“The Economics of Density: Evidence from the Berlin Wall” Discussion of Ahlfeldt, Redding, Sturm, and Wolf, Econometrica 2015

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Graduate Urban Economics, Lecture 13
May 23, 2019

Main Question

What is the main question?

Main question: how does density affect economic activity? Specifically, how does population density and employment density affect the level of amenities and productivity of a location?

Very fundamental question in urban economics and has well known identification challenge: separating agglomeration forces from natural advantages. How do they address this challenge?

First, build a structural general equilibrium model of a city that incorporates both natural advantages and agglomeration/congestion forces

Then use the division of Berlin as an exogenous shock to agglomeration/congestion forces—a sudden change in city size uncorrelated with changes in natural advantages—to estimate the effect of density on productivity and amenities

Data

Main data: workplace employment, residence employment, price of floor space, and commuting times between locations

Roughly three points in time: 1936 (pre-division), 1986 (division), 2006 (post-reunification); 1986 data only for West Berlin

Spatial unit: all data is at *block* level, with 15,937 blocks, each block has 274 people (of the 12,192 with people). Average block is about 50,000 sq. meters

Spatial unit is important: affects both their modeling framework and empirical analysis

Contributions

Very famous paper: won the Frisch Medal Award for best paper in Econometrica (presented every two years for papers within last five years)

Combines very detailed empirical work on a natural historical experiment with a rigorous theoretical and structural model of a city

Shows how to estimate complicated GE model at very granular level–most work in economic geography uses data across cities

Provides new estimates of agglomeration and endogenous amenities from density *within* cities, including rates of spatial decay

A great example to learn from: shows “best in class” techniques for empirical work

Brief Historical Background

July 1945 agreement separated Germany into zones controlled by Allies and zones controlled by Soviets

Soviets close border between East and West Germany in 1952

East German authorities build Berlin Wall in 1961 to prevent refugees from fleeing East Germany through West Berlin

Wall cuts off East Berlin's Mitte area, which "contained Berlin's main administrative, cultural, and education institutions and by far the largest pre-war concentration of employment"

Also cut subway (U-Bahn) and light rail lines (S-Bahn)

Land Values, Pre-Division

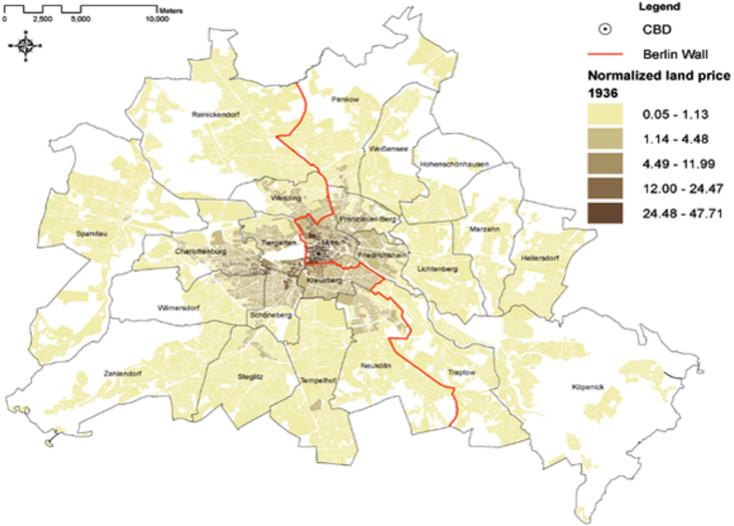


FIGURE 1.—Land prices in Berlin in 1936.

East and West Germany, Income 2011

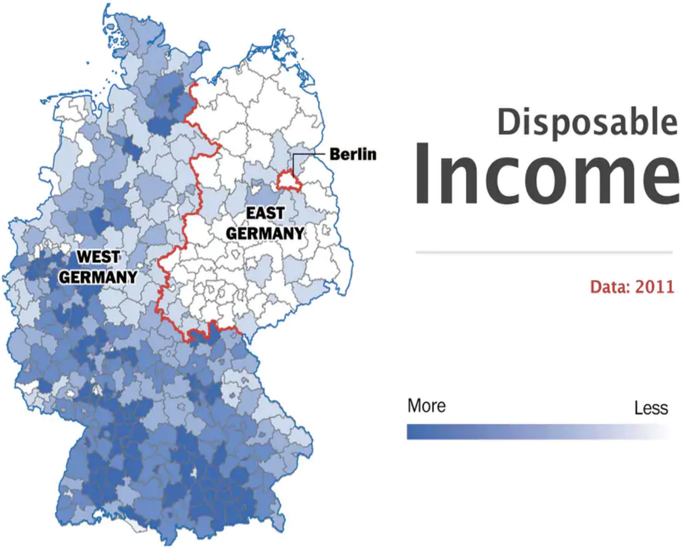


Figure: Source: Washington Post

Reduced Form Empirical Results

Before getting to the model it's helpful to start with the simpler empirical results

Authors present a series of figures showing *relative* land prices for city blocks as vertical bars in a three dimensional map.

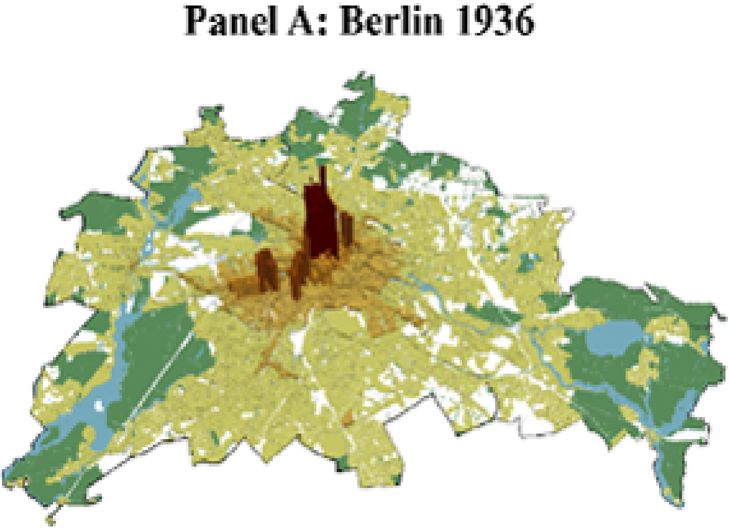
Mean of land prices is normalized to one in each year; height of bars is standardized so plots can be compared across years

Can see that pre-division, highest values in East Berlin.

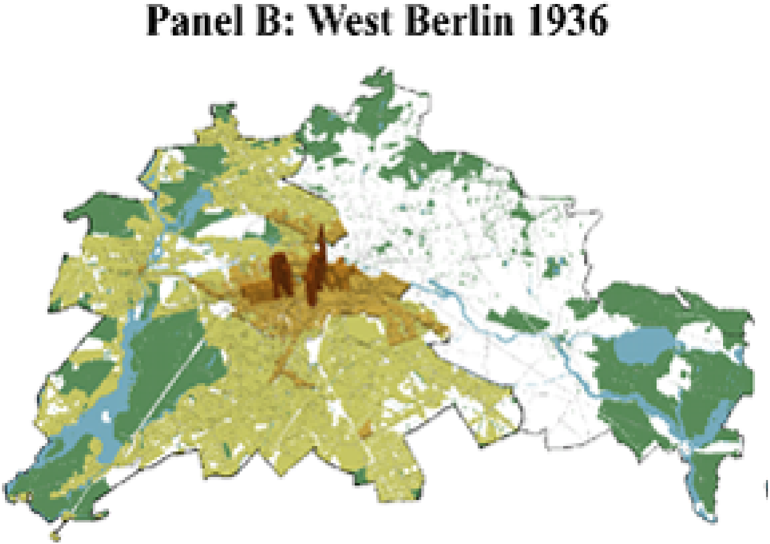
Post-division land prices in W. Berlin are more uniform with one previous peak (Potsdamer Platz) absent.

After reunification prices again show peaks, including a peak at Potsdamer Platz

Land Values, Pre-Division

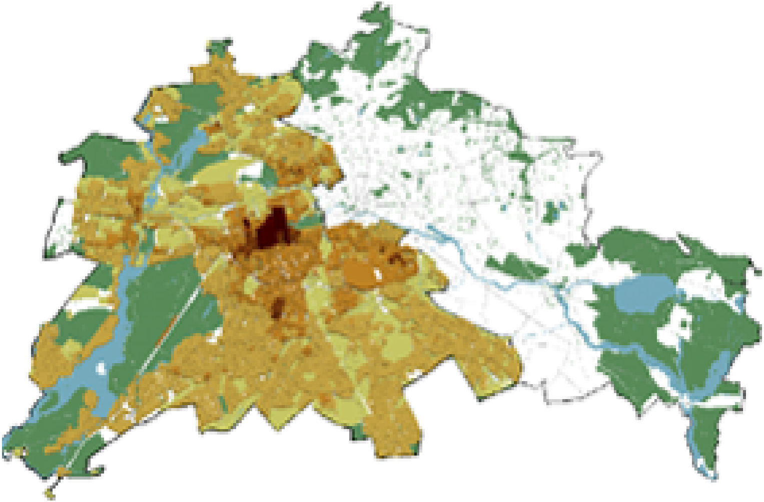


Land Values, Pre-Division



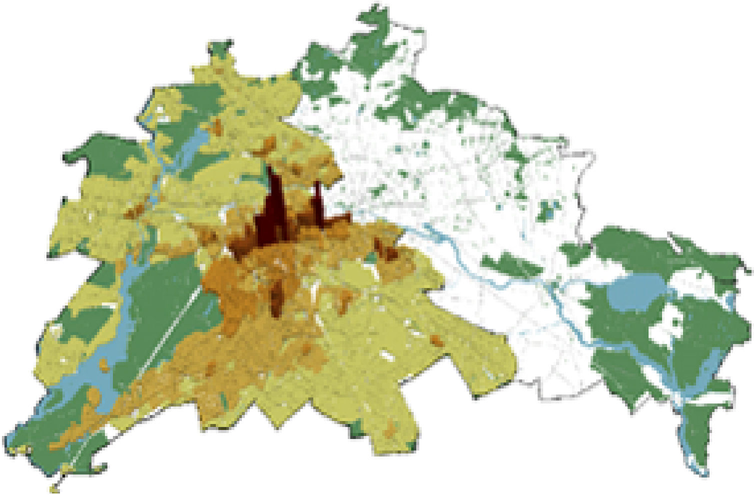
Land Values, Post-Division

Panel C: West Berlin 1986



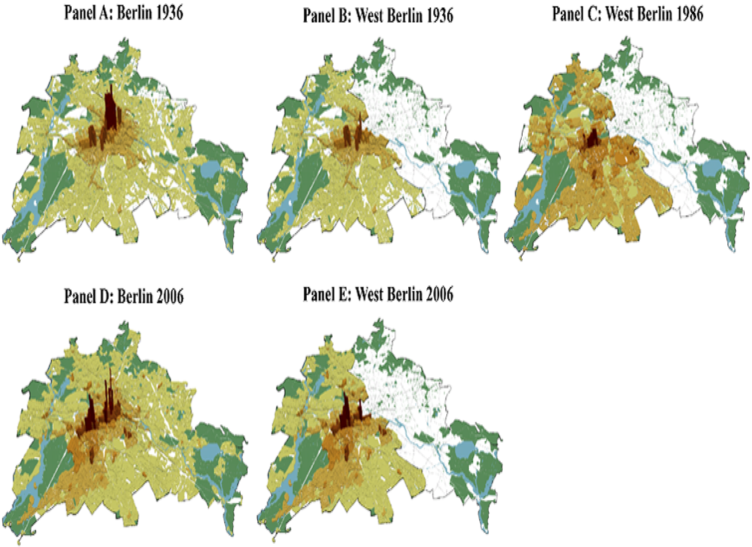
Land Values, Reunification

Panel E: West Berlin 2006



Land Values, Reunification

Berlin Across All Periods



DiD Specification and Results

$$\triangle lnO_i = \alpha + \sum_{k=1}^{K} \mathbb{I}_{ik}\beta_k + lnM_i\gamma + u_i \quad (22)$$

Estimate a difference specification for change from pre-division to division, and then a separate regression for division to unification. Examine floor space price and employment

Idea is to compare before and after, by distance to the CBD.

Estimate using 6 distance bands defined by grid cells: collections of blocks within a given distance to the pre-war CBD in East Berlin. Compare blocks at $\leq 1.25km$, $1.25 - 1.75km$,...$3.25 - 3.75km$

The M_i term allows for time-invariant characteristics to affect this change, ex: land prices grow more quickly near parks

Pre-Division to Division: DiD results

TABLE I

BASELINE DIVISION DIFFERENCE-IN-DIFFERENCE RESULTS (1936–1986)[a]

	(1) $\Delta \ln Q$	(2) $\Delta \ln Q$	(3) $\Delta \ln Q$	(4) $\Delta \ln Q$	(5) $\Delta \ln Q$	(6) $\Delta \ln$ EmpR	(7) $\Delta \ln$ EmpR	(8) $\Delta \ln$ EmpW	(9) $\Delta \ln$ EmpW
CBD 1	−0.800***	−0.567***	−0.524***	−0.503***	−0.565***	−1.332***	−0.975***	−0.691*	−0.639*
	(0.071)	(0.071)	(0.071)	(0.071)	(0.077)	(0.383)	(0.311)	(0.408)	(0.338)
CBD 2	−0.655***	−0.422***	−0.392***	−0.360***	−0.400***	−0.715**	−0.361	−1.253***	−1.367***
	(0.042)	(0.047)	(0.046)	(0.043)	(0.050)	(0.299)	(0.280)	(0.293)	(0.243)
CBD 3	−0.543***	−0.306***	−0.294***	−0.258***	−0.247***	−0.911***	−0.460**	−0.341	−0.471**
	(0.034)	(0.039)	(0.037)	(0.032)	(0.034)	(0.239)	(0.206)	(0.241)	(0.190)
CBD 4	−0.436***	−0.207***	−0.193***	−0.166***	−0.176***	−0.356**	−0.259	−0.512***	−0.521***
	(0.022)	(0.033)	(0.033)	(0.030)	(0.026)	(0.145)	(0.159)	(0.199)	(0.169)
CBD 5	−0.353***	−0.139***	−0.123***	−0.098***	−0.100***	−0.301***	−0.143	−0.436***	−0.340***
	(0.016)	(0.024)	(0.024)	(0.023)	(0.020)	(0.110)	(0.113)	(0.151)	(0.124)
CBD 6	−0.291***	−0.125***	−0.094***	−0.077***	−0.090***	−0.360***	−0.135	−0.280**	−0.142
	(0.018)	(0.019)	(0.017)	(0.016)	(0.016)	(0.100)	(0.089)	(0.130)	(0.116)
Inner Boundary 1–6			Yes	Yes	Yes		Yes		Yes
Outer Boundary 1–6			Yes	Yes	Yes		Yes		Yes
Kudamm 1–6				Yes	Yes		Yes		Yes
Block Characteristics					Yes		Yes		Yes
District Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,260	6,260	6,260	6,260	6,260	5,978	5,978	2,844	2,844
R^2	0.26	0.51	0.63	0.65	0.71	0.19	0.43	0.12	0.33

[a] Q denotes the price of floor space. EmpR denotes employment by residence. EmpW denotes employment by workplace. CBD1–CBD6 are six 500 m distance grid cells for distance from the pre-war CBD. Inner Boundary 1–6 are six 500 m grid cells for distance to the Inner Boundary between East and West Berlin. Outer Boundary 1–6 are six 500 m grid cells for distance to the outer boundary between West Berlin and East Germany. Kudamm 1–6 are six 500 m grid cells for distance to Breitscheid Platz on the Kurfürstendamm. The coefficients on the other distance grid cells are reported in Table A.2 of the Technical Data Appendix. Block characteristics include the log distance to schools, parks and water, the land area of the block, the share of the block's built-up area destroyed during the Second World War, indicators for residential, commercial and industrial land use, and indicators for whether a block includes a government building and urban regeneration policies post-reunification. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors in parentheses (Conley (1999)). * significant at 10%; ** significant at 5%; *** significant at 1%.

Division to Reunification: DiD results

TABLE II

BASELINE REUNIFICATION DIFFERENCE-IN-DIFFERENCE RESULTS (1986–2006)[a]

	(1) $\Delta \ln Q$	(2) $\Delta \ln Q$	(3) $\Delta \ln Q$	(4) $\Delta \ln Q$	(5) $\Delta \ln Q$	(6) $\Delta \ln$ EmpR	(7) $\Delta \ln$ EmpR	(8) $\Delta \ln$ EmpW	(9) $\Delta \ln$ EmpW
CBD 1	0.398***	0.408***	0.368***	0.369***	0.281***	1.079***	1.025***	1.574***	1.249**
	(0.105)	(0.090)	(0.083)	(0.081)	(0.088)	(0.307)	(0.297)	(0.479)	(0.517)
CBD 2	0.290***	0.289***	0.257***	0.258***	0.191**	0.589*	0.538*	0.684**	0.457
	(0.111)	(0.096)	(0.090)	(0.088)	(0.087)	(0.315)	(0.299)	(0.326)	(0.334)
CBD 3	0.122***	0.120***	0.110***	0.115***	0.063**	0.340*	0.305*	0.326	0.158
	(0.037)	(0.033)	(0.032)	(0.032)	(0.028)	(0.180)	(0.158)	(0.216)	(0.239)
CBD 4	0.033***	0.031	0.030	0.034	0.017	0.110	0.034	0.336**	0.261
	(0.013)	(0.023)	(0.022)	(0.021)	(0.020)	(0.068)	(0.066)	(0.161)	(0.185)
CBD 5	0.025***	0.018	0.020	0.020	0.015	−0.012	−0.056	0.114	0.066
	(0.010)	(0.015)	(0.014)	(0.014)	(0.013)	(0.056)	(0.057)	(0.118)	(0.131)
CBD 6	0.019**	−0.000	−0.000	−0.003	0.005	0.060	0.053	0.049	0.110
	(0.009)	(0.012)	(0.012)	(0.012)	(0.011)	(0.039)	(0.041)	(0.095)	(0.098)
Inner Boundary 1–6			Yes	Yes	Yes		Yes		Yes
Outer Boundary 1–6			Yes	Yes	Yes		Yes		Yes
Kudamm 1–6				Yes	Yes		Yes		Yes
Block Characteristics					Yes		Yes		Yes
District Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,050	7,050	7,050	7,050	7,050	6,718	6,718	5,602	5,602
R^2	0.08	0.32	0.34	0.35	0.43	0.04	0.07	0.03	0.06

[a] Q denotes the price of floor space. EmpR denotes employment by residence. EmpW denotes employment by workplace. CBD1–CBD6 are six 500 m distance grid cells for distance from the pre-war CBD. Inner Boundary 1–6 are six 500 m grid cells for distance to the Inner Boundary between East and West Berlin. Outer Boundary 1–6 are six 500 m grid cells for distance to the outer boundary between West Berlin and East Germany. Kudamm 1–6 are six 500 m grid cells for distance to Breitscheid Platz on the Kurfürstendamm. The coefficients on the other distance grid cells are reported in Table A.4 of the Technical Data Appendix. Block characteristics include the log distance to schools, parks and water, the land area of the block, the share of the block's built-up area destroyed during the Second World War, indicators for residential, commercial and industrial land use, and indicators for whether a block includes a government building and urban regeneration policies post-reunification. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors in parentheses (Conley (1999)). * significant at 10%; ** significant at 5%; *** significant at 1%.

Scatterplots of Differences by Block

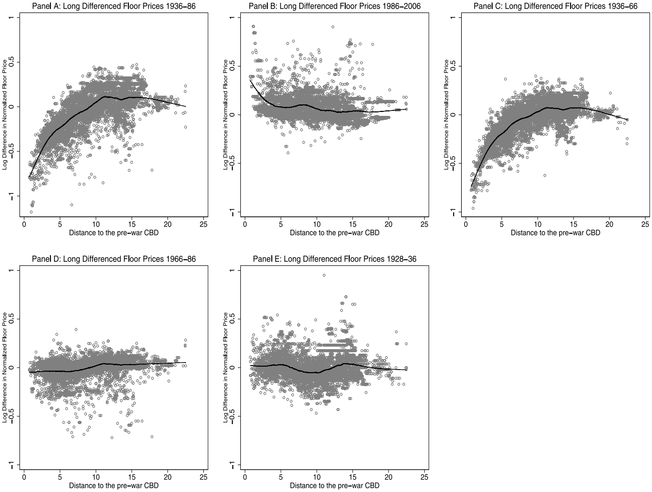


FIGURE 3.—Division and reunification treatments and placebos. Note: Log floor prices are normalized to have a mean of zero in each year before taking the long difference. Solid lines are fitted values from locally-weighted linear least squares regressions.

Summary of DiD Results

Convincing evidence that division and reunification had a strong effect on prices and employment

All effects seem to monotonically decrease in strength as distance to the pre-war CBD in East Berlin increases

However, results are only reduced form and don't tell us why the prices changed; authors cannot use these estimates along to conclude that agglomeration has strong effects

Therefore to understand the channels they need to use a structural model

Description of Model

Model is based on Eaton-Kortum (Econometrica, 2002), a very famous trade model that allows for geography and comparative advantage (also Frisch award winner)

Workers

A workers o has to choose a location i to live and a location j to work, and commutes between them. There are S locations.

Workers consume floor space l_{ijo} and a numeraire good c_{ijo} and have Cobb-Douglas utility (Utility is linear in a consumption index, $U_{ijo} = C_{ijo}$):

$$C_{ijo} = \frac{B_i z_{ijo}}{d_{ij}} \left(\frac{c_{ijo}}{\beta} \right)^{\beta} \left(\frac{l_{ijo}}{1-\beta} \right)^{1-\beta} \quad (1)$$

Commuting directly lowers utility with $d_{ij} = e^{\kappa \tau_{ij}}$, where τ_{ij} is travel time between locations

The B_i term captures residential amenities while the z_{ijo} is an idiosyncratic value worker o receives for commuting between i and j

This term introduces some heterogeneity and implies that workers will make different choices when facing same utility of a given commute

Frechet distribution and the z_{ijo} term

The z_{ijo} term is somewhat like the extreme value Type 1 errors we've seen in choice models, but follows a different extreme value distribution called the Fréchet:

$$F(z_{ijo}) = e^{-T_i E_j z_{ijo}^{-e}} \tag{2}$$

The $T_i > 0$ parameter determines average utility for living in i, $E_j > 0$ determines average utility for working in j

Like EV1, agents will choose the option with the highest utility, which generates a closed form solution for the probability of choosing each option (here it's living in i and working in j)

However, unlike EV1, this distribution has parameters that affect the utility of each choice and need to be estimated

This is an important aspect of the Eaton Kortum model

Choice of Commute

We can calculate the indirect utility for any i, j choice using utility maximization (I believe this utility equation is transformed to drop some constant terms):

$$u_{ijo} = \frac{z_{ijo} B_i w_j Q_i^{\beta-1}}{d_{ij}} \tag{3}$$

Let $v_{ij} = u_{ijo}/z_{ijo}$, the deterministic part of indirect utility. Then the probability of choosing to live in i and work in j is:

$$\pi_{ij} = \frac{T_i E_j v_{ij}^{\epsilon}}{\sum_{r=1}^{S} \sum_{s=1}^{S} T_r E_s v_{rs}^{\epsilon}} = \frac{\Phi_{ij}}{\Phi} \tag{4}$$

Commuting Market Clearing

Conditional on living in i, probability worker commutes to j:

$$\pi_{ij|i} = \frac{E_j(w_j/d_{ij})^{\epsilon}}{\sum_{s=1}^{S} E_s(w_s/d_{is})^{\epsilon}} \tag{6}$$

Notice that all i utility terms drop since they don't affect *conditional* choice of work location.

Let H_{Ri} be measure of workers residing in i. Commuting clearing condition is that measure of workers employed in j must be equal to measure commuting to j:

$$H_{Mj} = \sum_{i=1}^{S} \frac{E_j(w_j/d_{ij})^{\epsilon}}{\sum_{s=1}^{S} E_s(w_s/d_{is})^{\epsilon}} H_{Ri} \tag{7}$$

Production

Firms produce the numeraire good (c) with a Cobb-Douglas CRS production function over *commerical* floor space L_{Mj} and workers H_{Mj}. They operate in a perfectly competitive market and have zero profits i equilibrium.

These assumptions allow the authors to abstract away from individual firms and consider production at a given location:

$$y_j = A_j H_{Mj}^{\alpha} L_{Mj}^{1-\alpha} \tag{10}$$

FOC's for profit maximization and zero profit give equation for price of commercial floor space as function of wage:

$$q_j = (1-\alpha)\left(\frac{\alpha}{w_j}\right)^{\alpha/(1-\alpha)} \tag{12}$$

Land Market Clearing

In equilibrium land will be used for commercial or residential purposes depending which demands a higher price (like a bid rent curve)

Authors model the construction sector as perfectly competitive, with CRS Cobb-Douglas production function for producing floor space using capital M and land K (similar to Brueckner paper on monocentric city)

Then land market clearing conditions state that total demand for floor space (commercial and residential) equals total supply

Agglomeration and Fundamentals

Authors allow each location j to have a "production fundamental" a_j that exogenously increases productivity (ex:access to water)

Additionally, agglomeration Y_j is specified as a weighted average of employment density nearby that spatially decays with parameter δ. Agglomeration and location fundamentals combine to form the TFP parameter A_j in the production function:

$$A_j = a_j Y_j^{\lambda}, \;\; Y_j \equiv \sum_{s=1}^{S} e^{-\delta \tau_{js}} \left(\frac{H_{Ms}}{K_s} \right) \tag{20}$$

The authors use an identical structure for amenities:

$$B_i = b_i \Omega_j^{\eta}, \; \Omega_i \equiv \sum_{s=1}^{S} e^{-\rho \tau_{ir}} \left(\frac{H_{Rr}}{K_r} \right) \tag{21}$$

Estimating the Model

There are many details and several sophisticated techniques involved in estimating this model (see paper and online Appendix)

However, one important result is a “gravity equation” for commuting flows, analogous to a trade flows equation:

$$ln\pi_{ij} = -\nu\tau_{ij} + \upsilon_i + \varsigma_j \tag{1}$$

This gives an estimate of the elasticity of commuting with respect to travel time, which is $\epsilon\kappa$ from $d_{ij} = e^{\kappa\tau_{ij}}$ with the Frechet term

Gravity Model Estimats

TABLE III

COMMUTING GRAVITY EQUATION[a]

	(1) ln Bilateral Commuting Probability 2008	(2) ln Bilateral Commuting Probability 2008	(3) ln Bilateral Commuting Probability 2008	(4) ln Bilateral Commuting Probability 2008
Travel Time ($-\kappa\varepsilon$)	-0.0697^{***}	-0.0702^{***}	-0.0771^{***}	-0.0706^{***}
	(0.0056)	(0.0034)	(0.0025)	(0.0026)
Estimation	OLS	OLS	Poisson PML	Gamma PML
More than 10 Commuters		Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	144	122	122	122
R^2	0.8261	0.9059	–	–

[a]Gravity equation estimates based on representative micro survey data on commuting for Greater Berlin for 2008. Observations are bilateral pairs of 12 workplace and residence districts (post 2001 Bezirke boundaries). Travel time is measured in minutes. Fixed effects are workplace district fixed effects and residence district fixed effects. The specifications labelled more than 10 commuters restrict attention to bilateral pairs with 10 or more commuters. Poisson PML is Poisson Pseudo Maximum Likelihood estimator. Gamma PML is Gamma Pseudo Maximum Likelihood Estimator. Standard errors in parentheses are heteroscedasticity robust. * significant at 10%; ** significant at 5%; *** significant at 1%.

Counterfactuals: No Changes in Agglomeration

In first set of counterfactuals authors establish a baseline by simulating effect of division and then reunification where productivity, amenities, and development density are constant at the base year level (1936 or 1986)

They then run the diff-in-diff specification from before on the counterfactual outcomes

This gives an estimate of how land prices and employment would change without any agglomeration effects

Find that without agglomeration effects of division and then reunification are much smaller

Gravity Model Estimates

TABLE IV

PRODUCTIVITY, AMENITIES, AND COUNTERFACTUAL FLOOR PRICES[a]

	(1) $\Delta \ln A$ 1936–1986	(2) $\Delta \ln B$ 1936–1986	(3) $\Delta \ln A$ 1986–2006	(4) $\Delta \ln B$ 1986–2006	(5) $\Delta \ln QC$ 1936–1986	(6) $\Delta \ln QC$ 1986–2006
CBD 1	-0.207^{***}	-0.347^{***}	0.261^{***}	0.203^{***}	-0.408^{***}	-0.010
	(0.049)	(0.070)	(0.073)	(0.054)	(0.038)	(0.020)
CBD 2	-0.260^{***}	-0.242^{***}	0.144^{**}	0.109^{*}	-0.348^{***}	0.079^{**}
	(0.032)	(0.053)	(0.056)	(0.058)	(0.017)	(0.036)
CBD 3	-0.138^{***}	-0.262^{***}	0.077^{***}	0.059^{**}	-0.353^{***}	0.036
	(0.021)	(0.037)	(0.024)	(0.026)	(0.022)	(0.031)
CBD 4	-0.131^{***}	-0.154^{***}	0.057^{***}	0.010	-0.378^{***}	0.093^{***}
	(0.016)	(0.023)	(0.015)	(0.008)	(0.021)	(0.026)
CBD 5	-0.095^{***}	-0.126^{***}	0.028^{**}	-0.014^{*}	-0.380^{***}	0.115^{***}
	(0.014)	(0.013)	(0.013)	(0.007)	(0.022)	(0.033)
CBD 6	-0.061^{***}	-0.117^{***}	0.023^{**}	0.001	-0.354^{***}	0.066^{***}
	(0.015)	(0.015)	(0.010)	(0.005)	(0.018)	(0.023)
Counterfactuals					Yes	Yes
Agglomeration Effects					No	No
Observations	2,844	5,978	5,602	6,718	6,260	7,050
R^2	0.09	0.06	0.02	0.03	0.07	0.03

[a]Columns (1)–(4) based on calibrating the model for $\nu = \varepsilon\kappa = 0.07$ and $\varepsilon = 6.83$ from the gravity equation estimation. Columns (5)–(6) report counterfactuals for these parameter values. A denotes adjusted overall productivity. B denotes adjusted overall amenities. QC denotes counterfactual floor prices (simulating the effect of division on West Berlin). Column (5) simulates division holding A and B constant at their 1936 values. Column (6) simulates reunification holding A and B for West Berlin constant at their 1986 values and using 2006 values of A and B for East Berlin. CBD1–CBD6 are six 500 m distance grid cells for distance from the pre-war CBD. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors in parentheses (Conley (1999)). * significant at 10%; ** significant at 5%; *** significant at 1%.

Estimating Agglomeration

Final section of paper structurally estimates all parameters of model and performs additional counterfactuals

First counterfactual uses model with endogenous agglomeration and amenities to show that these factors lead to estimates consistent with reduced form results

Next break apart effect of each type of externality by first turning off production externalities and then residential externalities

Then show a counterfactual transportation change to demonstrate model can be used for additional applications (unrelated to Berlin's history)

Parameter Estimates

TABLE V

GENERALIZED METHOD OF MOMENTS (GMM) ESTIMATION RESULTS[a]

	(1) Division Efficient GMM	(2) Reunification Efficient GMM	(3) Division and Reunification Efficient GMM
Commuting Travel Time Elasticity ($\kappa\varepsilon$)	0.0951***	0.1011***	0.0987***
	(0.0016)	(0.0016)	(0.0016)
Commuting Heterogeneity (ε)	6.6190***	6.7620***	6.6941***
	(0.0939)	(0.1005)	(0.0934)
Productivity Elasticity (λ)	0.0793***	0.0496***	0.0710***
	(0.0064)	(0.0079)	(0.0054)
Productivity Decay (δ)	0.3585***	0.9246***	0.3617***
	(0.1030)	(0.3525)	(0.0782)
Residential Elasticity (η)	0.1548***	0.0757**	0.1553***
	(0.0092)	(0.0313)	(0.0083)
Residential Decay (ρ)	0.9094***	0.5531	0.7595***
	(0.2968)	(0.3979)	(0.1741)

[a] Generalized Method of Moments (GMM) estimates. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors in parentheses (Conley (1999)). * significant at 10%; ** significant at 5%; *** significant at 1%.

Externalities

TABLE VI

EXTERNALITIES AND COMMUTING COSTS[a]

	(1) Production Externalities $(1 \times e^{-\delta\tau})$	(2) Residential Externalities $(1 \times e^{-\rho\tau})$	(3) Utility After Commuting $(1 \times e^{-\kappa\tau})$
0 minutes	1.000	1.000	1.000
1 minute	0.696	0.468	0.985
2 minutes	0.485	0.219	0.971
3 minutes	0.338	0.102	0.957
5 minutes	0.164	0.022	0.929
7 minutes	0.079	0.005	0.902
10 minutes	0.027	0.001	0.863
15 minutes	0.004	0.000	0.802
20 minutes	0.001	0.000	0.745
30 minutes	0.000	0.000	0.642

[a]Proportional reduction in production and residential externalities with travel time and proportional reduction in utility from commuting with travel time. Travel time is measured in minutes. Results are based on the pooled efficient GMM parameter estimates: $\delta = 0.3617$, $\rho = 0.7595$, $\kappa = 0.0148$.

Counterfacutals

TABLE VII

COUNTERFACTUALS[a]

	(1) $\Delta \ln QC$ 1936–1986	(2) $\Delta \ln QC$ 1936–1986	(3) $\Delta \ln QC$ 1936–1986	(4) $\Delta \ln QC$ 1936–1986	(5) $\Delta \ln QC$ 1986–2006	(6) $\Delta \ln QC$ 1986–2006	(7) $\Delta \ln QC$ 1986–2006
CBD 1	−0.836***	−0.613***	−0.467***	−0.821***	0.363***	1.160***	0.392***
	(0.052)	(0.032)	(0.060)	(0.051)	(0.041)	(0.052)	(0.043)
CBD 2	−0.560***	−0.397***	−0.364***	−0.624***	0.239***	0.779***	0.244***
	(0.034)	(0.025)	(0.019)	(0.029)	(0.028)	(0.044)	(0.027)
CBD 3	−0.455***	−0.312***	−0.336***	−0.530***	0.163***	0.594***	0.179***
	(0.036)	(0.030)	(0.030)	(0.036)	(0.031)	(0.045)	(0.031)
CBD 4	−0.423***	−0.284***	−0.340***	−0.517***	0.140***	0.445***	0.143***
	(0.026)	(0.019)	(0.022)	(0.031)	(0.021)	(0.042)	(0.021)
CBD 5	−0.418***	−0.265***	−0.351***	−0.512***	0.177***	0.403***	0.180***
	(0.032)	(0.022)	(0.027)	(0.039)	(0.032)	(0.038)	(0.032)
CBD 6	−0.349***	−0.222***	−0.304***	−0.430***	0.100***	0.334***	0.103***
	(0.025)	(0.016)	(0.022)	(0.029)	(0.024)	(0.034)	(0.023)
Counterfactuals	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Agglomeration Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,260	6,260	6,260	6,260	7,050	6,260	7,050
R^2	0.11	0.13	0.07	0.13	0.12	0.24	0.13

[a]Columns (1)–(6) are based on the parameter estimates pooling division and reunification from Table V. Column (7) is based on the parameter estimates for division from Table V. QC denotes counterfactual floor prices. Column (1) simulates division using our estimates of production and residential externalities and 1936 fundamentals. Column (2) simulates division using our estimates of production externalities and 1936 fundamentals but setting residential externalities to zero. Column (3) simulates division using our estimates of residential externalities and 1936 fundamentals but setting production externalities to zero. Column (4) simulates division using our estimates of production and residential externalities and 1936 fundamentals but halving their rates of spatial decay with travel time. Column (5) simulates reunification using our estimates of production and residential externalities, 1986 fundamentals for West Berlin, and 2006 fundamentals for East Berlin. Column (6) simulates reunification using our estimates of production and residential externalities, 1986 fundamentals for West Berlin and 1936 fundamentals for East Berlin. Column (7) simulates reunification using division rather than pooled parameter estimates, 1986 fundamentals for West Berlin, and 2006 fundamentals for East Berlin. CBD 1–CBD6 are six 500 m distance grid cells for distance from the pre-war CBD. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors in parentheses (Conley (1999)). * significant at 10%; ** significant at 5%; *** significant at 1%.