payoffs (higher magnitudes of strategic markdowns), which can result when bidding for firms with lower default profits. The range of payoffs that rationalize the range of observed winning bids, $[0, \bar{b}]$, increase from $[0, \bar{v}]$ to $[0, \bar{v}']$.

Figure 5 shows the medians and standard deviations of assumed default profit distributions, computed using values in Table 3.

Figure 5: Assumed default profit distributions



Notes: These figures show the medians and standard deviations of assumed default profit distributions. In the high (low) default profit specification, the probability of type j firms having default profits lower than the predicted maximum accepted incentive is assumed to be equal to the observed share of type j firms that relocated from ms to ms' (0.5). Median default profit is equal to $\exp(\mu^{\pi}_{jms})$, and the standard deviation is equal to $\sqrt{(\exp((\sigma^{\pi}_{jms})^2) - \exp(2\mu^{\pi}_{jms} + (\sigma^{\pi}_{jms})^2))}$.

Distribution of equilibrium bids of new locations ($G_{B_{jms}}$)

I specify new locations' equilibrium bids to be log-normally distributed:

$$\log(b_{jms}) \sim \mathcal{N}\left(\mu^b_{jms}, \left(\sigma^b_{jms}\right)^2\right)$$
$$\mu^b_{jms} = \mu^{b0}_{ms} + \mu^{b1}_{ms} \times \log(\text{jobs}_j)$$
$$\sigma^b_{jms} = \sigma^{b0}_{ms}.$$

Equilibrium bid distributions vary with locations and firm size, which is a key firm attribute that explains the empirical variation in the winning bids. $\left(\vec{\mu^b}, \vec{\sigma^b}\right)$ denotes the parameter vectors of the equilibrium bid distributions.

Maximum likelihood estimation

I estimate $\left(\vec{\mu^b}, \vec{\sigma^b}\right)$ via maximum likelihood estimation. By Bayes's rule, the joint density of location ms's winning bids conditional on firm size can be expressed as follows:

$$g_{B_{jms}}(b_{jms}|ms \text{ wins } j)\Pr(ms \text{ wins } j) = g_{B_{jms}}(b_{jms})\Pr(ms \text{ wins } j\ |b_{jms})$$
$$= \phi\left(\frac{\log(b_{jms}) - \mu^b_{jms}}{\sigma^b_{jms}}\right)\Phi\left(\frac{\log(b_{jms}) - \mu^{\pi}_{jms}}{\sigma^{\pi}_{jms}}\right),$$

where the left-hand side is data, and the right-hand side is the likelihood of observing firm j accept b_{jms} for relocation to ms.

The estimation sample consists of 109 firms that relocated within Kansas City and have at most 600 jobs, excluding two outlier firms that have 1039 and 1408 jobs and relocated to KCMO.

Results

Table 4 shows the estimated $\left(\vec{\mu^b}, \vec{\sigma^b}\right)$. In both low and high default profit specifications, KCKS has a higher μ^{b0} but lower μ^{b1} than KCMO, reflecting the fact that KCKS is observed to have paid higher incentives for relocation of smaller firms than KCMO. Table A4 shows that the predicted median incentive payments using parameter estimates fit the observed data reasonably well. Appendix Tables A6 and A7 also show that the estimates are not very sensitive to σ^π.

Table 4: Equilibrium bid distribution parameter estimates

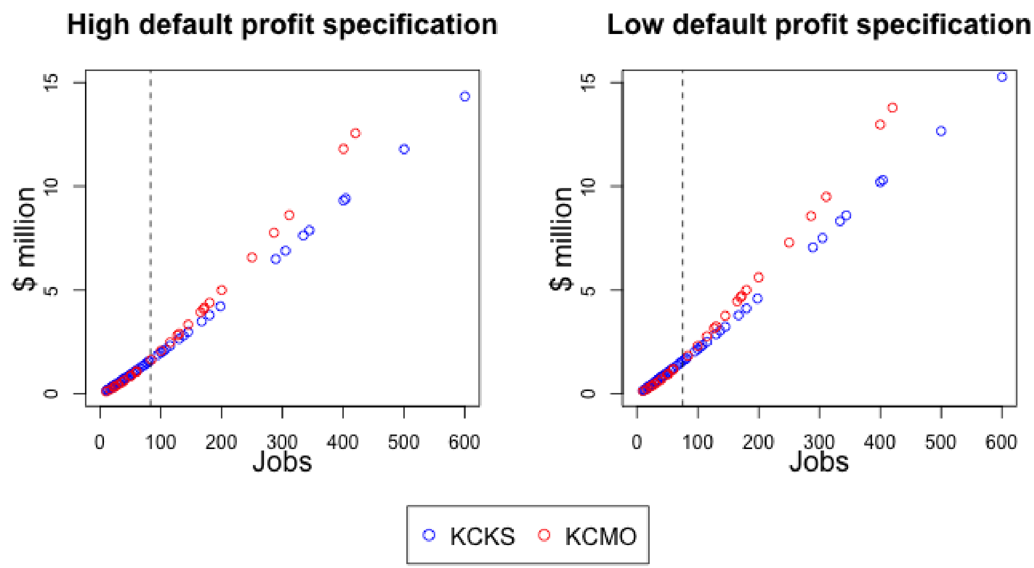
	High default profit specification: (τ_{jms} = observed relocation shares)		Low default profit specification: ($\tau_{jms} = 0.5$)	
	KCKS	KCMO	KCKS	KCMO
μ^{b0}	9.3162	8.6325	9.3169	8.6320
	(0.3147)	(0.5512)	(0.3148)	(0.5510)
μ^{b1}	1.1017	1.2567	1.1016	1.2568
	(0.0762)	(0.1224)	(0.0763)	(0.1223)
σ^{b0}	0.6718	0.7164	0.6718	0.7161
	(0.0545)	(0.0882)	(0.0545)	(0.0881)

Notes: This table shows the equilibrium bid distribution parameters of KCKS and KCMO estimated using the maximum likelihood estimator. The standard deviation of firm profits in the default locations is assumed to be $\sigma^\pi = 0.5$. See appendix for sensitivity of results to $\sigma^\pi = 0.25$ and 1.

Strategic markdowns at estimated bid quantiles, $b_{jms}^{(q)} = \exp(\mu_{jms}^b + \sigma_{jms}^b \Phi^{-1}(q))$ $q \in [0, 1]$, can be computed as $D_{jms}(b_{jms}^{(q)}) = -\frac{\Pr(ms \text{ wins } j \mid b_{jms}^{(q)})}{\frac{\partial}{\partial b} \Pr(ms \text{ wins } j \mid b_{jms}^{(q)})} = -b_{jms}^{(q)} \Phi\left(\frac{\log(b_{jms}^{(q)}) - \mu_{jms}^\pi}{\sigma_{jms}^\pi}\right) / \phi\left(\frac{\log(b_{jms}^{(q)}) - \mu_{jms}^\pi}{\sigma_{jms}^\pi}\right)$. Strategic markdowns computed at estimated median bids are shown in Appendix Figure A3.

Figure 6 shows the upper bounds on median political payoffs ($b_{jms}^{(0.5)} - D_{jms}(b_{jms}^{(0.5)})$) for firms observed to have been won by KCKS and KCMO. The upper bounds range from 0.015 to 0.024 (0.016 to 0.026) and 0.011 to 0.031 (0.013 to 0.037) million dollars per job for KCKS and KCMO respectively in the high (low) default profit specification. KCKS's upper bounds exceed KCMO's for small firms (fewer than about 80 jobs), reflecting the fact that KCKS won substantially more small firms than KCMO by paying higher incentives (see Table 1). Figure A3 shows that higher upper bounds are obtained in the low default profit specification due to the shifting down of the equilibrium bid function as discussed in subsection 6.1.

Figure 6: Upper bounds on median political payoffs



Notes: These figures show the upper bounds on median political payoffs $(b^{(0.5)}_{jms} - D_{jms}(b^{(0.5)}_{jms}))$ for firms won by KCKS and KCMO in the sample. KCKS's upper bounds exceed KCMO's to the left of dashed line in each figure.

6.2 Spillover coefficient and the ratio of economic payoff quantiles

Using ACS Commuting Flows data, I construct the spillover coefficient (γ_{ms}) to approximate the number of jobs that will spill over to ms when ms' attracts a firm:

$$\gamma_{ms} = \frac{\text{Share of } ms' \text{ workforce that resides in } ms}{\text{Share of } ms \text{ workforce that resides in } ms}.$$

According to this specification, $(\gamma_{KCKS}, \gamma_{KCMO}) = (0.18, 0.25)$.[17] The likelihood ratio of a KCKS resident being hired by a firm located in KCMO relative to a firm located in KCKS is thus approximated as 0.18, and the spillover that KCKS derives when KCMO lands a firm would be 0.18 of the economic payoff that KCKS would derive if it lands the same firm.[18] Proposed specification is motivated by the fact that states mainly use job creation figures to evaluate the economic impacts of incentive programs.[19]

As an alternate specification, I use $\gamma_{ms} = 0$ while keeping γ_{-ms} constructed using commuting flows as described above. This alternate specification allows me to consider the impact of γ_{ms} potentially being biased upward due to omission of factors such as tax revenues that do not spill over when $-ms$ wins.

For the ratio of economic payoff quantiles (z), I start with the baseline specification of KCKS

[17] $\gamma^{ms'}_{ms}$ for other Core-Based Statistical Areas (CBSA) that contain multiple states are shown in Table A5.

[18] $\gamma^{ms'}_{ms}$ can be treated as an equilibrium outcome of workers' location decisions in a richer spatial equilibrium framework, as firm entry to a location can induce geographic sorting of workers.

[19] See footnote 9 and `https://www.nytimes.com/2011/04/08/us/08states.html`

and KCMO having identical economic payoff distributions: $z = \frac{F^{-1}_{V^e_{jKCMO}}(q)}{F^{-1}_{V^e_{jKCKS}}(q)} = 1 \quad q \in [0,1]$.[20] State documents suggest that the two states reach similar assessments of the economic impacts of their incentive programs.[21][22] KS Department of Commerce assesses that \$1 of investment in the PEAK Program generates \$960 for the Kansas state economy over roughly six years, averaging \$160 per year. On the other hand, MO Department of Economic Development assesses that \$1 of investment in the Missouri Quality Jobs Program (predecessor to the Missouri Works Program) generates \$179.88 per year for the MO state economy over fifteen years.[23]

As an alternate specification, I use $z = \frac{179.88}{160} \approx 1.12$, reflecting the accounting differential from the state documents.

6.3 Lower bounds on political payoffs

Using Inequality 4 and the variables quantified in the last two subsections, I compute the lower bounds on KCKS and KCMO's median political payoffs ($F^{-1}_{V^p_{jms}}(0.5)$) for firms in the sample.

Figure 7 plots the positive lower bounds on median political payoffs per job. As argued in Section 5, the lower bounds increase when positive spillovers are assumed. KCKS (KCMO)'s lower bounds also increase (decrease) when KCKS's economic payoff quantiles are assumed to be lower than KCMO's. KCKS (KCMO)'s lower bounds are positive for firms with less than 130 (more than 50) jobs and are decreasing (increasing) in jobs. This pattern mirrors the fact shown in Table 1 that KCKS (KCMO)'s incentive payment per job and wins were focused on small (large) firms and is consistent with the finding from subsection 6.2 that the difference between KCKS and KCMO's upper bounds is decreasing in jobs.[24] It is important to note that the finding that KCKS (KCMO)'s lower bounds are decreasing (increasing) in jobs does not necessarily imply that KCKS (KCMO)'s political payoffs per job are also decreasing (increasing) in jobs.

When positive spillovers and identical economic payoffs are assumed, KCKS's median political payoff for relocating a firm with less than 20 jobs is at least 1.67 thousand dollars per job, implying that KCKS derived sizable political payoffs even from relocating small firms. On the other hand,

[20] This assumption is analogous to the symmetric independent private-value assumption used in the empirical auction literature to recover bidders' valuations for the auctioned items. A similar assumption is also used by Mast (2020), who assumes that the towns in New York state derive common deterministic values from attracting firms.

[21] KS's assessment is found in 2019 Kansas PEAK Program Annual Report (Department of Commerce, 2019). MO's assessment is found in 2019 Missouri Quality Jobs Program Annual Report (Department of Economic Development, 2019). KS Department of Commerce uses analyses done by The Docking Institute of Public Affairs (2013) and Legislative Division of Post Audit (2014). MO Department of Economic Development uses the Regional Economic Models, Inc. (REMI) Policy Insight Model.

[22] Other estimates are also similar across the two states although the variable definitions slightly differ. For example, KS assesses that \$1 of PEAK incentive generates net present value of \$3.48 in state and local tax revenues. MO assesses that \$1 of Quality Jobs incentive generates \$2.95 in state revenue over fifteen years.

[23] State assessments cannot strictly be taken as economic payoffs in my model, as the opportunity costs of incentive spending (e.g., reduced spending on education) must be taken into account, similar to the distinction between economic and accounting profits.

[24] Table 1 showed that firms with less than 100 jobs make up 75% of KCKS's wins in the sample and that KCKS paid the most incentives per job to firms with less than 20 jobs. On the other hand, firms with more than 100 jobs make up more than half of KCMO's wins in the sample, and KCMO paid the most incentives per job to firms with more than 250 jobs.

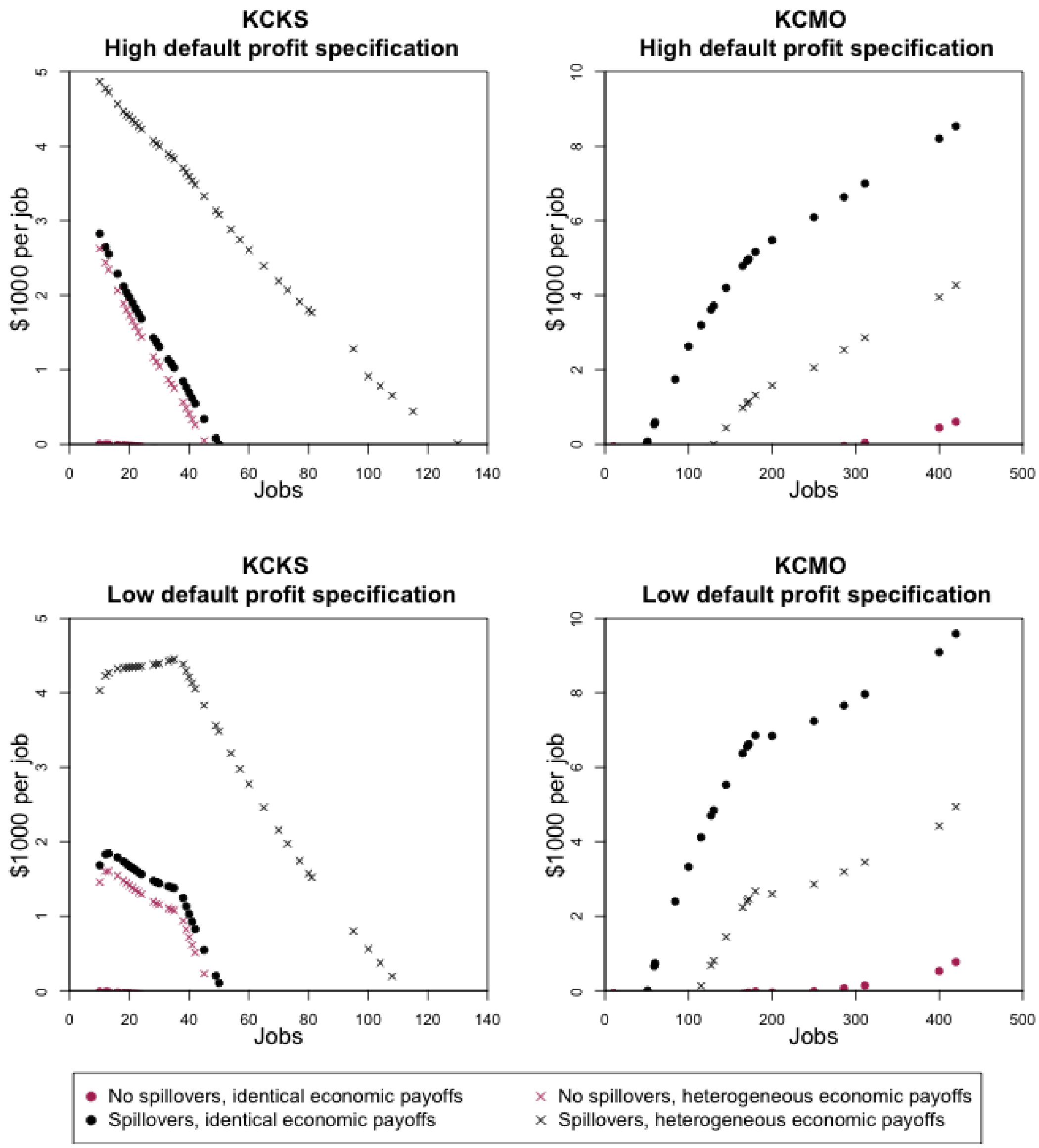
KCMO's median political payoff for relocating a firm with more than 70 jobs is at least 1.46 thousand dollars per job and is steeply increasing in jobs. KCKS's total median political payoffs for firms with fewer than 50 jobs that KCKS won in the sample amount to at least 1.37 million dollars, or at least 7.83% of observed incentive payments. On the other hand, KCMO's total median political payoffs for firms with more than 49 jobs that KCMO won in the sample amount to at least 20.98 million dollars, or at least 18.67% of observed incentive payments.

When zero spillover is assumed, KCKS lower bounds are still positive when KCKS is assumed to have lower economic payoff quantiles than KCMO. These lower bounds are similar to the ones computed assuming positive spillovers and identical economic payoffs. On the other hand, KCMO's lower bounds are positive for large firms with more than 300 jobs when assuming identical economic payoffs; these lower bounds are simply the difference between KCMO and KCKS's upper bounds derived in subsection 6.1.

Discussion

The lower bound results suggest that both KCKS and KCMO had much to gain politically from fighting for relocation of existing firms from each other. Kansas Governor Brownback ran on a platform of tax cuts and aggressive economic development policies, the success of which was partly measured by job growth in KCKS. Governor Brownback would have had a high stake in relocating firms from KCMO to KCKS. Political payoffs may also explain why Governor Brownback rejected Missouri Governor Nixon's proposal for a ceasefire on incentive provision in 2013. Although Missouri proposed the ceasefire, this paper's results suggest that KCMO also derived considerable political gains from relocating firms from KCKS as Governor Nixon was under political pressure to fight against the job losses to Kansas. It appears that the growing criticism against the border war and waning support for economic policies initiated by Governor Brownback greatly reduced the political benefits from relocating firms within Kansas City, ultimately leading to a ceasefire in 2019.

Figure 7: Lower bounds on median political payoffs per job



Notes: These figures show the lower bounds on median political payoffs for firms won by KCKS and KCMO in the sample. Lower bounds are computed using Inequality 4. Spillover specification uses $(\gamma_{KCKS}, \gamma_{KCMO}) = (0.18, 0.25)$. No spillover specification uses (0,0.25) and (0.18, 0) for KCKS and KCMO respectively. Identical economic payoffs specification uses $z = F^{-1}_{V^e_{jKCMO}}(q)/F^{-1}_{V^e_{jKCKS}}(q) = 1 \quad q \in [0, 1]$ and the heterogeneous economic payoffs specification uses $z = 1.12$.

7 Conclusion

I have studied inter-jurisdictional competition for firms in which the winning jurisdictions derive economic and political payoffs and non-winning jurisdictions can derive economic spillovers. In my model, jurisdictions can locally coordinate to improve their joint expected welfare but political payoffs and the lack of transfer arrangements can prevent jurisdictions from committing to coordinate. I use data on incentives accepted by firms that relocated across the state border in Kansas City and a bounding strategy to learn about the size of political payoffs derived by Kansas and Missouri during 2009-2019. Empirical results show that both states derived sizable political gains from poaching existing firms from each other.

This paper provides several directions for future research. While this paper distinguishes economic and political payoffs of winning firms, the mechanism behind how political payoffs are generated is not made explicit. Specifically, how incentive provision is determined by reelection motives and political influence wielded by firms through lobbying and campaign contributions (e.g., Richter et al. (2009), Bombardini and Trebbi (2011), DiSalvo and Li (2020)) can be examined further. Effects of worker mobility on economic spillovers can also be studied further in a broader spatial equilibrium framework.

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Appendix

A. Model simulations: gains from metro-level coordination

Using simulations of the parameterized model, I show that the correlation of firm profits and the size of economic spillovers impact governments' expected gains from metro-level coordination as described in Section 3. To concisely capture the correlation of firm profits, I use a nested logit firm profit function:

$$\pi_{jms} = b_{jms} + \underbrace{\delta_{ms} + \zeta_{jm} + (1-\sigma)\epsilon_{jms}}_{=\overline{\pi}_{jms}\text{: } j\text{'s base profit in } ms},$$

where δ_{ms} is assumed to be common knowledge, and $\zeta_{jm} + (1-\sigma)\epsilon_{jms}$, assumed to be distributed Type I Extreme Value, represents j's profit shock in ms and is j's private information. The nesting parameter $0 \leq \sigma < 1$ governs the correlation of $\overline{\pi}_{jms}$ within metro m. The correlation of base profits within metro goes to one (zero) as σ goes to one (zero).

I consider a simple example with three locations, $A1, A2$ and $B3$, competing for firms. Metro A – a multi-state metro – belongs to states 1 and 2, and metro B only belongs to state 3. $A1$ and $A2$'s optimal incentive offers under coordination, $(\hat{b}_{A1}, \hat{b}_{A2})$, maximize their sum of expected welfare:

$$\max_{\hat{b}_{A1},\hat{b}_{A2}} \sum_{s\in\{1,2\}} \Pr(As \text{ wins} \mid A1, A2 \text{ offer } \hat{b}_{A1}, \hat{b}_{A2}) \left(v_{As} + \tilde{v}^{As}_{A(-s)} - \hat{b}_{As}\right).$$

First-order condition for optimal $\hat{b}_{As}$, $s \in \{1,2\}$, under coordination are:

$$\hat{b}_{As} = v_{As} + \tilde{v}^{As}_{A(-s)} + D_{As} + \tilde{D}_{As}(\hat{b}_{A1}, \hat{b}_{A2}) \left(v_{A(-s)} + \tilde{v}^{A(-s)}_{As} - \hat{b}_{A(-s)}\right), \tag{7}$$

where $D_{As}(\hat{b}_{A1}, \hat{b}_{A2}) = \frac{-\Pr(As \text{ wins} \mid A1, A2 \text{ offer } \hat{b}_{A1}, \hat{b}_{A2})}{\frac{\partial}{\partial \hat{b}_{As}} \Pr(As \text{ wins} \mid A1, A2 \text{ offer } \hat{b}_{A1}, \hat{b}_{A2})}$ denotes the strategic markdown and $\tilde{D}_{As}(\hat{b}_{A1}, \hat{b}_{A2}) = \frac{\frac{\partial}{\partial \hat{b}_{As}} \Pr(A(-s) \text{ wins} \mid A1, A2 \text{ offer } \hat{b}_{A1}, \hat{b}_{A2})}{\frac{\partial}{\partial \hat{b}_{As}} \Pr(As \text{ wins} \mid A1, A2 \text{ offer } \hat{b}_{A1}, \hat{b}_{A2})}$ denotes the diversion ratio of As.[25]

I assume $A1$, $A2$, and $B3$'s economic values for firms, v^e_{ms}, are iid draws from a truncated normal distribution ($\mu = 5.5, \sigma^2 = 1, [a,b] = [5,6]$). Political values, v^p_{ms}, comonotonic with v^e_{ms}, are drawn from a standard uniform distribution. I vary the spillover coefficient, $\gamma = \gamma^{A2}_{A1} = \gamma^{A1}_{A2}$, from 0 to 0.1, at increment of 0.02. All three locations have identical deterministic firm profitabilities, $\delta_{ms} = 1$. I vary the nesting parameter, σ, from 0 to 0.75 at increment of 0.15. Under this setup, I numerically solve for equilibrium bidding strategies of $A1, A2$, and $B3$ using Equations 1 and 7. In case without $A1$ and $A2$'s coordination, I assume bids to be quadratic in values for firms. In case with $A1$ and $A2$'s coordination, I further assume $A1$ and $A2$'s bids to be quadratic in both v_{A1} and v_{A2}. In both cases, I impose symmetry between $A1$ and $A2$'s bid functions. Draws of values for firms (v_{jms}) and firm profit shocks (ϵ_{jms}) are held constant across different combinations of γ and σ.

Figure A1 shows the distributions of simulated changes in $A1$ and $A2$'s joint welfare, incentive offers, and joint win share under coordination. Figure A1a shows that when spillovers between $A1$ and $A2$ are low (i.e., low γ), $A1$ and $A2$'s joint welfare gains from coordination are increasing as their firm profits are more

[25] Local changes from b_{As} that satisfies Equation 1 (optimal non-coordinated incentive offers) to $\hat{b}_{As}$ that satisfies Equation 7 (optimal coordinated incentive offers) are captured by $\tilde{v}^{As}_{A(-s)} + \tilde{D}_{As}(\hat{b}_{A1}, \hat{b}_{A2})(v_{A(-s)} - \hat{b}_{A(-s)})$ in Equation 7. Downward pressure on bids exerted by internalization of competitive externalities is captured by $\tilde{D}_{As}(\hat{b}_{A1}, \hat{b}_{A2})(v_{A(-s)} - \hat{b}_{A(-s)})$. On the other hand, upward pressure on bids exerted by internalization of economic spillovers is captured by $\tilde{v}^{As}_{A(-s)}$.

correlated (i.e., higher σ). Figure A1b shows that changes in $A1$'s incentive offers are increasingly negative as correlation of firm profits in $A1$ and $A2$ increases, illustrating that these gains from coordination are derived from internalization of competitive externalities.

On the other hand, when spillovers between $A1$ and $A2$ are high, welfare gains are more pronounced as $A1$ and $A2$ offer higher incentive offers that divert firms away from $B3$; however, higher incentive offers are occasionally "wasted" on firms that would have chosen either $A1$ or $A2$ even without coordination, resulting in more pronounced welfare losses as well. Figure A1c shows that changes in $A2$ and $A2$'s joint win share are positive when spillovers are high, illustrating that these gains are derived from internalization of economic spillovers. Further, these gains are decreasing as firm profits in $A1$ and $A2$ are more correlated, making it more difficult to divert firms away from $B3$.

B. Ceasefire analysis

I consider an example in which locations, $m1, m2$, in metro m compete for a single, existing firm that is currently located in location $m1$. Table A1 lists the payoffs that locations can obtain under possible competition outcomes.

Table A1: Example: payoffs under competition and ceasefire

Location	Case	Payoff
$ms \in \{m1, \cdots mS\}$	Competition, ms wins	$v_{ms} - b_{ms}$
$ms \in \{m1, \cdots mS\}$	Competition, $ms' \neq ms$ wins	$\gamma_{ms}^{ms'} v_{ms}^{e}$
$m1$	Ceasefire (i.e., $m1$ keeps the firm)	v_{m1}
$ms \in \{m2, \cdots mS\}$	Ceasefire (i.e., $m1$ keeps the firm)	$\gamma_{ms}^{m1} v_{ms}^{e}$

I proceed by comparing the expected welfare of individual locations under competition and ceasefire. Note that ms's expected welfare under competition is a weighted average of the first two rows of Table A1.

Metro with two locations. $m1$ is better off under ceasefire, since v_{m1} is larger than the weighted average of $v_{m1} - b_{m1}$ and $\gamma_{m1}^{m2} v_{m1}^{e}$. On the other hand, $m2$ is worse off under ceasefire, since $m2$'s freeriding markdown under competition is equal to the spillover, $\gamma_{m1}^{m2} v_{m1}^{e}$, implying that the weighted average of $v_{m2} - b_{m2}$ and $\gamma_{m2}^{m1} v_{m2}^{e}$ is larger than $\gamma_{m2}^{m1} v_{m2}^{e}$.

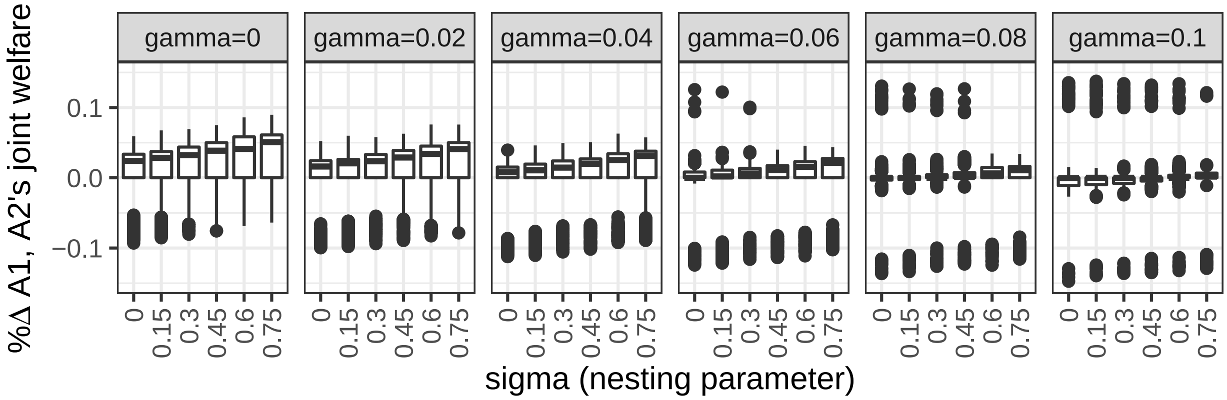
Metro with more than two locations. $m1$ is better off under ceasefire, by the same logic as in the previous case. On the other hand, the possibility that $ms \in \{m2, \cdots mS\}$ is worse off under competition cannot be ruled out. To construct a case where $ms \in \{m2, \cdots mS\}$ is worse off under competition, suppose: (1) $\gamma_{ms}^{m1} > \gamma_{ms}^{ms'}$ $\forall s' \in \mathcal{S}_m \setminus \{1, s\}$; and (2) $D_{ms}(b_{ms}) < \gamma_{ms}^{m1} v_{ms}^{e} - \sum_{s' \in \mathcal{S}_m \setminus s} \tilde{D}_{ms}^{ms'}(b_{ms}) \gamma_{ms}^{ms'} v_{ms}^{e}$. Then the following inequality holds:

$$\Pr(ms \text{ wins} \mid b_{ms})(v_{ms} - b_{ms}) + \sum_{ms' \in \mathcal{S}_m \setminus s} \Pr(ms' \text{ wins} \mid b_{ms}) \gamma_{ms}^{ms'} v_{ms}^{e} < \gamma_{ms}^{m1} v_{ms}^{e},$$

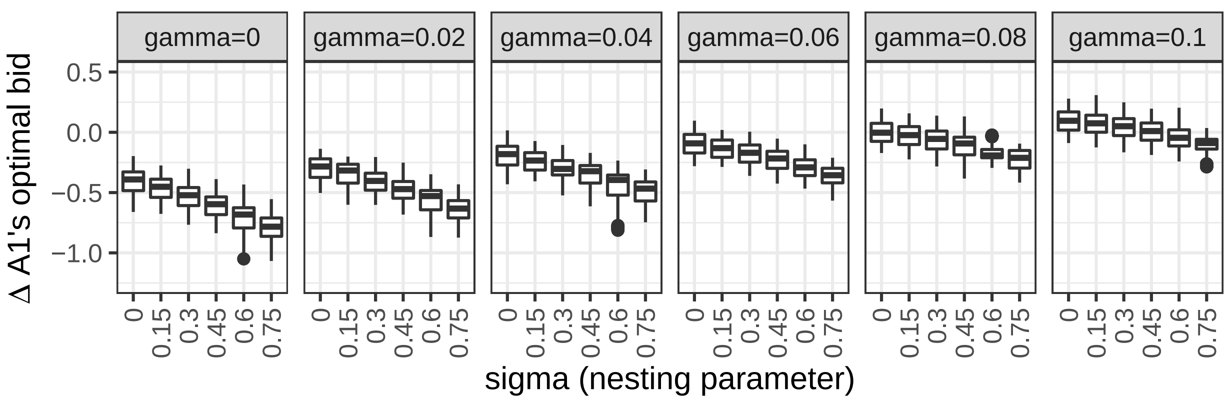
where the left (right)-hand side is ms's expected welfare under competition (ceasefire). By the first assumption, $\gamma_{ms}^{ms'} v_{ms}^{e} < \gamma_{ms}^{m1} v_{ms}^{e}$ for all $s' \neq 1, s$. Note that by the first-order condition (Equation 1), $v_{ms} - b_{ms} = D_{ms}(b_{ms}) + \sum_{s' \in \mathcal{S}_m \setminus s} \tilde{D}_{ms}^{ms'}(b_{ms}) \gamma_{ms}^{ms'} v_{ms}^{e}$ on the left-hand side. By the second assumption, it follows that $v_{ms} - b_{ms} < \gamma_{ms}^{m1} v_{ms}^{e}$. Therefore, the weighted average of $(v_{ms} - b_{ms})$ and $\gamma_{ms}^{ms'} v_{ms}^{e}$ is less than $\gamma_{ms}^{m1} v_{ms}^{e}$. Intuitively, when the largest spillover that ms derives is from $m1$ (first assumption) and when ms derives only a small strategic markdown when it wins (second assumption), ms prefers to let $m1$ win than compete, in which case the increased probability of locations other than $m1$ winning is unfavorable to ms.

Figure A1: Simulated changes in $A1, A2$'s welfare, bids, and win shares under coordination

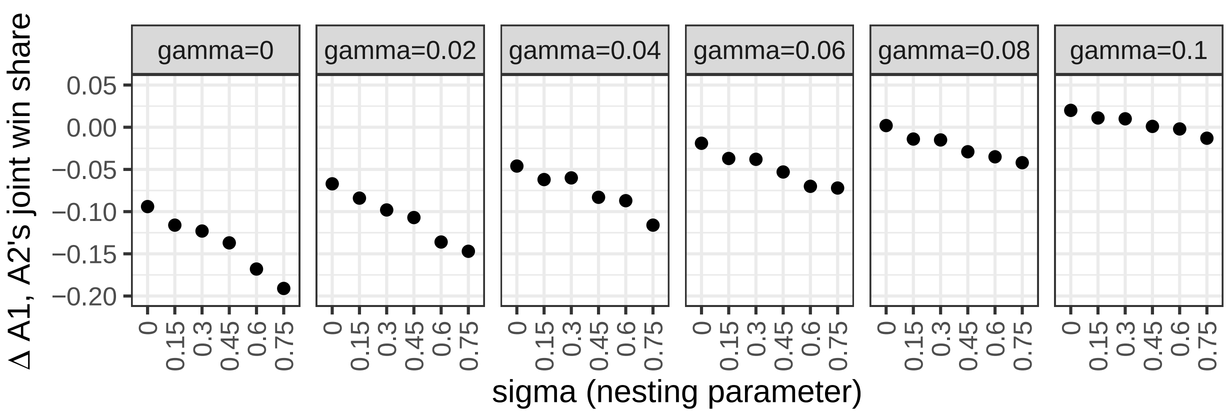
(a) Distributions of simulated changes in $A1, A2$'s joint welfare under coordination



(b) Distributions of simulated changes in $A1$'s incentive offers under coordination



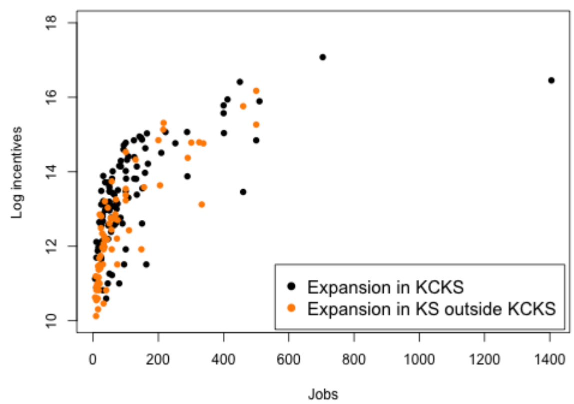
(c) Simulated changes in $A1, A2$'s joint win share under coordination



Notes: Figure A1a shows box plots of simulated changes in $A1, A2$'s joint welfare realized in each competition when $A1, A2$ coordinate. Figure A1b shows box plots of simulated changes in $A1$'s optimal incentive offers when $A1, A2$ coordinate; results for $A2$ are similar due to symmetry between $A1$ and $A2$. Figure A1c shows simulated changes in $A1, A2$'s joint win share when $A1, A2$ coordinate. Each subfigure displays simulated changes under different values of: (1) spillover coefficient ($\gamma = \gamma_{A1}^{A2} = \gamma_{A2}^{A1}$) that governs the size of economic spillovers between $A1$ and $A2$; and (2) nesting parameter (σ) that governs the correlation of firm profits in $A1$ and $A2$. Appendix provides details of the simulation exercise.

B. Data

Figure A2: Incentive provision by KS for firm expansion, retention, and new operations



Notes: This figure compares incentives provided by KS for firm expansion, retention, and new operations in counties inside versus outside KCKS.

Table A2: Correlation between incentive provision by KS for firm expansion, retention, and new operations and firm characteristics

	Dependent variable: log incentives	
	(1)	(2)
Jobs	0.002*** (0.0003)	0.002*** (0.0003)
Wage		0.045*** (0.011)
Outside KCKS	−1.012*** (0.202)	−0.591*** (0.222)
Constant	13.195*** (0.136)	11.959*** (0.340)
Observations	173	173
R^2	0.239	0.303

Notes: *p<0.1; **p<0.05; ***p<0.01. Wage variable is missing for one of the firms that relocated to KCKS.

Table A3: Data sources

Data	Years	Source
Accepted incentives	10-19	Hall Family Foundation
CBSA delineations	13	OMB
County to subdivision crosswalk	10	Census
CBSA to county crosswalk	13	NBER
County-to-county commuting flows	11-15	ACS
Number of establishments	18	County Business Patterns

Table A4: Comparison of observable characteristics of KCKS and KCMO

	Year	KCKS	KCMO
Number of counties		5	9
Population	2018	888453	1255974
Unemployment rate (average county)	2019	4.7%	4.5%
Median household income (average county)	2019	60086.6	57907.33
State corporate income tax rate	2011-19	4% \$0+ 7% \$50,000+	6.25%
Number of establishments with employees < 5	2018	12713	15909
Number of establishments with $5 \leq$ employees < 10	2018	4002	5216
Number of establishments with $10 \leq$ employees < 20	2018	3006	3772
Number of establishments with $20 \leq$ employees < 50	2018	2474	3107
Number of establishments with $50 \leq$ employees < 100	2018	842	992
Number of establishments with $100 \leq$ employees < 250	2018	502	556
Number of establishments with $250 \leq$ employees < 500	2018	159	167
Number of establishments with $500 \leq$ employees < 1000	2018	59	42
Number of establishments with employees ≥ 1000	2018	19	27

D. Construction of spillover coefficient: $\gamma_{ms}^{ms'}$

For each location ms with at least one local competitor, I compute the following variables using 2011-2015 5-Year ACS Commuting Flows data:

$$\text{Share of } ms' \text{ workforce that resides in } ms = \frac{\text{Total commuters from } ms \text{ to } ms'}{\text{Total commuters to } ms'}$$
$$\text{Share of } ms \text{ workforce that resides in } ms = \frac{\text{Total commuters from } ms \text{ to } ms}{\text{Total commuters to } ms},$$

which I divide to compute $\gamma_{ms}^{ms'} \equiv \frac{\text{Share of } ms' \text{ workforce that resides in } ms}{\text{Share of } ms \text{ workforce that resides in } ms}$. Sum of spillover coefficients, $\sum_{s \in \mathcal{S}_m \setminus s} \gamma_{ms}^{ms'}$, computed for locations in multi-state CBSA is shown in Table A5.

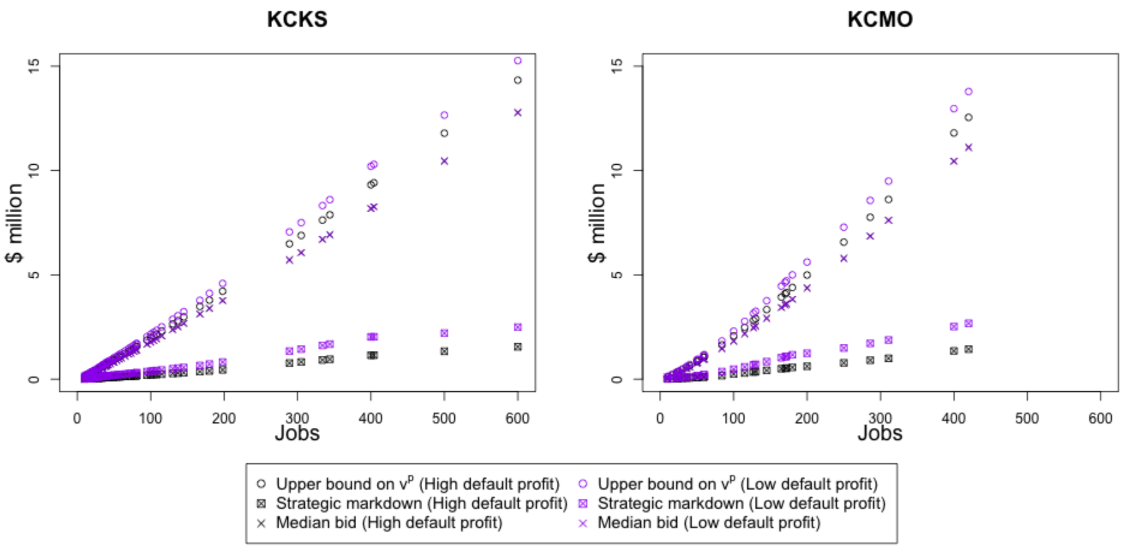
Table A5: Sum of spillover coefficients: $\sum_{s\in\mathcal{S}_m\setminus s}\gamma_{ms}^{ms'}$

CBSA	State	$\sum\gamma$	CBSA	State	$\sum\gamma$	CBSA	State	$\sum\gamma$
Allentown-Bethlehem-Easton, PA-NJ	NJ	0.01	Fort Smith, AR-OK	AR	0.09	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	DE	0.02
Allentown-Bethlehem-Easton, PA-NJ	PA	0.20	Fort Smith, AR-OK	OK	0.11	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	MD	0.01
Augusta-Richmond County, GA-SC	GA	0.17	Grand Forks, ND-MN	MN	0.14	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	NJ	0.05
Augusta-Richmond County, GA-SC	SC	0.12	Grand Forks, ND-MN	ND	0.18	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	PA	0.09
Berlin, NH-VT	NH	0.18	Hagerstown-Martinsburg, MD-WV	MD	0.06	Point Pleasant, WV-OH	OH	0.12
Berlin, NH-VT	VT	0.07	Hagerstown-Martinsburg, MD-WV	WV	0.13	Point Pleasant, WV-OH	WV	0.14
Bluefield, WV-VA	VA	0.14	Huntington-Ashland, WV-KY-OH	KY	0.06	Portland-Vancouver-Hillsboro, OR-WA	OR	0.11
Bluefield, WV-VA	WV	0.18	Huntington-Ashland, WV-KY-OH	OH	0.15	Portland-Vancouver-Hillsboro, OR-WA	WA	0.07
Boston-Cambridge-Newton, MA-NH	MA	0.09	Huntington-Ashland, WV-KY-OH	WV	0.09	Providence-Warwick, RI-MA	MA	0.08
Boston-Cambridge-Newton, MA-NH	NH	0.02	Iron Mountain, MI-WI	MI	0.33	Providence-Warwick, RI-MA	RI	0.14
Burlington, IA-IL	IL	0.09	Iron Mountain, MI-WI	WI	0.11	Quincy, IL-MO	IL	0.04
Burlington, IA-IL	IA	0.05	Jackson, WY-ID	ID	0.12	Quincy, IL-MO	MO	0.05
Cape Girardeau, MO-IL	IL	0.03	Jackson, WY-ID	WY	0.03	St. Joseph, MO-KS	KS	0.04
Cape Girardeau, MO-IL	MO	0.04	Kansas City, MO-KS	KS	0.18	St. Joseph, MO-KS	MO	0.29
Charlotte-Concord-Gastonia, NC-SC	NC	0.18	Kansas City, MO-KS	MO	0.25	St. Louis, MO-IL	IL	0.08
Charlotte-Concord-Gastonia, NC-SC	SC	0.06	Kingsport-Bristol-Bristol, TN-VA	TN	0.26	St. Louis, MO-IL	MO	0.07
Chattanooga, TN-GA	GA	0.17	Kingsport-Bristol-Bristol, TN-VA	VA	0.15	Salisbury, MD-DE	DE	0.12
Chattanooga, TN-GA	TN	0.14	La Crosse-Onalaska, WI-MN	MN	0.08	Salisbury, MD-DE	MD	0.06
Chicago-Naperville-Elgin, IL-IN-WI	IL	0.08	La Crosse-Onalaska, WI-MN	WI	0.13	Sioux City, IA-NE-SD	IA	0.50
Chicago-Naperville-Elgin, IL-IN-WI	IN	0.02	Lewiston, ID-WA	ID	0.47	Sioux City, IA-NE-SD	NE	0.14
Chicago-Naperville-Elgin, IL-IN-WI	WI	0.01	Lewiston, ID-WA	WA	0.36	Sioux City, IA-NE-SD	SD	0.08
Cincinnati, OH-KY-IN	IN	0.02	Logan, UT-ID	ID	0.04	South Bend-Mishawaka, IN-MI	IN	0.09
Cincinnati, OH-KY-IN	KY	0.08	Logan, UT-ID	UT	0.10	South Bend-Mishawaka, IN-MI	MI	0.05
Cincinnati, OH-KY-IN	OH	0.18	Louisville/Jefferson County, KY-IN	IN	0.09	Texarkana, TX-AR	AR	0.35
Claremont-Lebanon, NH-VT	NH	0.17	Louisville/Jefferson County, KY-IN	KY	0.14	Texarkana, TX-AR	TX	0.38
Claremont-Lebanon, NH-VT	VT	0.18	Marinette, WI-MI	MI	0.25	Union City, TN-KY	KY	0.07
Clarksville, TN-KY	KY	0.08	Marinette, WI-MI	WI	0.24	Union City, TN-KY	TN	0.32
Clarksville, TN-KY	TN	0.45	Memphis, TN-MS-AR	AR	0.02	Virginia Beach-Norfolk-Newport News, VA-NC	NC	0.01
Columbus, GA-AL	AL	0.22	Memphis, TN-MS-AR	MS	0.13	Virginia Beach-Norfolk-Newport News, VA-NC	VA	0.06
Columbus, GA-AL	GA	0.26	Memphis, TN-MS-AR	TN	0.20	Wahpeton, ND-MN	MN	0.29
Cumberland, MD-WV	MD	0.28	Minneapolis-St. Paul-Bloomington, MN-WI	MN	0.10	Wahpeton, ND-MN	ND	0.38
Cumberland, MD-WV	WV	0.17	Minneapolis-St. Paul-Bloomington, MN-WI	WI	0.02	Washington-Arlington-Alexandria, DC-VA-MD-WV	DC	0.10
Davenport-Moline-Rock Island, IA-IL	IL	0.27	Myrtle Beach-Conway-North Myrtle Beach, SC-NC	NC	0.02	Washington-Arlington-Alexandria, DC-VA-MD-WV	MD	0.22
Davenport-Moline-Rock Island, IA-IL	IA	0.24	Myrtle Beach-Conway-North Myrtle Beach, SC-NC	SC	0.03	Washington-Arlington-Alexandria, DC-VA-MD-WV	VA	0.18
Duluth, MN-WI	MN	0.25	Natchez, MS-LA	LA	0.15	Washington-Arlington-Alexandria, DC-VA-MD-WV	WV	0.01
Duluth, MN-WI	WI	0.09	Natchez, MS-LA	MS	0.19	Weirton-Steubenville, WV-OH	OH	0.17
Evansville, IN-KY	IN	0.12	New York-Newark-Jersey City, NY-NJ-PA	NJ	0.07	Weirton-Steubenville, WV-OH	WV	0.12
Evansville, IN-KY	KY	0.04	New York-Newark-Jersey City, NY-NJ-PA	NY	0.05	Wheeling, WV-OH	OH	0.24
Fargo, ND-MN	MN	0.24	New York-Newark-Jersey City, NY-NJ-PA	PA	0.00	Wheeling, WV-OH	WV	0.15
Fargo, ND-MN	ND	0.37	Omaha-Council Bluffs, NE-IA	IA	0.08	Winchester, VA-WV	VA	0.01
Fayetteville-Springdale-Rogers, AR-MO	AR	0.14	Omaha-Council Bluffs, NE-IA	NE	0.25	Winchester, VA-WV	WV	0.08
Fayetteville-Springdale-Rogers, AR-MO	MO	0.02	Ontario, OR-ID	ID	0.32	Worcester, MA-CT	CT	0.02
Fort Madison-Keokuk, IA-IL-MO	IL	0.13	Ontario, OR-ID	OR	0.16	Worcester, MA-CT	MA	0.04
Fort Madison-Keokuk, IA-IL-MO	IA	0.05	Paducah, KY-IL	IL	0.07	Youngstown-Warren-Boardman, OH-PA	OH	0.10
Fort Madison-Keokuk, IA-IL-MO	MO	0.05	Paducah, KY-IL	KY	0.16	Youngstown-Warren-Boardman, OH-PA	PA	0.02

Notes: This table shows location ms's sum of spillover coefficient, $\sum_{s\in\mathcal{S}_m\setminus s}\gamma_{ms}^{ms'}$ using 2011-2015 5-Year ACS Commuting Flows data.

D. Median bids and strategic markdowns

Figure A3: Median bids and strategic markdowns



E. Model fit

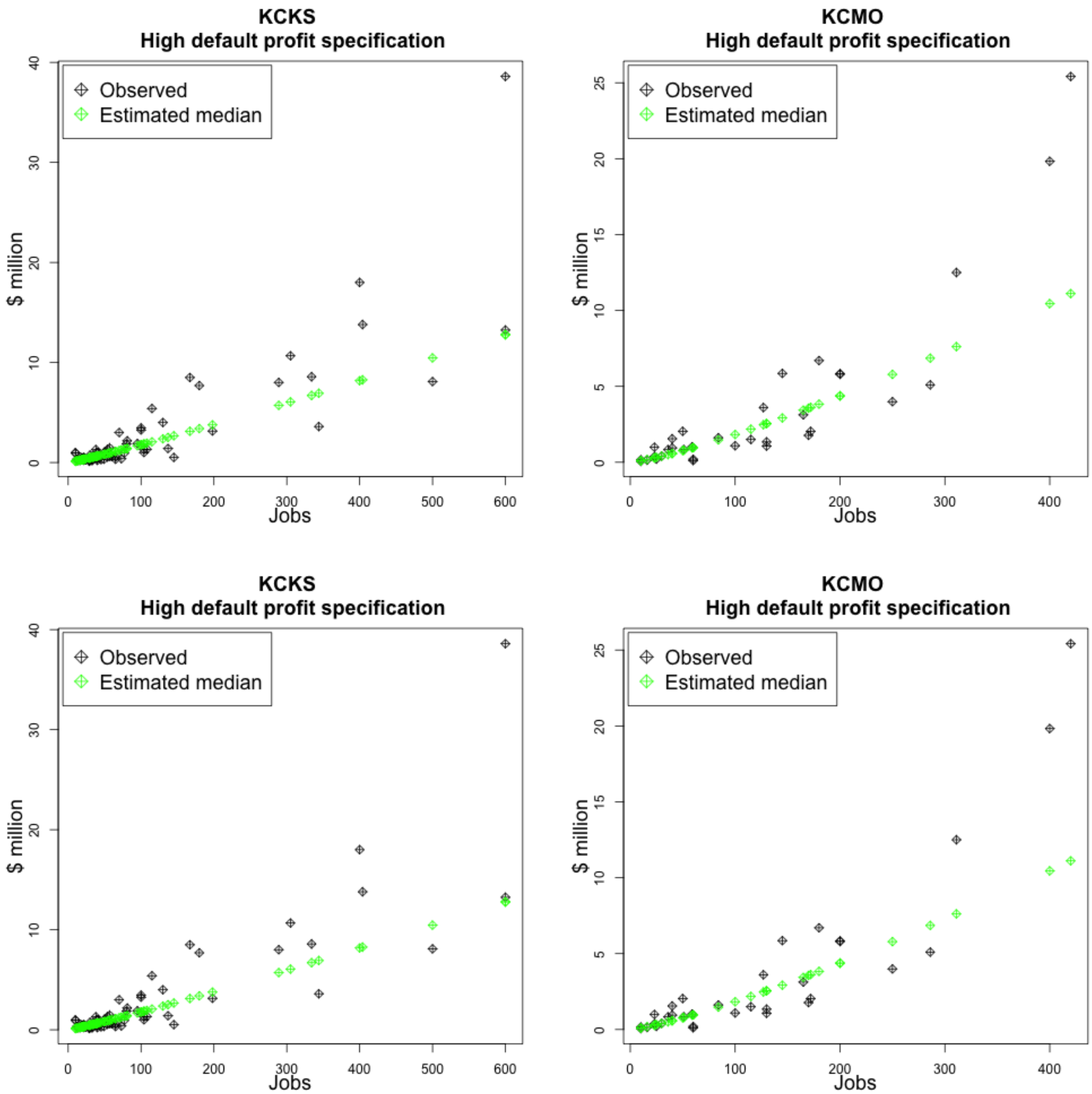
F. Sensitivity of parameter estimates to σ^{π}

Table A6: Equilibrium distribution parameter estimates assuming $\sigma^{\pi} = 0.25$

	High default profit specification: τ_{jms} = observed relocation shares		Low default profit specification: $\tau_{jms} = 0.5$	
	KCKS	KCMO	KCKS	KCMO
μ^{b0}	9.3170	8.6325	9.3162	8.6325
	(0.3147)	(0.5512)	(0.3147)	(0.5512)
μ^{b1}	1.1016	1.2567	1.1017	1.2567
	(0.0762)	(0.1224)	(0.0762)	(0.1224)
σ^{b0}	0.6718	0.7164	0.6718	0.7164
	(0.0545)	(0.0882)	(0.0545)	(0.0882)

Notes: This table shows the equilibrium bid distribution parameters of KCKS and KCMO estimated using the maximum likelihood estimator.

Figure A4: Model fit



Notes: These figures compare the observed incentive payments to predicted median incentive payments using parameter estimates: $\exp(\mu^b)$.

Table A7: Equilibrium distribution parameter estimates assuming $\sigma^{\pi} = 1$

	High default profit specification: τ_{jms} = observed relocation shares		Low default profit specification: $\tau_{jms} = 0.5$	
	KCKS	KCMO	KCKS	KCMO
μ^{b0}	9.3169	8.632	9.3172	8.6322
	(0.3148)	(0.5510)	(0.3148)	(0.5510)
μ^{b1}	1.1016	1.2568	1.1014	1.2568
	(0.0763)	(0.1223)	(0.0763)	(0.1223)
σ^{b0}	0.6718	0.7161	0.6719	0.7162
	(0.0545)	(0.0881)	(0.0545)	(0.0882)

Notes: This table shows the equilibrium bid distribution parameters of KCKS and KCMO estimated using the maximum likelihood estimator.