The Settlement of the United States, 1800 to 2000: The Long Transition Towards Gibrat's Law ONLINE APPENDIX*

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September 2013

Appendix A: Figures

Appendix B: Tables

*Michael Connolly and Li Yi have provided excellent research assistance. We acknowledge the financial support of the Spanish Ministry of Science and Innovation (ECO-2011-27014) and of the Fundación Ramón Areces. The views expressed herein are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

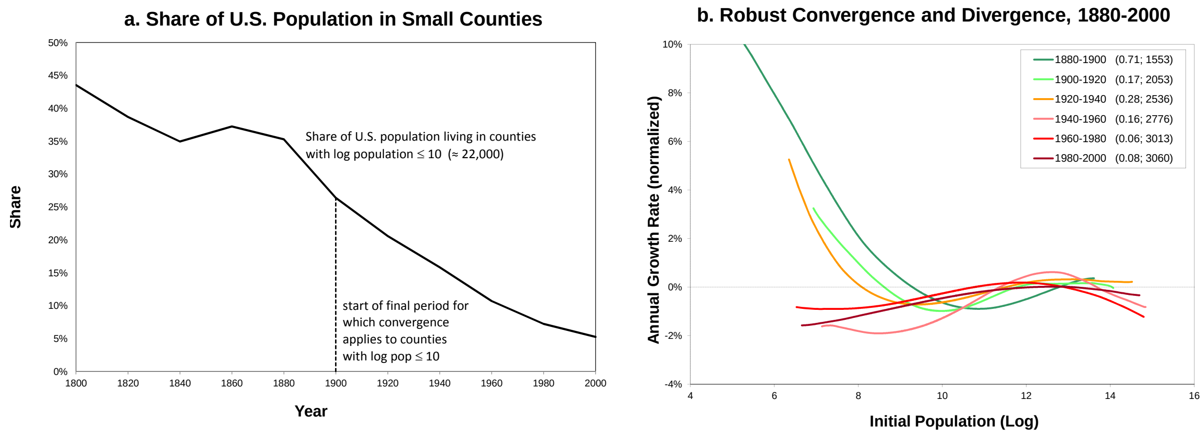

Figure A.1: Empirical Relevance and Robustness of Convergence

Panel A shows share of U.S. population living in county/metros with log population ≤ 10 (population $\lesssim 22,000$). Panel B shows fitted spline regressions of county growth on initial log population using a non-metro build of the data. County observations are combined to match the composition of their predecessor locations 40 years earlier. Fitted growth rates are normalized by subtracting the aggregate growth rate of all locations active at the start of each period.

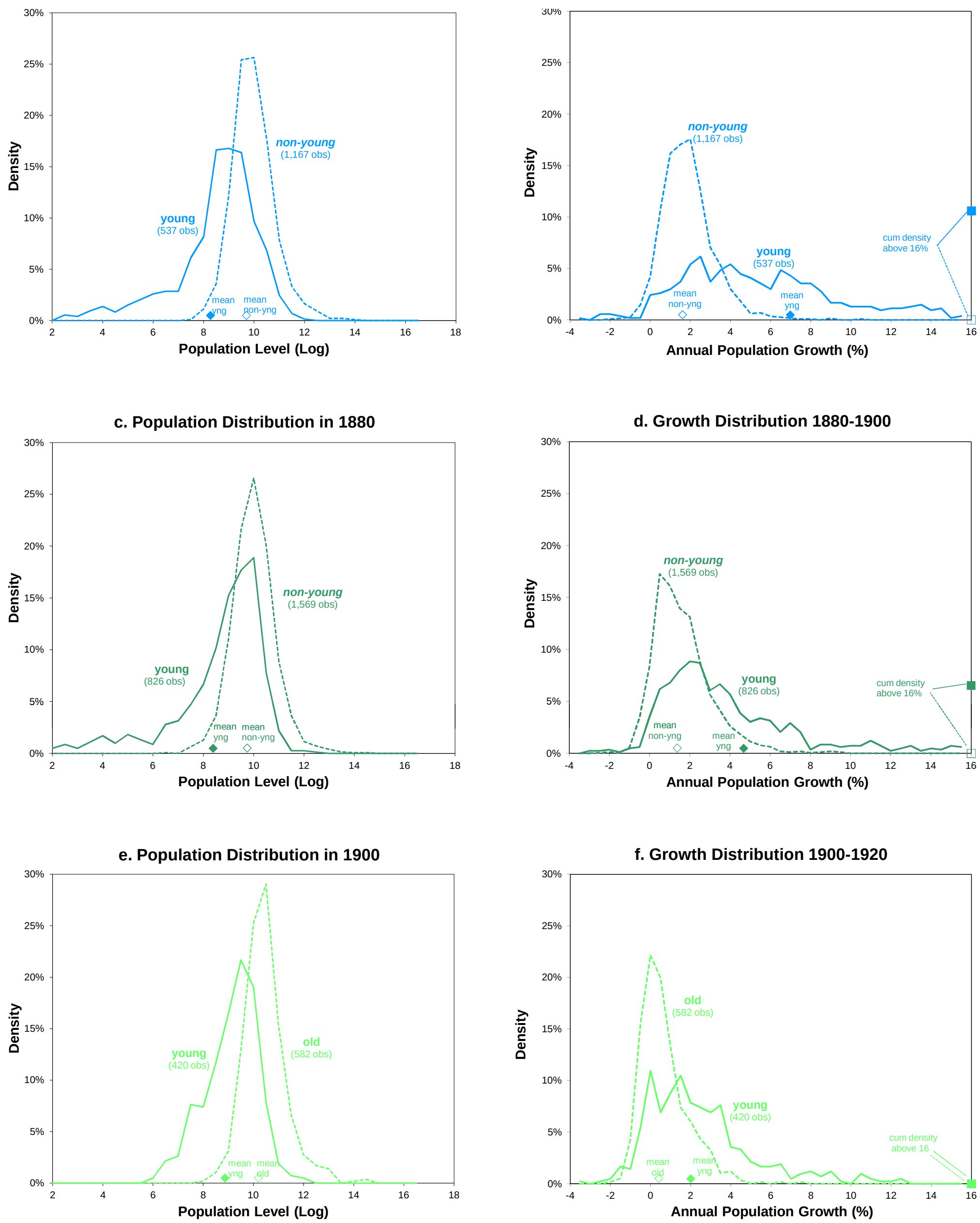

Figure A.2: *Empirical* Population Level and Growth Distributions by Age in 1860, 1880 and 1900

Figure shows the distribution of population across locations (Panel A) population growth across locations, in each case split by age groups, for 1860, 1880, and 1900. For the first two of these years, the age split is between "young" and remaining locations. For 1900, the split is between "young" and "old" locations. Definitions of these age categories are included in the main text. Note that for all years, the density of young locations by population is shifted to the left compared to the density of non-young/old locations by population (panels A, C, and E). For all three twenty-year periods, the density of young locations by growth rate is shifted to the right compared to the density of non-young/old locations by growth rate (panels B, D, and F).

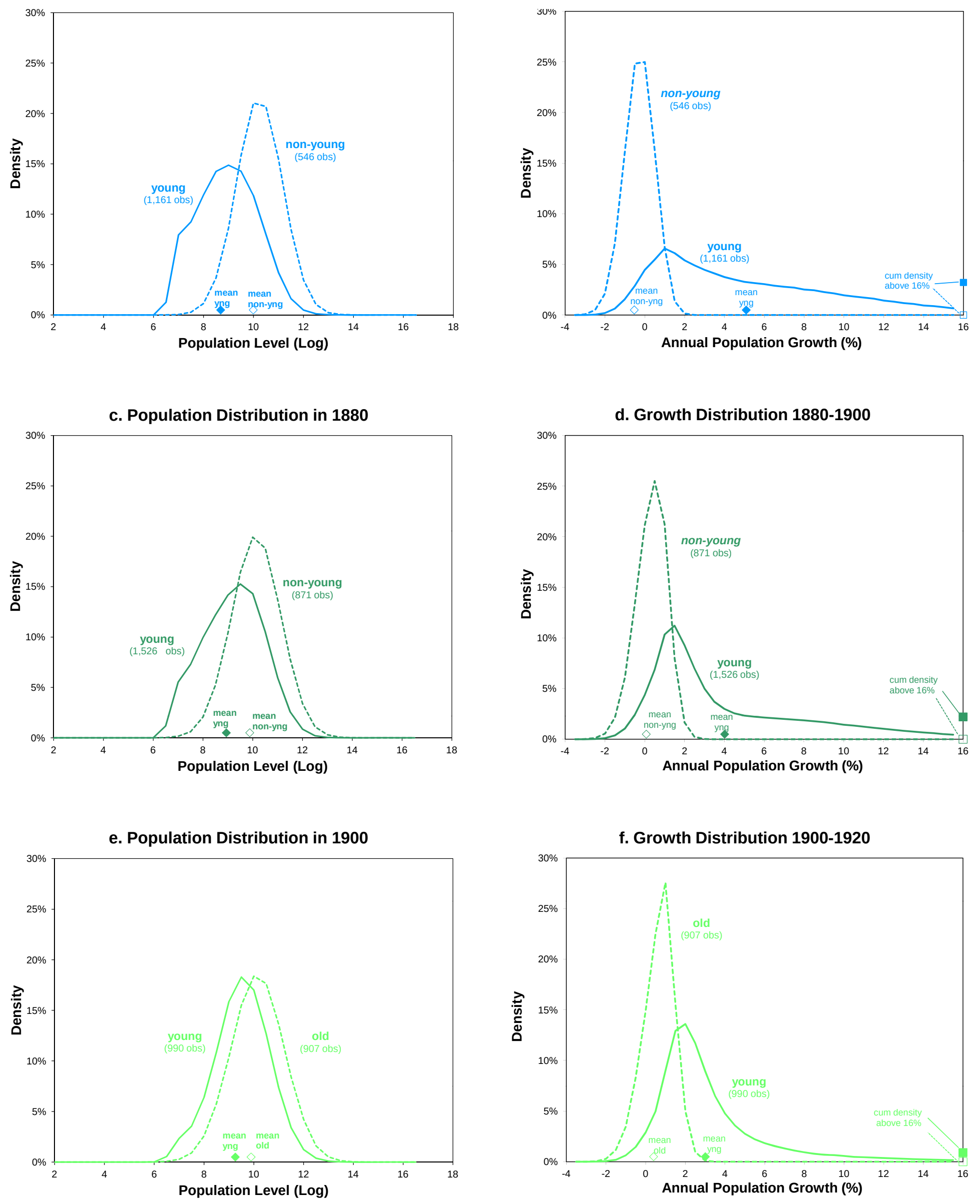

Figure A.3: *Simulated* Population Level and Growth Distributions by Age in 1860, 1880 and 1900

The simulated distributions of location population and population growth by age in 1860, 1880, and 1900 approximately match their empirical counterparts. The largest difference is that the simulated distributions are moderately more dispersed than are the empirical ones.

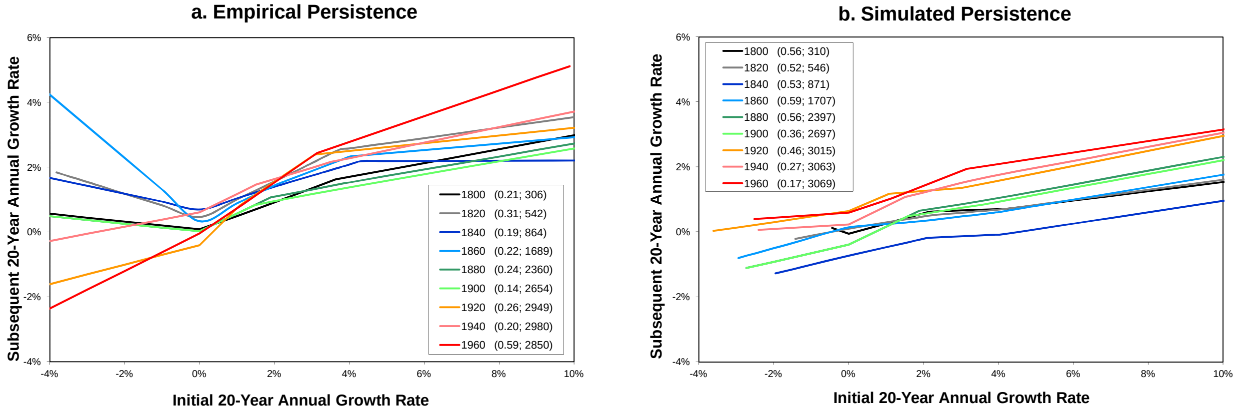

Figure A.4: Empirical and Simulated Growth Persistence

Fitted values from regressing county/metro population growth (not normalized) over twenty years on a four-way spline of population growth over the previous twenty years. Enumerated years are the start of the initial twenty-year period. Numbers in parenthesis are R-squared values.

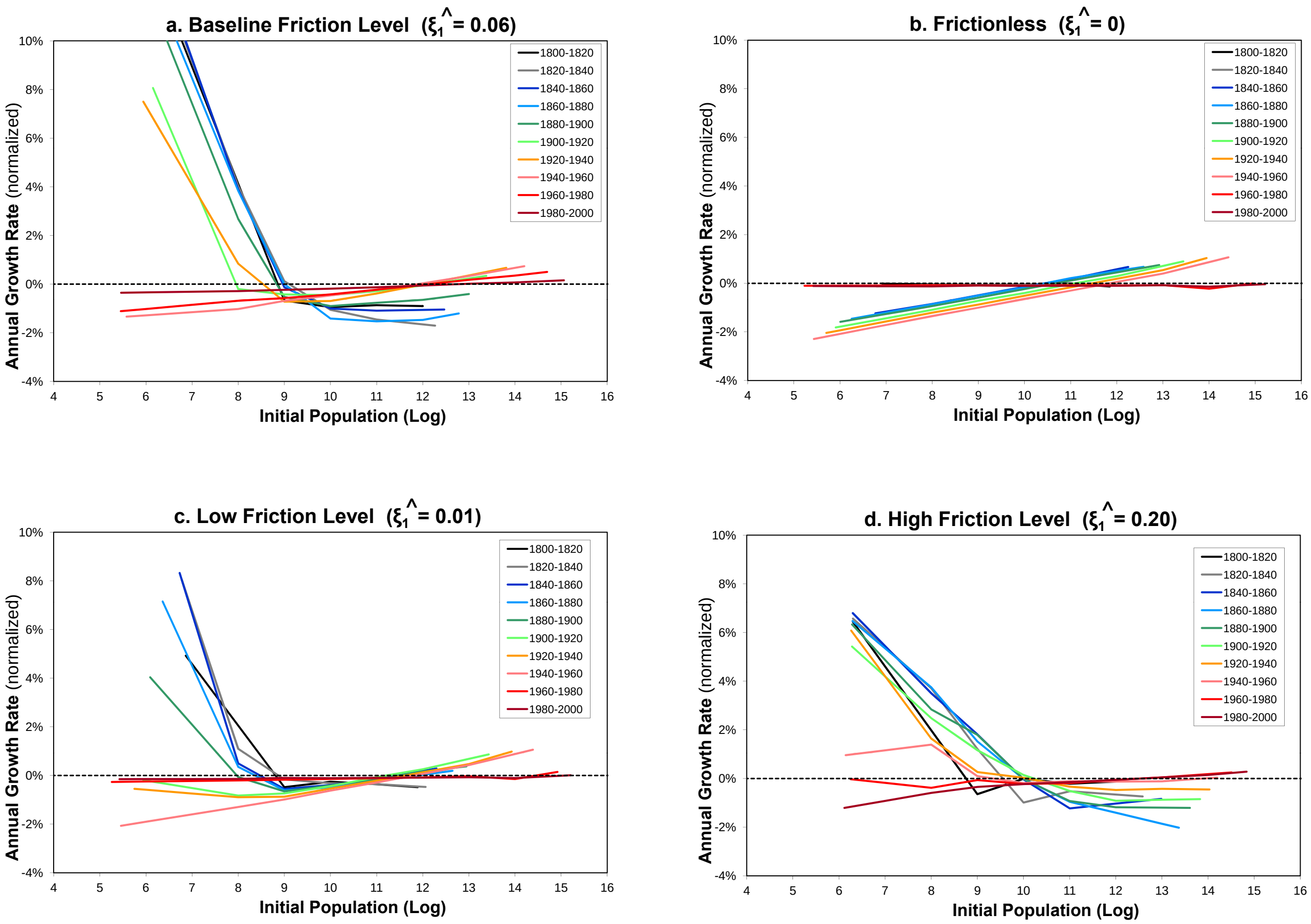

Figure A.5: Sensitivity of Simulated Convergence to the Level of the Growth Friction ($\hat{\xi}_1$)

Without fricitions, local growth is no longer characterized by convergence (panel B). Population divergence remains driven by gradually decreasing congestion (the decrease in $\hat{\alpha}$ from 0.15 in 1840 to 0.10 in 1960). However even with a minimal friction level (equivalent to a 1 percent discount at a 4 percent growth rate), convergence persists through the 1880-1900 period (Panel C). In this case convergence ends in 1900, which is 40 years sooner than under the baseline. Alternatively assuming a very high growth friction (a 20 percent to productivity at a 4 percent growth rate), some convergence persists as late as 1980 and divergence at low population levels persists through 2000 (Panel D).

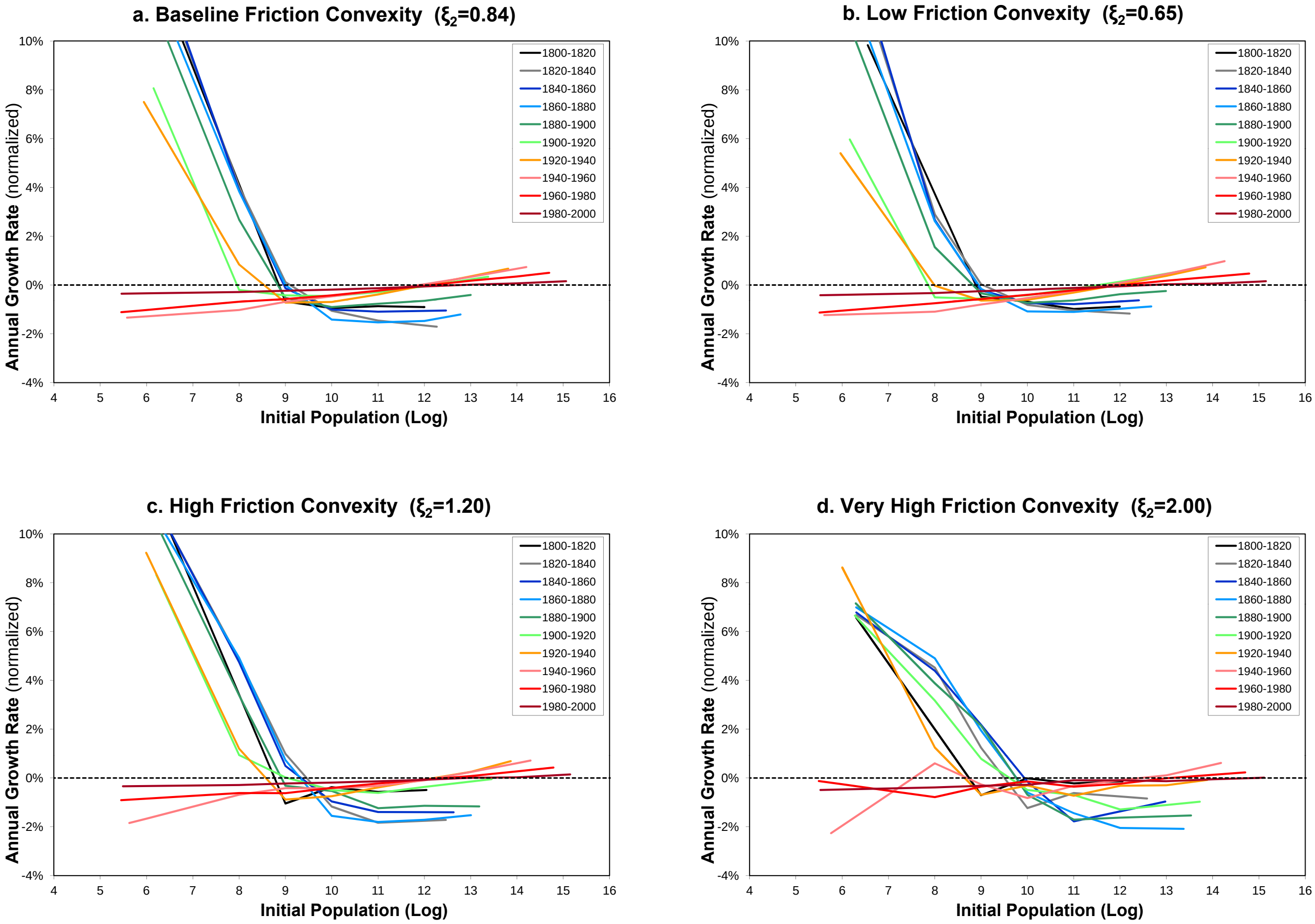

Figure A.6: Sensitivity of Simulated Convergence to the Convexity of the Growth Friction ($\hat{\xi}_1$)

Figure shows the effect of varying the convexity of the growth friction (ξ_2), while holding the level of the friction, $\hat{\xi}_1$ constant at its baseline value. Moderately lowering the friction convexity from its baseline value of 0.84 to 0.65 causes a slight dampening of convergence during the 1900-1920 and 1920-1940 periods (Panel B). Conversely, moderately increasing the friction convexity to 1.20 slightly strengthens convergence in those years (panel C). Increasing the growth friction convexity to 2 significantly dampens fitted growth at low population levels, which follows directly from the considerable increase of realized frictions at fast growth rates (Panel D). It also introduces some divergence among small locations from 1940 to 1960. Such divergence most likely reflects some intra-cohort dynamics in which the most productive locations among those that enter within a small time interval separate based on their productivity. For reasons that are not immediately clear, the higher convexity also dampens the divergence for high-population locations from 1900-1920 and for locations of all sizes from 1960 to 1980.

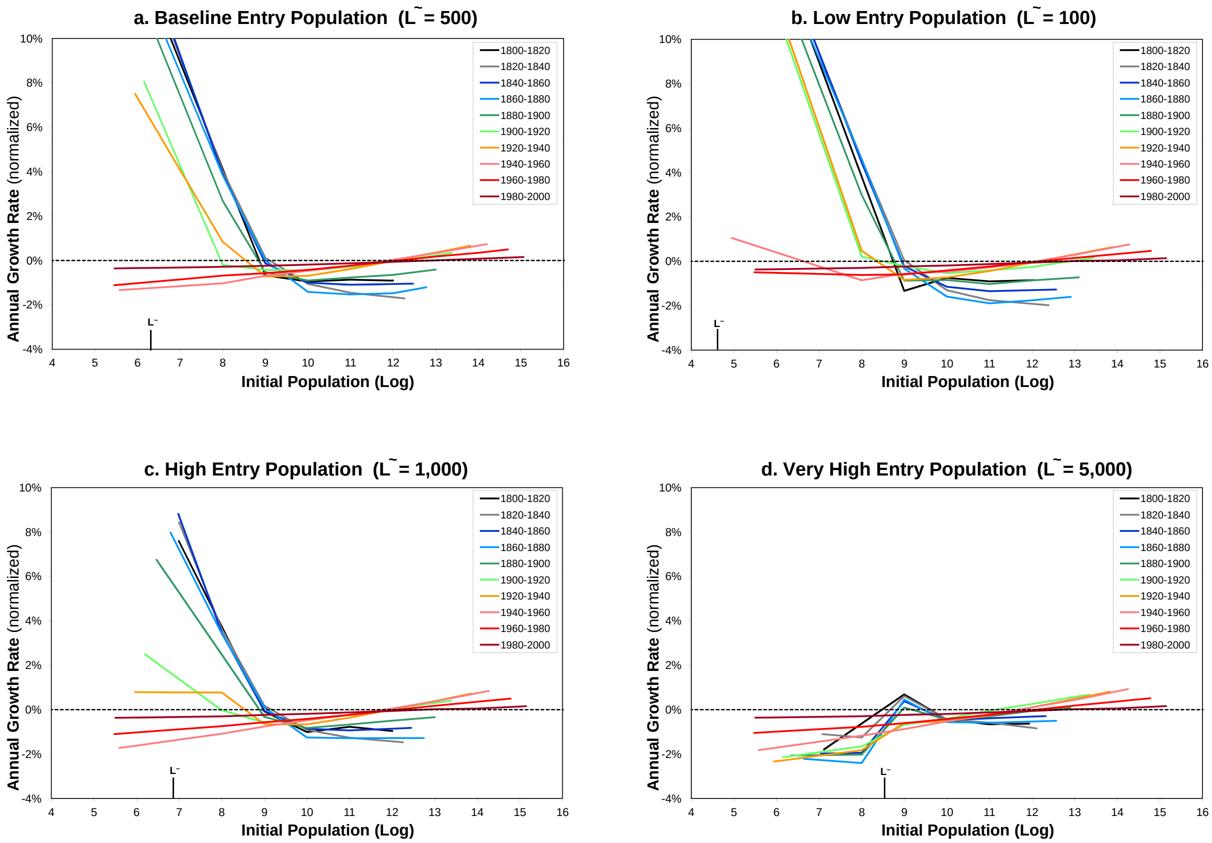

Figure A.7: Sensitivity of Simulated Convergence to the Pre-Entry Population ($\tilde{L}$)

Lowering the pre-entry population proxy, $\tilde{L}$, from its baseline value of 500 to 100, strengthens convergence in the 1900-1920 and 1920-1940 periods and causes some convergence to persist into the 1940 to 1960 period (panel B). Unsurprisingly, transitions from entry to a local steady state take longer. Conversely, increasing the pre-entry population to 1000 significantly dampens convergence during the 1900-1920 and 1920-1940 periods (panel C). Finally, further increasing pre-entry population to 5000 allows many locations to quickly move to their local steady state (since they are starting closer to it). This almost completely dampens convergence (panel D).

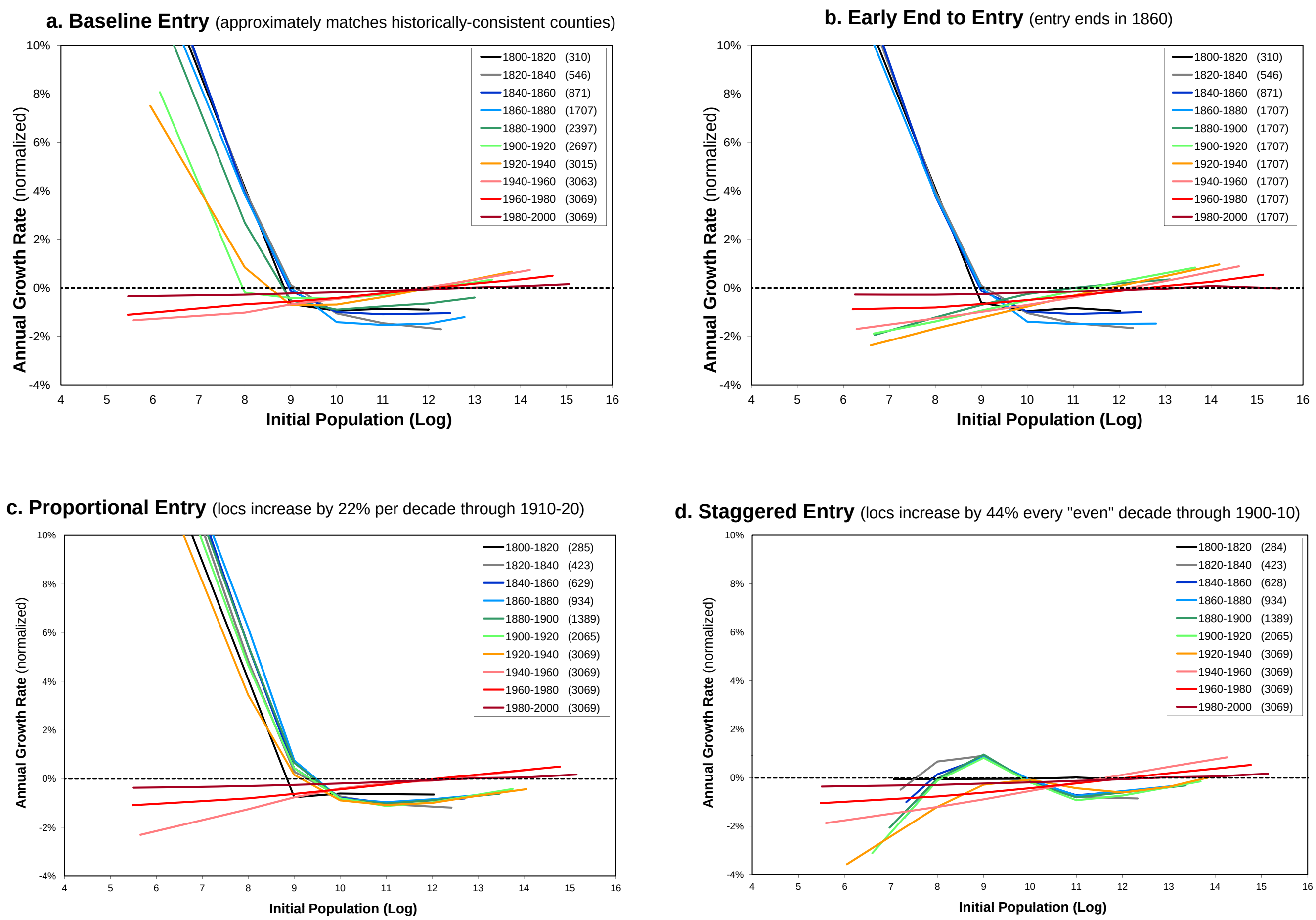

Figure A.8: Sensitivity of Simulated Convergence to the Timing of Location Entry

If the entry of new locations to the U.S. system had ended in 1860, the 1860-1880 period would be the last where population growth (among smaller locations) was characterized by convergence (panel B). Equivalently, growth among smaller locations for the twenty-year periods beginning in 1880, 1900, and 1920 would now be characterized by divergence. But growth during the twenty-year periods beginning in 1940, 1960, and 1980 would be essentially the same as under the baseline. Convergence is at least moderately sensitive to timing. The entry path in panel D is similar to that in panel C except that all of the entry takes place during the fist decade of each twenty-year period. For example, all of the 138 locations that enter smoothly from 1800 to 1820 in panel C instead enter smoothly from 1800 to 1810 followed by no entry from 1810 to 1820. In this case, transitional growth is characterized only by divergence. The seeming disappearance of convergence reflects that newly entering locations have accomplished the larger part of their transition prior to the start of the first twenty-year period for which their growth can be measured. For example locations that enter between 1801 and 1810 will have had between 10 and 19 years to grow rapidly towards their local steady state. Then, for the 1820-1840 period, an intra-cohort effect dominates. Those locations with the highest productivity that entered between 1801 and 1810 will have grown the fastest from their entry through 1820 and so will be the largest in 1820. Because these high-productivity locations will still be relatively far from their local steady state, they will also tend to grow fastest from 1820 to 1840.

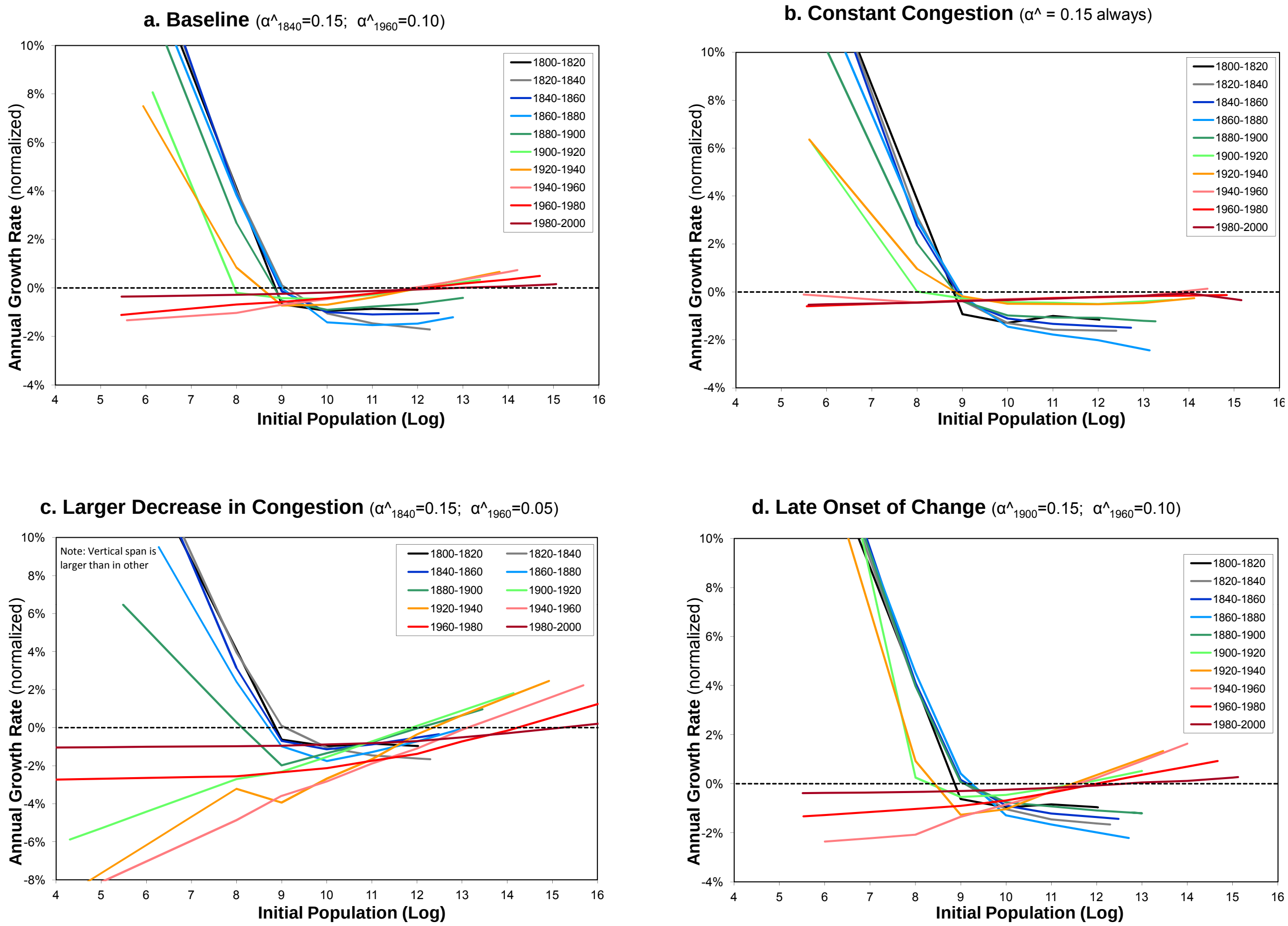

Figure A.9: Sensitivity of Simulated Convergence to the Change in Congestion ($\Delta\,\hat{\alpha}$)

If the congestion parameter ($\hat{\alpha}$), that is the difference between the land share and the agglomeration elasticity, remains constant over time, population convergence would be roughly the same as in the baseline scenario (panel B). Unsurprisingly, population growth at higher populations would never be characterized by divergence.

If the decrease in congestion was substantially larger than in the baseline ($\hat{\alpha}$ falls by two thirds rather than by a third), the force driving divergence is considerably stronger than under the baseline (panel C). In this case, divergence comes to dominates convergence among small locations twenty years earlier than under the baseline. At population levels at which there is divergence—intermediate and larger ones during the earlier periods; all locations during the latter periods—the slope of the fitted growth relative to population significantly steepens. The near orthogonal growth of smaller locations during the 1960-1980 and 1980-2000 periods reflects that lack of any friction to population decline. Hence, once the decrease in $\hat{\alpha}$ is done in 1960, locations with lower productivity can jump much of the way to their new local steady state. They can't jump all of the way because the high-productivity locations are still attracting population from the remainder of the system. But they do so proportionally in the sense that attract population approximately proportionately from lower-productivity locations. Hence fitted growth is flat and negative among locations near their local steady state.

If the decrease in congestion was bunched into 60 years rather than 120 years, the force driving divergence is again significantly strengthened (panel D). However this scenario dramatically differ from the baseline as does the scenario under which the decrease is larger.

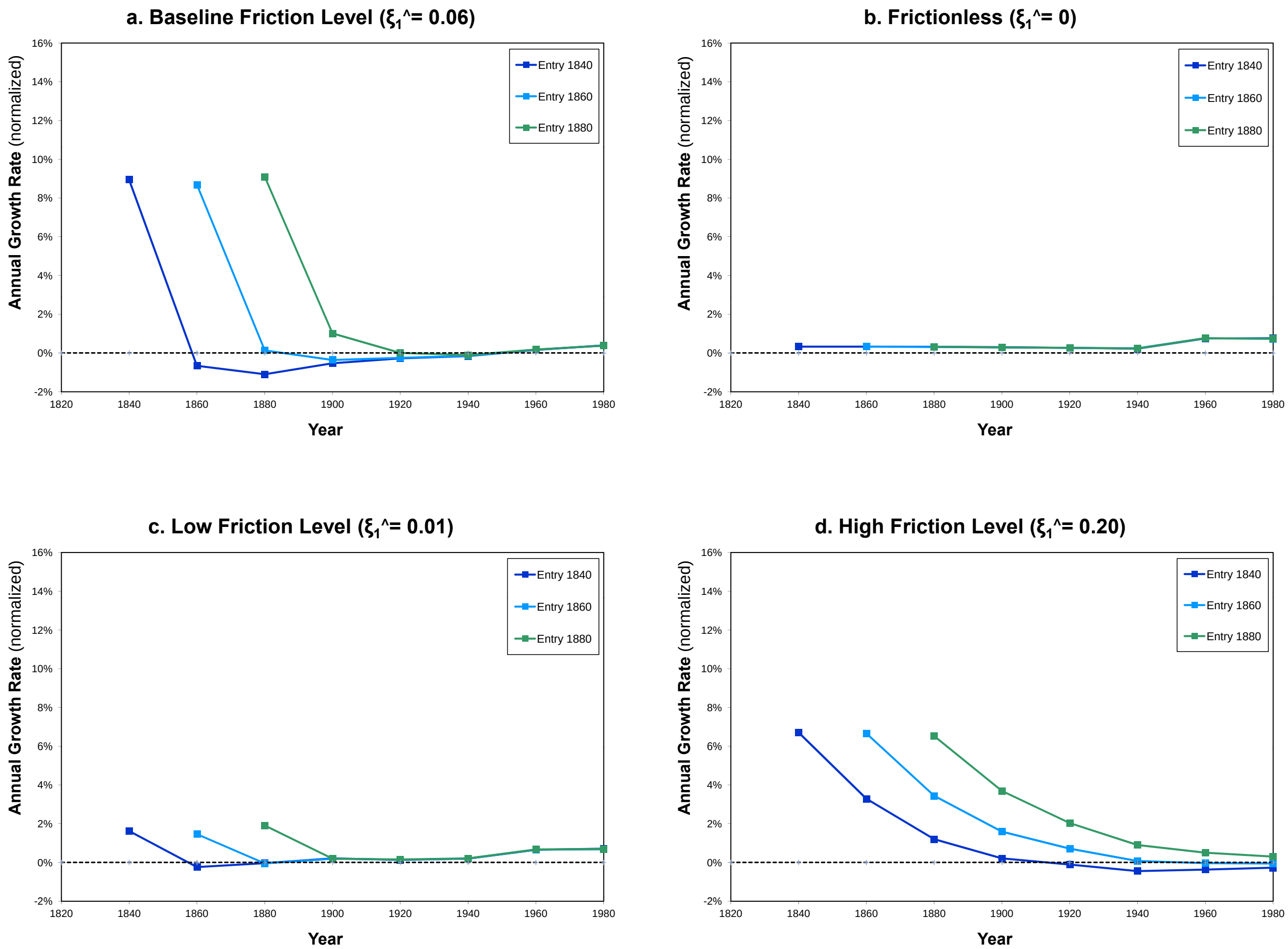

Figure A.10: Sensitivity of Simulated 80th Percentile Cohort Growth to the Level of the Growth Friction

The trajectories shown above are the 80th percentile growth rate within each entering cohort. Absent any frictions, locations' growth is uncorrelated with their cohort (panel B). Essentially, locations "jump" immediately to their local steady state population from their unobserved pre-entry population. Thereafter, 80th percentile growth within each cohort is equal across cohorts. Dampening this shared rate is the fast growth rates of the largest locations, who's steady-state populations shift up the most from the decrease in net congestion. The decrease in net congestion ends in 1960. After this, 80th percentile growth moves moderately higher.

A low friction level—one for which 4 percent growth causes a 1 percent decrease in productivity—induces growth trajectories relatively similar to those when there is no friction (panel C). The only difference is some modestly elevated growth during the first twenty-year period following entry. Peak growth rates are low and transition durations short in part because locations can jump much of the way to their local steady state upon entering.

A high friction level—one for which 4 percent growth rate causes a 20 percent decrease in productivity—also dampens peak growth rates relative to the baseline specification (panel D). But in this case transition durations are approximately 80 years rather than 40 years.

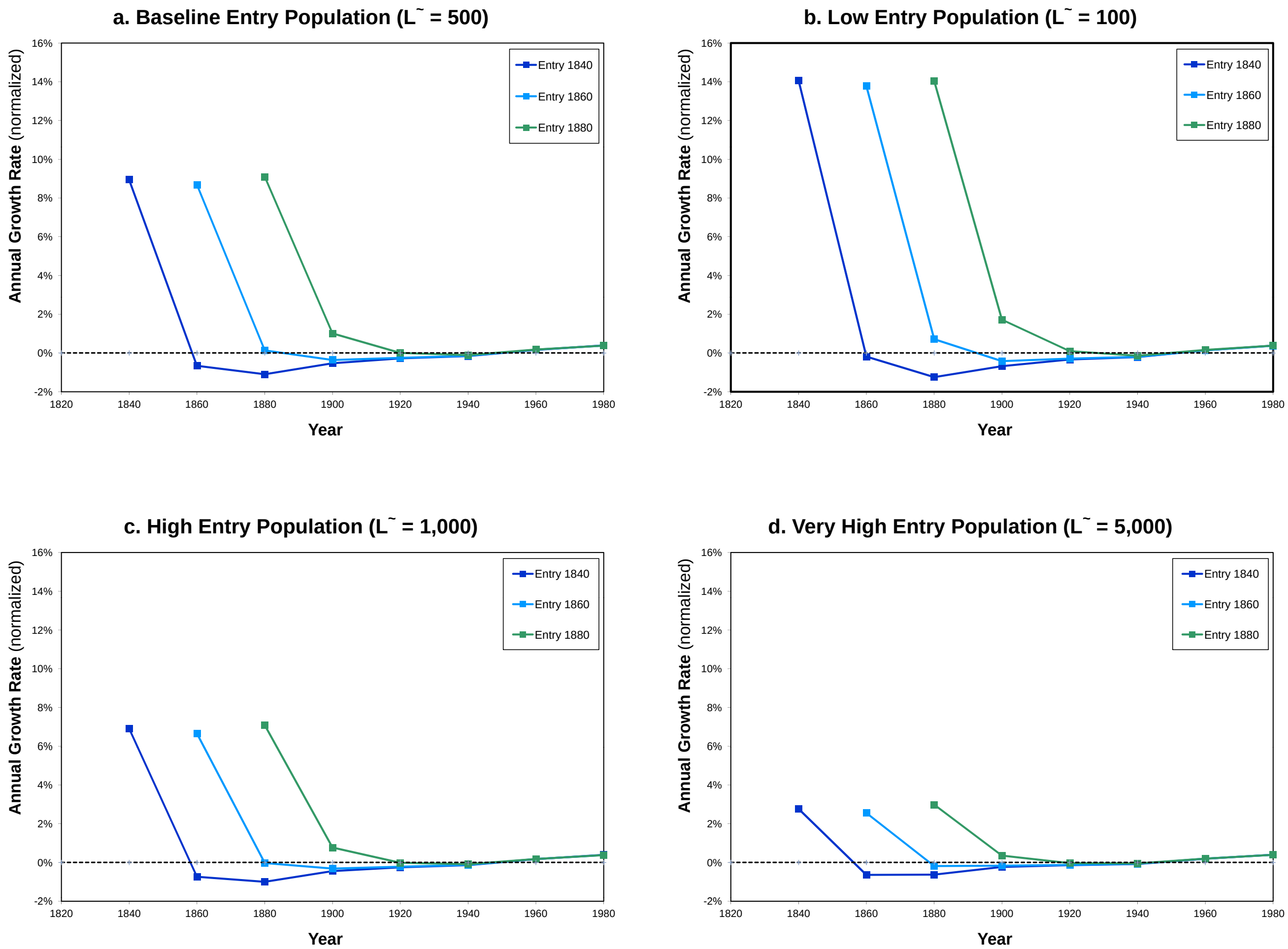

Figure A.11: Sensitivity of Simulated 80th Percentile Cohort Growth to Pre-Entry Population ($\tilde{L}$)

With a lower pre-entry population, $\tilde{L} = 100$, initial period population growth is considerably faster than under the baseline, for which $\tilde{L} = 500$ (panel B). This reflects that cumulative population growth during the transition is higher. However the duration of the transitions is the same as in the baseline. Doubling the pre-entry population to $\tilde{L} = 1000$ from its baseline value has almost no effect on the growth trajectories. Increasing it further to $\tilde{L} = 5000$ causes initial growth rates to significantly decrease. The reason is that the pre-entry population is relatively close to locations' local steady state.

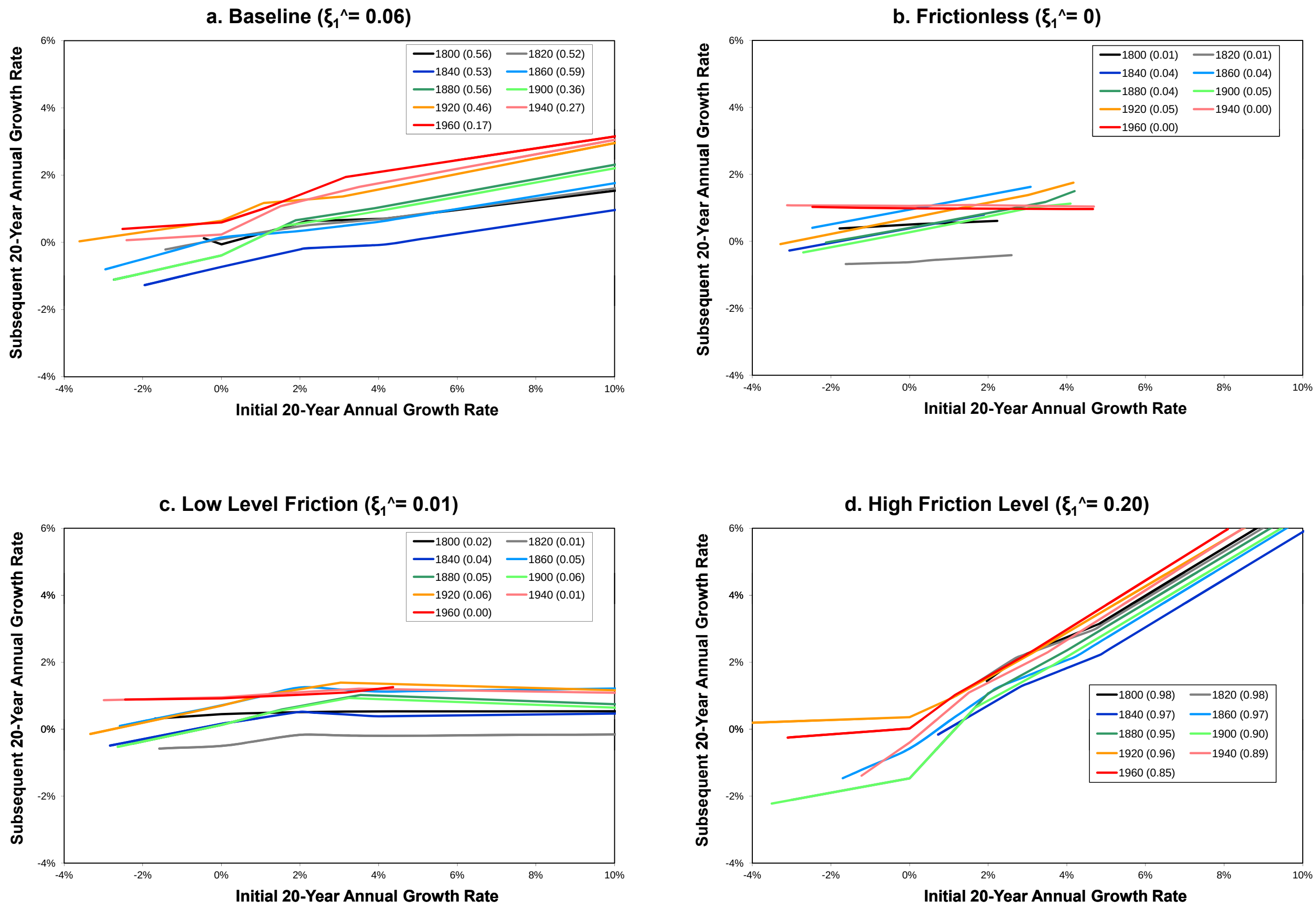

Figure A.12: Sensitivity of Simulated Persistence to the Level of the Growth Friction

Figure shows result of regressing simulated growth during a second twenty-year period on a four-way spline of growth during a first twenty-year period. Without any frictions, persistence derives solely from the decrease in net congestion (panel B). The small slope of the dependence (≈ 0.25) and the near-zero R-squared values establish that the larger share of variations in growth rates are coming from the idiosyncratic shocks rather than the persistent decline in net congestion. The range of realized simulated growth rates in the frictionless scenario, measured by the horizontal range of the fitted curves, is much smaller than under the scenarios with positive frictions.

Persistence with a small friction is similar to that without frictions with the addition of orthogonal growth for high initial growth rates (panel C). Such high growth rates are driven almost entirely by shocks. The resulting changes in locations' local steady states are quickly closed because the friction level is low. Because the shocks are i.i.d., second period growth is largely orthogonal.

Persistence with a very high friction, in contrast is especially strong (panel D). For locations experiencing positive growth in the first period, expected second-period growth increases as high as one-to-one with initial period growth for some years and some spline segments. Correspondingly, for many years R-squared values are near one.

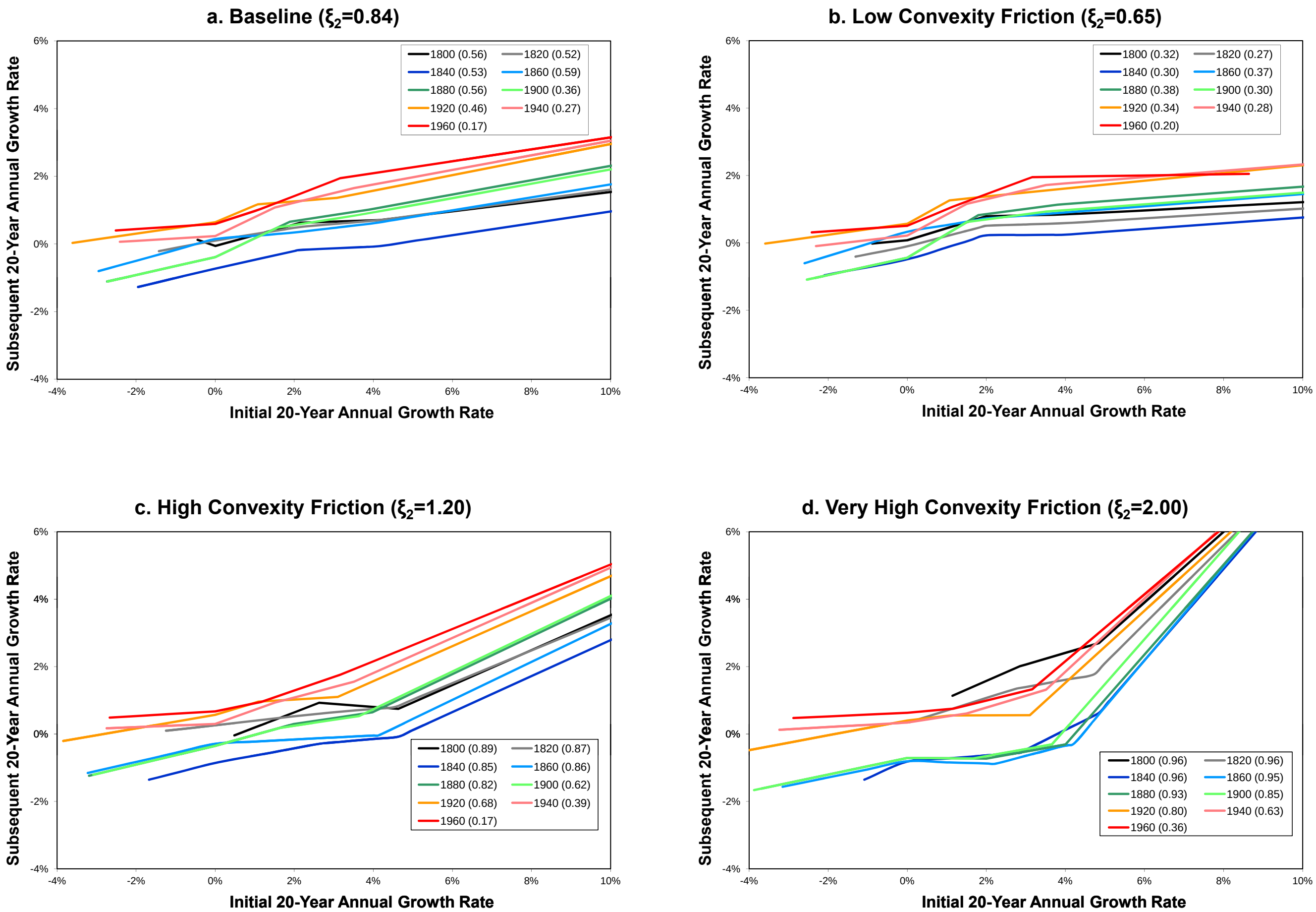

Figure A.13: Sensitivity of Simulated Persistence to the Convexity of the Growth Friction

The convexity of fitted persistence depends closely on the convexity of the growth friction, ξ_2. Specifically the fitted persistence curves are moderately concave when the growth friction is moderately concave ($\xi_2 = 0.64$) (Panel B). They are slightly and strongly convex when the growth curves are slightly and strongly convex ($\xi_2 = 1.2$, $\xi_2 = 2.0$) (panels C and D).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
log(pop) bin:	**1800 -1820**	**1820-1840**	**1840-1860**	**1860-1880**	**1880-1900**	**1900-1920**	**1920-1940**	**1940-1960**	**1960-1980**	**1980-2000**	**2020-2040**
min to lowest lb	**-0.048**	**-0.051**	**-0.054**	**-0.046**	**-0.047**	**-0.045**	**-0.032**	0.001	0.002	0.000	0.000
	(0.004)	**(0.006)**	**(0.006)**	**(0.004)**	**(0.004)**	**(0.007)**	**(0.006)**	(0.001)	(0.001)	(0.001)	(0.001)
lpop 08to09		**-0.039**	**-0.040**	**-0.038**	**-0.032**	-0.002	**-0.016**	**0.003**	0.001	0.000	0.000
		(0.006)	**(0.005)**	**(0.003)**	**(0.003)**	(0.003)	**(0.003)**	**(0.001)**	(0.001)	(0.001)	(0.001)
lpop09to10	-0.003	**-0.012**	**-0.009**	**-0.014**	**-0.004**	0.000	0.000	**0.002**	**0.002**	0.000	0.000
	(0.004)	**(0.003)**	**(0.003)**	**(0.003)**	**(0.002)**	(0.001)	(0.002)	**(0.001)**	**(0.001)**	(0.001)	(0.001)
lpop 10to11	0.001	-0.004	-0.001	-0.001	0.001	0.002	**0.003**	**0.002**	**0.002**	0.001	0.000
	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**	(0.000)	(0.001)
lpop 11to12				0.001	0.001	0.002	**0.004**	**0.003**	**0.002**	0.001	0.000
				(0.003)	(0.002)	(0.002)	**(0.001)**	**(0.001)**	**(0.001)**	(0.001)	(0.001)
lpop 12to13							0.004	0.003	0.002	0.001	0.000
							(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
lpop 13to14									0.002	0.001	0.000
									(0.003)	(0.002)	(0.002)
highest ub to max	0.000	-0.002	0.000	0.003	0.002	0.003	0.004	0.003	0.002	0.001	0.000
	(0.005)	(0.004)	(0.003)	(0.010)	(0.007)	(0.003)	(0.009)	(0.004)	(0.043)	(0.006)	(0.004)
N	310	546	871	1707	2397	2697	3015	3063	3069	3069	3069
R^2 across 400 Seeds:											
mean	0.646	0.600	0.562	0.520	0.421	0.139	0.150	0.083	0.073	0.015	0.003
std dev	0.039	0.027	0.024	0.017	0.019	0.021	0.018	0.009	0.008	0.004	0.002
min	0.526	0.530	0.500	0.469	0.358	0.081	0.105	0.055	0.052	0.004	0.000
median	0.646	0.601	0.561	0.520	0.422	0.138	0.151	0.082	0.073	0.015	0.003
max	0.756	0.673	0.620	0.572	0.469	0.203	0.218	0.119	0.105	0.031	0.010

Table B.1: Simulated Growth Fitted on Initial Population Spline Table shows results from regressing population growth on a linear continuous spline of starting year log population. Coefficients are mean values over separate regressions for each of 400 seeds. The corresponding standard deviations over the 400 seeds are reported in parentheses.

	1800		1820		1840		1860		1880		1900		1920		1940		1960		1980		2000	
	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp
Locations	310	310	546	545	871	870	1,707	1,705	2,397	2,387	2,697	2,695	3,015	3,014	3,063	3,062	3,069	3,064	3,069	3,067	3,069	3,069
Pop:																						
Aggre-gate	5.3E+06	5.3E+06	9.7E+06	9.7E+06	1.7E+07	1.7E+07	3.2E+07	3.1E+07	5.0E+07	5.0E+07	7.6E+07	7.6E+07	1.1E+08	1.1E+08	1.3E+08	1.3E+08	1.8E+08	1.8E+08	2.3E+08	2.3E+08	2.8E+08	2.8E+08
Mean	1.7E+04	1.7E+04	1.8E+04	1.8E+04	2.0E+04	2.0E+04	1.8E+04	1.8E+04	2.1E+04	2.1E+04	2.8E+04	2.8E+04	3.5E+04	3.5E+04	4.3E+04	4.3E+04	5.8E+04	5.8E+04	7.4E+04	7.4E+04	9.1E+04	9.1E+04
log(Pop):																						
Mean	9.3	9.3	9.2	9.2	9.3	9.3	9.1	9.1	9.3	9.3	9.6	9.6	9.8	9.8	9.9	9.9	9.9	9.9	10.1	10.1	10.2	10.2
Std Dev	1.2	1.0	1.2	1.1	1.2	1.1	1.3	1.4	1.2	1.4	1.1	1.1	1.2	1.0	1.2	1.1	1.3	1.2	1.4	1.3	1.4	1.4
Min	6.6	5.5	6.5	5.0	6.4	4.2	6.3	2.1	6.3	2.1	6.1	2.8	6.0	3.6	5.6	5.7	5.3	5.3	5.3	4.5	5.4	4.2
Pctile 01	6.7	7.1	6.6	6.6	6.5	6.3	6.5	3.7	6.5	3.6	6.8	5.9	6.8	7.0	7.0	7.4	6.9	7.1	6.9	7.1	7.0	6.9
Pctile 05	7.1	7.7	7.0	7.5	7.0	7.4	6.9	6.2	7.1	6.9	7.7	7.6	7.7	8.1	7.8	8.2	7.8	8.1	7.9	8.1	7.9	8.1
Pctile 10	7.6	8.1	7.5	7.9	7.6	7.9	7.3	7.6	7.6	7.9	8.2	8.3	8.2	8.6	8.3	8.7	8.2	8.6	8.4	8.6	8.5	8.6
Pctile 20	8.2	8.6	8.2	8.3	8.3	8.4	7.9	8.4	8.2	8.7	8.7	9.0	8.8	9.1	8.8	9.1	8.8	9.0	9.0	9.1	9.1	9.1
Pctile 40	9.1	9.1	9.0	9.1	9.1	9.0	8.8	9.1	9.1	9.3	9.4	9.6	9.5	9.6	9.6	9.6	9.6	9.6	9.8	9.7	9.9	9.8
Pctile 50	9.5	9.3	9.4	9.3	9.4	9.2	9.2	9.3	9.4	9.5	9.6	9.8	9.8	9.8	9.9	9.8	9.9	9.8	10.1	10.0	10.2	10.1
Pctile 60	9.8	9.6	9.6	9.5	9.7	9.5	9.5	9.5	9.7	9.7	9.9	9.9	10.1	10.0	10.2	10.0	10.3	10.1	10.5	10.3	10.6	10.5
Pctile 80	10.3	10.1	10.3	10.1	10.3	10.1	10.2	10.1	10.3	10.2	10.5	10.3	10.8	10.4	10.9	10.6	11.0	10.8	11.3	11.1	11.4	11.3
Pctile 90	10.8	10.5	10.7	10.6	10.7	10.7	10.7	10.5	10.8	10.5	11.0	10.8	11.3	10.9	11.5	11.1	11.6	11.5	11.9	11.8	12.0	12.1
Pctile 95	11.1	10.9	11.0	10.9	11.0	11.1	11.1	10.8	11.2	10.9	11.4	11.2	11.8	11.4	11.9	11.7	12.1	12.3	12.4	12.5	12.5	12.8
Pctile 99	11.6	11.3	11.7	11.7	11.7	12.0	11.7	11.9	11.9	12.0	12.1	12.3	12.5	12.8	12.8	13.1	13.0	13.5	13.3	13.7	13.5	14.0
Max	12.2	12.1	12.4	12.4	12.4	12.7	12.8	13.7	13.0	14.0	13.3	14.5	13.8	14.9	14.2	15.2	14.5	15.6	14.9	15.8	15.1	16.1

Table B.2: Population Level Summary Statistics, Simulated vs Empirical Table shows summary statistics on population and log population across locations. Empirical results are based on the historically-consistent data build. Simulated results are based on stacked population and log population levels across 350 seeds. (The full 400 seeds are not used due to software feasibility constraints.)

	1800-20		1820-40		1840-60		1860-80		1880-1900		1900-20		1920-40		1940-60		1960-80		1980-2000	
	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp	sim	emp
Locations	310	310	546	544	871	865	1,707	1,691	2,397	2,361	2,697	2,654	3,015	2,950	3,063	2,982	3,069	2,853	3,069	2,631
Aggre-gate	3.0	3.0	2.9	2.9	3.1	3.1	2.3	2.3	2.0	2.0	1.7	1.7	1.1	1.1	1.5	1.5	1.2	1.2	1.1	1.1
Aggre-gate	2.2	1.6	2.2	1.7	2.1	2.3	2.0	2.0	1.9	1.9	1.6	1.5	1.1	1.1	1.5	1.5	1.2	1.2	1.1	1.0
Mean	3.4	1.9	3.5	2.1	3.2	3.0	3.3	3.3	2.6	2.4	1.4	1.2	0.9	0.6	1.0	0.2	0.8	0.8	0.9	0.5
Std Dev	4.2	2.3	4.4	2.8	4.3	3.6	4.7	4.6	4.0	3.5	2.3	2.4	2.6	1.7	1.1	1.8	0.8	1.4	0.7	1.2
Min	-0.4	-5.0	-1.4	-3.8	-2.0	-4.5	-2.9	-8.9	-2.7	-7.4	-2.7	-12.0	-3.6	-5.9	-2.4	-4.8	-2.5	-4.5	-2.1	-3.0
Pctile 01	0.0	-2.4	-0.9	-2.8	-1.2	-1.6	-2.0	-1.2	-1.6	-1.3	-1.5	-1.9	-2.3	-2.1	-1.1	-3.1	-1.3	-1.9	-0.9	-1.7
Pctile 05	0.4	-0.3	-0.3	-0.9	-0.6	-0.4	-1.4	-0.1	-0.9	-0.4	-0.8	-1.1	-1.5	-1.1	-0.4	-2.2	-0.6	-1.2	-0.3	-1.2
Pctile 10	0.7	0.0	-0.1	-0.3	-0.2	0.1	-1.0	0.3	-0.5	0.0	-0.4	-0.7	-1.1	-0.8	-0.1	-1.7	-0.2	-0.8	0.0	-0.8
Pctile 20	1.0	0.4	0.3	0.2	0.2	0.6	-0.5	0.8	0.0	0.4	0.1	-0.3	-0.6	-0.4	0.3	-1.2	0.2	-0.3	0.4	-0.5
Pctile 40	1.3	1.1	0.9	1.0	0.9	1.4	0.5	1.5	0.7	1.1	0.7	0.3	0.1	0.1	0.8	-0.4	0.6	0.4	0.8	0.1
Pctile 50	1.5	1.4	1.5	1.4	1.3	2.0	1.4	1.9	1.0	1.5	0.9	0.6	0.4	0.3	0.9	0.0	0.8	0.7	0.9	0.4
Pctile 60	1.7	1.7	2.6	2.0	2.0	2.5	2.8	2.4	1.6	2.0	1.2	1.0	0.7	0.6	1.1	0.4	1.0	0.9	1.1	0.6
Pctile 80	6.8	3.1	6.8	3.8	6.0	4.9	7.2	4.4	4.8	3.5	2.1	2.3	1.4	1.3	1.6	1.5	1.4	1.7	1.5	1.3
Pctile 90	10.5	4.5	10.5	6.0	9.8	7.4	10.6	7.7	8.7	5.5	3.5	3.7	2.9	2.1	2.1	2.5	1.7	2.5	1.8	1.9
Pctile 95	13.1	6.8	13.1	7.2	12.8	10.4	13.1	12.5	11.6	8.8	5.5	5.5	6.5	3.0	2.7	3.6	2.0	3.4	2.0	2.6
Pctile 99	16.9	10.7	17.2	11.5	17.3	15.8	17.3	24.2	16.4	18.9	11.9	10.2	12.7	6.2	4.9	6.2	2.6	5.5	2.5	4.1
Max	19.8	12.5	20.9	21.4	21.8	32.3	22.9	32.7	22.8	35.0	21.3	28.2	21.8	22.6	15.3	11.8	11.3	9.9	3.9	7.6

Table B.3: Population Growth Summary Statistics, Simulated vs Empirical: Simulated growth statistics are based on the county/metro hybrid data build. Simulated statistics are based on stacked growth rates from 350 seeds. (The full 400 seeds are not used due to software feasibility constraints.)

lagged growth spline				(1) 1820-40 on 1800-20	(2) 1840-60 on 1820-40	(3) 1860-80 on 1840-60	(4) 1880-1900 on 1860-80	(5) 1900-20 on 1880-1900	(6) 1920-40 on 1900-1920	(7) 1940-60 on 1920-1940	(8) 1960-80 on 1940-1960	(9) 1980-2000 on 1960-1980
SIMPLE												
		sim	ρ	**0.140**	**0.150**	**0.167**	**0.175**	**0.201**	**0.267**	**0.227**	**0.357**	**0.326**
				(0.014)	**(0.013)**	**(0.012)**	**(0.011)**	**(0.012)**	**(0.012)**	**(0.015)**	**(0.016)**	**(0.016)**
			N	310	546	871	1,707	2,397	2,697	3,015	3,063	3,069
			R^2	**0.549**	**0.521**	**0.518**	**0.580**	**0.548**	**0.339**	**0.445**	**0.247**	**0.154**
		emp	ρ	**0.287**	**0.289**	**0.115**	**0.166**	**0.277**	**0.238**	**0.497**	**0.354**	**0.673**
				(0.034)	**(0.021)**	**(0.011)**	**(0.009)**	**(0.011)**	**(0.012)**	**(0.018)**	**(0.013)**	**(0.011)**
			N	306	542	864	1,689	2,360	2,654	2,949	2,980	2,850
			R^2	**0.190**	**0.252**	**0.117**	**0.154**	**0.226**	**0.123**	**0.203**	**0.193**	**0.581**
SPLINE												
	negative	sim	ρ	-0.400	0.222	**0.279**	**0.320**	**0.280**	**0.265**	**0.169**	0.070	0.077
				(2.733)	(0.208)	**(0.116)**	**(0.050)**	**(0.052)**	**(0.066)**	**(0.028)**	(0.064)	(0.056)
			N	5	62	128	527	502	500	1,119	344	470
		emp	ρ	-0.111	**-0.352**	-0.233	**-0.984**	0.173	-0.114	**0.302**	**0.220**	**0.580**
				(0.176)	**(0.131)**	(0.133)	**(0.126)**	(0.106)	(0.058)	**(0.074)**	**(0.037)**	**(0.042)**
			N	27	91	72	98	250	835	1,085	1,512	775
	0 to aggregate	sim	ρ	**0.317**	**0.186**	**0.259**	**0.098**	**0.349**	**0.552**	**0.491**	**0.561**	**0.382**
				(0.082)	**(0.059)**	**(0.054)**	**(0.044)**	**(0.036)**	**(0.044)**	**(0.052)**	**(0.034)**	**(0.040)**
			N	220	247	402	401	1,038	1,432	1,088	2,033	1,659
		emp	ρ	**0.390**	**0.531**	**0.338**	**0.575**	**0.612**	**0.533**	**1.135**	**0.568**	**0.768**
				(0.099)	**(0.077)**	**(0.047)**	**(0.068)**	**(0.063)**	**(0.060)**	**(0.089)**	**(0.060)**	**(0.045)**
			N	219	294	496	909	1,211	1,085	1,144	887	1,144
	aggregate to aggregate + 0.02	sim	ρ	0.039	0.098	0.054	**0.136**	0.049	**0.180**	**0.095**	**0.286**	**0.454**
				(0.071)	(0.057)	(0.051)	**(0.040)**	(0.032)	**(0.035)**	**(0.035)**	**(0.035)**	**(0.043)**
			N	10	70	106	202	308	506	518	608	929
		emp	ρ	**0.392**	**0.446**	**0.264**	**0.351**	**0.296**	**0.193**	**0.779**	**0.349**	**0.800**
				(0.202)	**(0.125)**	**(0.072)**	**(0.074)**	**(0.069)**	**(0.065)**	**(0.075)**	**(0.069)**	**(0.036)**
			N	39	79	134	336	528	465	592	420	760
	above aggregate + 0.02	sim	ρ	**0.142**	**0.155**	**0.176**	**0.192**	**0.209**	**0.212**	**0.230**	**0.216**	**0.176**
				(0.020)	**(0.016)**	**(0.014)**	**(0.013)**	**(0.014)**	**(0.016)**	**(0.016)**	**(0.037)**	**(0.055)**
			N	76	167	234	577	548	260	290	77	11
		emp	ρ	0.180	**0.125**	-0.008	**0.100**	**0.211**	**0.201**	**0.119**	**0.240**	**0.396**
				(0.105)	**(0.051)**	(0.019)	**(0.014)**	**(0.017)**	**(0.025)**	**(0.033)**	**(0.060)**	**(0.040)**
			N	25	80	163	348	372	269	129	163	174
		sim	R^2	**0.563**	**0.524**	**0.525**	**0.585**	**0.557**	**0.363**	**0.455**	**0.266**	**0.165**
		emp	R^2	**0.209**	**0.306**	**0.192**	**0.221**	**0.243**	**0.139**	**0.261**	**0.199**	**0.589**

Table B.4: Persistence of Growth, Simulated vs Empirical Top panel shows result of regressing population growth during a second twenty-year period on growth during a first twenty-year period. The empirical regressions are based on the county/metro hybrid data build. Standard errors are robust to spatial correlation. For the simulated regressions, coefficients are mean values over 400 seeds. The standard deviations of the 400 coefficients are reported in parentheses. Bottom panel shows results from an analogous regression of second-period growth on a four-way linear continuous spline of first-period growth.