

POPULATION DYNAMICS
Connecting Past, Present and Future
A Four-Part Curriculum

Part C
U.S Urbanization from 1820-1920

by
Jennifer Anderson
Jeff Potash

POPULATION DYNAMICS
Connecting Past, Present and Future
A Four-Part Curriculum

<http://clexchange.org/curriculum/complexsystems/populationdynamics/>

PART A

Push and Pull Forces in Settling America

PART B

Push and Pull Forces in U.S. Colonial History

PART C

U.S. Urbanization from 1820-1920

PART D

America's Baby Boom and Global Youth Bulges

TEACHER INSTRUCTIONS

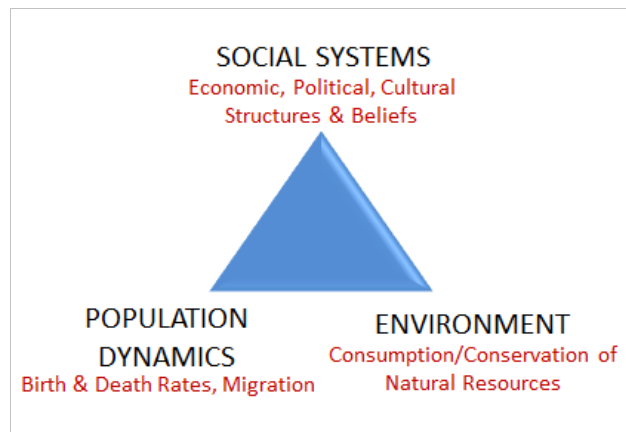
POPULATION DYNAMICS – PART C

U.S. Urbanization From 1820-1920

OVERVIEW

America's transition from an almost entirely rural society in 1820 (93% of its people living in communities of 2500 or less) to one in 1920, where a majority resided in cities, marks a major turning point in American history. Similar dynamics of dramatic urban growth are happening across the globe today, raising important implications for the future. This lesson introduces students to the dynamics of "relative attractiveness" in both rural and urban settings that contribute to "Push" and "Pull" movements of people either into or out of a particular setting.

Using guided handouts, students can do these supplementary lessons either during or outside of class time, or within a flipped classroom context. They provide a frame to help students conceptualize how population dynamics *cause* changes in social systems and the environment, while also being *affected* by them (graphic on right). Additionally, simulations encourage students to explore the conditions under which people are pushed or pulled between rural and urban communities, and to experiment with alternative and more sustainable long-term scenarios. Using multiple resources and structured problem-solving, these lessons encourage students to connect historical trends, structures, and relationships with real-world present and future challenges.



INTRODUCTIONS TO SIMULATIONS/STUDENT ACTIVITIES

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

Simulation 1: How Do Population Dynamics Create Push and Pull Forces in a Rural Setting?

In the first simulation, students examine how births and deaths (population dynamics), rural land (environment), and farm labor productivity (social systems) combine to affect overall rural jobs. Depending upon the relationship between the size of the labor force and available farm jobs, residents may be pushed out or pulled into rural communities.

Students will:

1. Familiarize themselves with the core components of rural life (labor force, farmland, and farm jobs) and the manner in which these factors interact.
2. Use a simulation to explore how different rural birth rates, land availability, and rural technologies combine to define a rural labor force and rural jobs.
3. Use the simulation to consider possible push (limits to growth) and pull scenarios based on dynamic labor forces and rural jobs.

Simulation 2: How Do Population Dynamics Create Push and Pull Forces in an Urban Setting?

In the second simulation, students actively examine how births, deaths, and migration combine to influence numbers of urban jobs. Depending upon the relationship between the size of the urban labor force and available factory jobs, residents may be pushed out of rural communities or pulled into urban communities.

Students will:

1. Familiarize themselves with the core components of urban life (labor force, factories, and urban jobs) and the manner in which these factors interact.
2. Use a simulation to explore how different urban birth rates and urban migration, factory growth, and urban technologies combine to define an urban labor force and urban jobs.
3. Use the simulation to consider possible push (limits to growth) and pull scenarios based on dynamic labor forces and urban jobs.

Simulation 3: How Did Push and Pull Dynamics Affect American History From 1820-1920?

In the third and final simulation, students will learn about the specific conditions underlying America's changing (1820-1920) population dynamics (both rural and urban), environment (farmland and urban factories), and social systems (both rural and urban jobs and technology). In addition to reconstructing the specific push and pull dynamics operating during this period, students will use the simulation to recreate alternative historical scenarios ("What ifs") based on the presence of one or more constraints on urban growth.

Students will:

1. Use a variety of historical sources (including pictures, primary sources, graphs and maps) to reconstruct how changing population dynamics, environments, and social systems combined to transform America from a predominantly rural into a majority urban society between 1820 and 1920.
2. Use a simulation to reconstruct the push and pull dynamics that shaped this transformation.

3. Use the simulation to explore alternative pasts based upon different conditions involving population dynamics (no immigration), environment (less farmland), or social systems (rural productivity and urban factory growth).

NOTE: Each of the three simulations includes a student handout with clear instructions for using the simulation. In addition, specific prompts for written responses challenge students to document and explain their learning.

STANDARDS AND METHODS

As with earlier lessons, these simulations engage students by approaching history as active problem-solving exercises, to synthesize information from a variety of traditional and non-traditional sources. Further, students are expected and encouraged to apply their learning by connecting historical patterns, systemic structures, and relationships to challenges in the modern world. These processes address three important sets of standards:

1. Content:

The College Board identifies twelve major themes that *encourage students to think conceptually about the American past and to focus on historical change over time.*¹ Simulation 3 (How Did Push and Pull Dynamics Affect American History from 1820-1920?) highlights the following themes: demographic changes, economic changes, environment, culture, the American identity, diversity, and globalization.

2. Method:

The Common Core Standards stipulate that students learn to integrate information from both primary and secondary sources to forge *a coherent understanding of an idea or event, noting discrepancies between sources.*² This lesson uses primary and secondary historical sources, incorporated with demographic simulations. Students actively reconstruct a past where population change is both the *result of* and the *agent for* change in other areas, including the economy and environment. Simulation 3 includes graphs, maps, pictures and other primary and secondary sources for students to reconstruct the multiplicity of changing forces that contributed to America's transformation from a rural to a predominantly urban society.

3. Relevance:

The National Council For Social Studies specifies the need to *empower students to make connections between learning and their world, to support active citizenship.*³ This is the central focus of these simulations: to challenge students to grapple with the future prospects of a world borne out of the past, and to exercise an understanding, of patterns and structures to be “systems citizens” in pursuing actions that effect positive change.

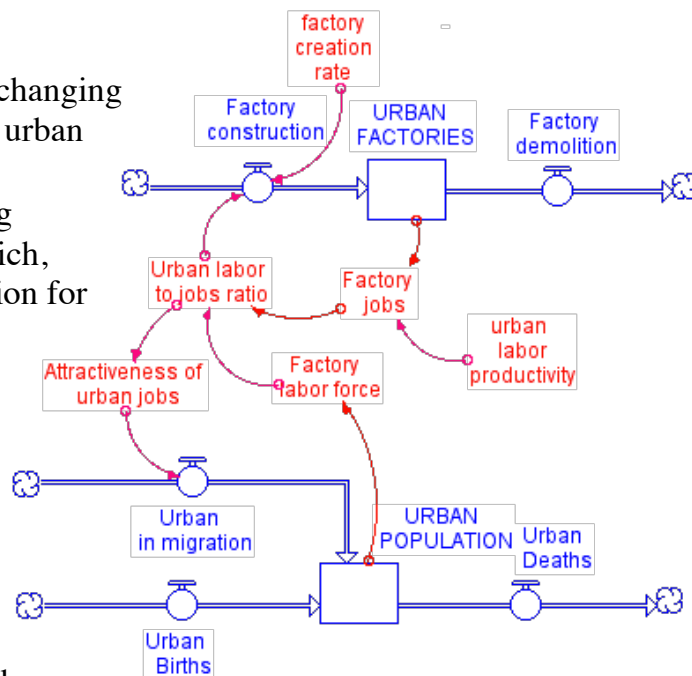
FOR THOSE INTERESTED: HOW DO THE SIMULATION MODELS WORK?

Two core structures have been used to develop these simulations, one rural and the other urban. (Note that these are developed in more detail on the Introduction page of each simulation.)

Both structures incorporate the following:

- A dynamic population, in both cases changing as a result of births and deaths: in the urban model, immigration is added.
- An environmental resource, that being either farmland or urban factories which, historically, have served as a foundation for urban jobs.
- A social system involving technologies that define labor productivity.

The model recognizes the relationship between the size of the population and the percent who are workers – this determines the size of the labor force. The model also recognizes the relationship between the number of jobs (based on rural land available for farming and/or the number of urban factories) and the relative productivity of each worker (based on technology).



In both cases, there is the potential (where resources are available) for a larger labor force to obtain jobs or, alternatively (where productivity and/or resources limit growth), for there to be a labor force that exceeds the number of available jobs.

Depending upon the circumstance in both the rural or urban communities, there can be any number of possible push or pull dynamics between the two. These dynamics reflect the “relative attractiveness” of one over the other.

These same dynamics continue to operate in the present across many portions of the globe. By providing students with tools to make these connections and to explore a variety of configurations and scenarios, these simulations offer a foundation for undertaking meaningful discussion.

¹ See <http://apcentral.collegeboard.com/apc/public/repository/ap-us-history-course-description.pdf>

² See <http://www.corestandards.org/ELA-Literacy/RH/11-12/> for 11-12th Grade English/Language Arts standards involving teaching History.

³ See <http://www.socialstudies.org/standards/execsummary>.

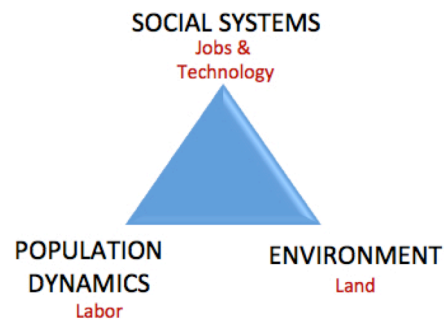
Teacher Guide – Part C, #1

How Do Population Dynamics Create Push and Pull Forces in a Rural Setting?

This handout will guide you through a problem-solving exercise that uses a simulation to help you understand how interconnections between changing populations, land, jobs, and technology influence push (people leaving) and pull (people entering) dynamics in a rural setting.

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

The focus of this simulation is on general conditions present across rural communities that connect farm jobs to farmland, technology, and changing population dynamics (illustrated in the figure on the right). In moving through the Sims, students identify conditions under which push (where farm labor exceeds farm jobs) and pull dynamics (where potential farm jobs exceed available farm labor) operate.



Because there are multiple factors in each of these three sectors, the simulation helps students explore different scenarios and patterns that can and have unfolded in the past and are likely to occur in the future.

STEP 1. Familiarize Yourself With the Introduction

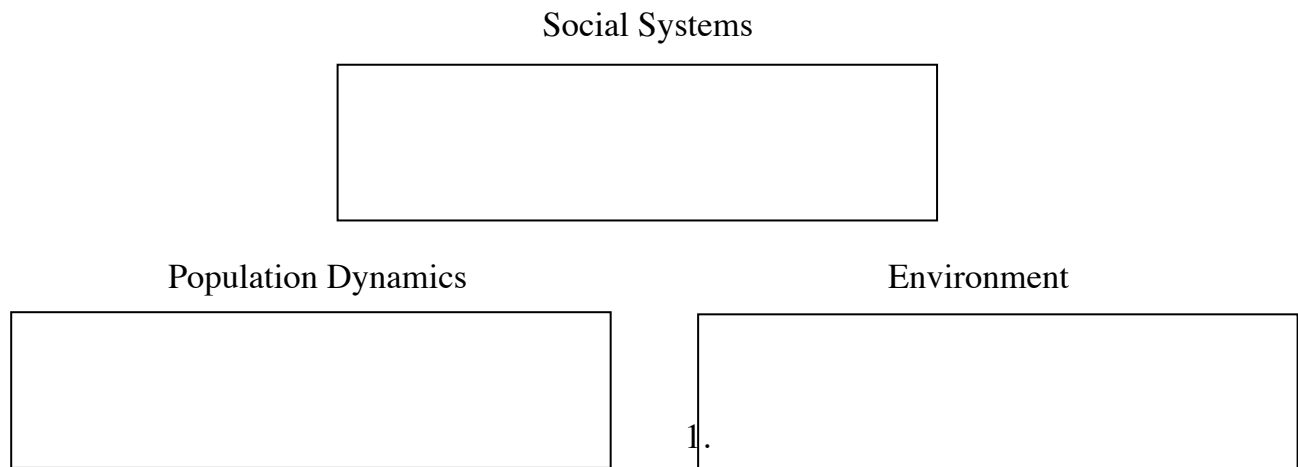
Open the simulation and read each of the links on the Introduction page. Define what demographers mean by push and pull dynamics.

Push and pull refer to the factors that cause the movement of people from one place to another. People experiencing major difficulties, either due to a lack of resources/opportunities (e.g., jobs, food, land) or political unrest, often feel a PUSH to leave. People who are not experiencing difficulties but who see better opportunities elsewhere are said to be PULLED to a new place.

The consequent movements of people from one place to another have shaped the past (as in the case of the Puritan settlement of America), the present (see map in PUSH and PULL Dynamics), and probably will also shape the future.

STEP 2. What Factors Contribute to Push and Pull Forces in a Rural Setting?

Open Sim 1 and read Page 1. Using the triangle visual, describe how population dynamics, environment, and social systems create push and pull forces in a rural setting.



The idea of brainstorming before using the simulation is to encourage the students to think about “the system” in terms of interrelationships between these three broad sectors. Consider some possibilities:

1. If a rural population is growing and rural technologies (social systems) remain constant, demands for land (environment) will grow.
2. Where technologies do not change, land availability determines the size of the rural labor force that can be employed.
3. Where technologies improve, such that each worker can cultivate more land, the number of workers needed will fall.

Ideally, if students see the general value of this conceptual construct, they can apply it in other settings.

STEP 3. How Does the Simulation Extend Your Understanding of Rural Push and Pull Dynamics?

Open Page 2 and familiarize yourself with how the simulation is set up to include population dynamics, environment (in this simulation, land), and social systems (here, jobs and technology):

- There’s an initial population of 10,000 that is growing because the annual birth rate is higher than the death rate (set at 15 per 1000).
- You have significant land reserves because the amount of land being used reflects a jobs and technology value which is 25% of the population, or 2500 people (farm labor participation) each of whom cultivates 10 acres (farm labor productivity). That translates into 25,000 of the total potential farmland of 200,000 acres in initial use.
- NOTE: some portion of unused land is always prepared for possible use. This land has potential for supporting additional farm jobs.

Run the simulation under the different “what if” conditions listed below and record what happens in each sector as a result. Make sure you “Reset” the simulation before starting the next scenario. When you’re finished, reflect more generally on push (labor exceeds jobs) or pull (jobs exceed labor) dynamics within a rural community.

Record Changes in:	Population	Land	Jobs & Technology
Run simulation as initialized.	The population grows to more than 44,000 over 100 years.	Potential land is put into increasing use to support growing number of workers.	Until the last few years, the labor force grows at a rate less than the rate that potential land is made available for use. However, at the end of 100 years, the labor force begins to exceed farm jobs.

Scenario	Impacts on:		
	Population	Land	Jobs & Technology
Population: Increase birth rate to 40 per 1000.	The population grows to more than 120,000 over 100 years.	While potential land is actively put into use, it is increasingly difficult to do so. By year 50, the labor force exceeds jobs. Some workers could be “pushed” out.	While land is put into use to address the needs of the rapidly growing population, after year 50 the labor force exceeds farm jobs.
Population: Set the initial population at 15,000.	The population grows to more than 66,000 over 100 years.	Similar to what happened with a birth rate increase. By year 70, the labor force exceeds jobs that the land can support. Some unemployed workers could be pushed out.	Same as above.
Land: Reduce potential land to 100,000 acres.	Same as default: 44,000 over 100 years.	Land reserves fall to a point where potential land cannot be converted quickly into usable farmland.	With less overall land available, by year 50, the labor force outstrips jobs.
Land: Increase annual farmland loss rate to 1%.	Same as default: 44,000 over 100 years.	Land reserves fall (from 86,000 acres in the initial run to 67,000 acres).	Similar to above scenario, except that rapid land exhaustion and loss reduce land in use to 50,000 acres. Labor outstrips jobs by year 50.
Jobs: Increase farm labor participation to 30%.	Same as default: 44,000 over 100 years.	Toward the end of the century, the labor force exceeds jobs.	Greater labor participation translates into a larger farm labor population that puts increasing pressure on land needs.
Technology: Set farm worker productivity at 30 acres per laborer.	Same as default: 44,000 over 100 years.	This results in a dramatic increase in farmland in use (153,000 acres), leaving limited reserves.	Because farm jobs fall by two-thirds and land reserves cannot be quickly put into use, the labor force quickly (by year 25) exceeds available jobs.

STEP 4. Analyze Your Findings

Use the insights generated from these different scenarios to describe in general terms, the conditions under which populations, land, and jobs and technology combine to create push dynamics. Then do the same with pull dynamics.

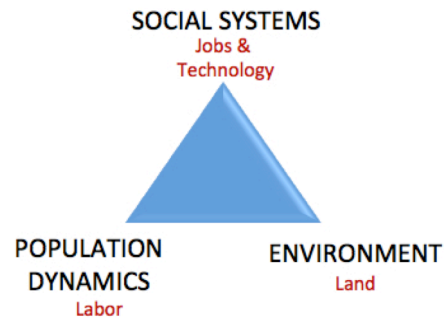
Students will have seen several scenarios in which both push and pull dynamics are present.

A. In the case of push dynamics, growing pressure is generated initially within the:

1. Population sector (large or rapidly increasing populations, based on high birth rates);
2. Land sector (insufficient reserves to meet growing needs or high rates of land exhaustion and loss); or
3. Jobs and Technology sector (high/growing rates of farm labor participation or improved farm labor productivity) drive the labor force significantly above the available farm jobs, thereby creating a significant push for individuals to leave.

B. In the case of pull dynamics, the presence of large land reserves (total potential farmland) that exceed the immediate needs of the current farm labor force can create a pull dynamic in which others are drawn to the community.

In all cases, students should be able to see the relationships between the three core sectors highlighted at the start of the simulation. This provides a general conceptual frame for thinking broadly about the conditions under which strong push and pull dynamics operate in rural areas.



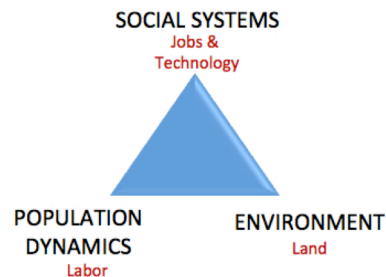
Student Guide – Part C, #1
How Do Population Dynamics Create Push and Pull Forces
in a Rural Setting?

This handout will guide you through a problem-solving exercise that uses a simulation to help you understand how interconnections between changing populations, land, jobs, and technology influence push (people leaving) and pull (people entering) dynamics in a rural setting.

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

STEP 1. Familiarize Yourself With the Introduction

Open the simulation and read each of the links on the Introduction page. Define what demographers mean by push and pull dynamics.



STEP 2. What Factors Contribute to Push and Pull Forces in a Rural Setting?

Open Sim 1 and read Page 1. Using the triangle visual, describe how population dynamics, environment, and social systems create push and pull forces in a rural setting.

Social Systems	
<div style="border: 1px solid black; height: 70px; margin: 0 auto; width: 100%;"></div>	
Population Dynamics	Environment
<div style="border: 1px solid black; height: 70px; margin: 0 auto; width: 100%;"></div>	<div style="border: 1px solid black; height: 70px; margin: 0 auto; width: 100%;"></div>

STEP 3. How Does the Simulation Extend Your Understanding of Rural Push and Pull Dynamics?

Open Page 2 and familiarize yourself with how the simulation is set up to include population dynamics, environment (in this simulation, land), and social systems (here, jobs and technology):

- There's an initial population of 10,000 that is growing because the annual birth rate is higher than the death rate (set at 15 per 1000).
- You have significant land reserves because the amount of land being used reflects a jobs and technology value which is 25% of the population, or 2500 people (farm labor participation) each of whom cultivates 10 acres (farm labor productivity). That translates into 25,000 of the total potential farmland of 200,000 acres in initial use.
- NOTE: some portion of unused land is always prepared for possible use. This land has potential for supporting additional farm jobs.

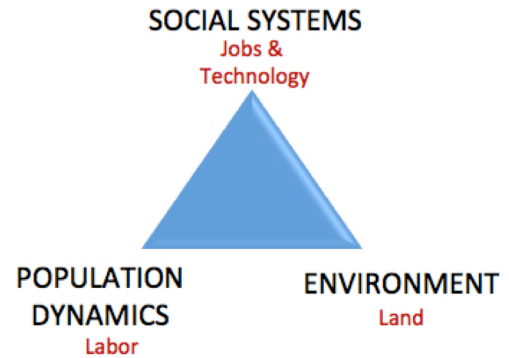
Run the simulation under the different “what if” conditions listed below and record what happens in each sector as a result. Make sure you “Reset” the simulation before starting the next scenario. When you're finished, reflect more generally on push (labor exceeds jobs) or pull (jobs exceed labor) dynamics within a rural community.

Record Changes in:	Population	Land	Jobs & Technology
Run simulation as initialized.			

Scenario	Impacts on:		
	Population	Land	Jobs & Technology
Population: Increase birth rate to 40 per 1000.			
Population: Set the initial population at 15,000.			
Land: Reduce potential land to 100,000 acres.			
Land: Increase annual farmland loss rate to 1%.			
Jobs: Increase farm labor participation to 30%.			
Technology: Set farm worker productivity at 30 acres per laborer.			

STEP 4. Analyze Your Findings

Use the insights generated from these different scenarios to describe in general terms, the conditions under which populations, land, and jobs and technology combine to create push dynamics. Then do the same with pull dynamics.



Teacher Guide – Part C, #2

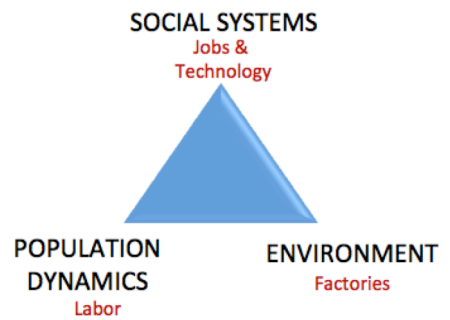
How Do Population Dynamics Create Push and Pull Forces in an Urban Setting?

This handout will guide you through a problem-solving exercise that uses a simulation to help you understand how interconnections between changing populations, factories, jobs, and technology influence push (people leaving) and pull (people entering) dynamics in an urban setting.

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

The focus of this simulation is on general conditions present across urban communities that connect urban jobs to land, technology, and changing population dynamics (illustrated in the figure on the right). In doing so, students identify conditions under which strong pull dynamics (where potential urban jobs exceed the available urban labor force) operate.

Because there are multiple factors in each of these three sectors, the simulation helps students explore different scenarios and patterns that can and have unfolded across the past and are likely to occur in the future.



STEP 1. What Factors Contribute to Push and Pull Forces in an Urban Setting?

Open Sim 2 and read Page 1. Using the triangle visual describe how population dynamics (labor), environment (factories), and social systems (jobs & technology) create push and pull forces in an urban setting.

Social Systems	
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	
Population Dynamics	Environment
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	<div style="border: 1px solid black; height: 80px; width: 100%;"></div>

The idea of brainstorming before using the simulation is to encourage the students to think about “the system” in terms of interrelationships between these three broad sectors. Consider some possibilities:

1. If an urban labor force (population) is growing and urban technologies (social systems) remain constant, there may be an incentive for additional factory growth (environment).
2. Where technologies do not change, factory growth (and land availability to build new factories) determines the maximum size of the urban labor force that can be employed.
3. Where there is factory growth, there may be a pull for populations to come to cities to seek jobs.

Ideally, if students see the general value of this conceptual construct, they can apply it in other settings.

STEP 2. How Does the Simulation Extend Your Understanding of Urban Push and Pull Dynamics?

Open Page 2 and carefully familiarize yourself with how the simulation is set up to include population dynamics (labor), environment (factories), and social systems (jobs and technology):

- There is an initial urban population of 2500 that is growing because the annual birth rate (30 per 1000) is higher than the death rate (initially, 15 per 1000); and migrants are arriving at a rate of 5 per 1000 in the population.
- There are 50 factories, each having an average of 25 jobs and, as a result of new technology, new factories are growing at a 3% annual rate.
- There are significant urban land reserves to build more factories (initial setting is only 10 of 500 potential acres).
- The factory labor force is calculated as half of the entire urban population.

Run the simulation under the different “what if” conditions listed below and record what happens in each sector as a result. Make sure you “Reset” the simulation before starting the next scenario. When you’re finished, reflect more generally on push (labor exceeds jobs) or pull (jobs exceed labor) dynamics within an urban community.

Record Changes in:	Population	Land	Jobs & Technology
Run simulation as initialized.	Over 100 years, the population grows to more than 30,000.	Urban land reserves are being used to build new factories (60% of land available used).	Until the end of the 100-year period, potential factory jobs exceed the available labor force, suggesting full factory employment.

Scenario	Impacts on:		
What Ifs:	Population	Land	Jobs & Technology
Population: Set immigration at 0 (no immigration).	Over 100 years, the population grows to only 11,000.	Fewer new factories reduce overall land requirements (38% occupied).	Factory growth is significantly reduced by limited labor force. Full factory employment.
Population: Increase death rate to 25 per 1000.	Population grows to just over 16,000.	Similar to above (45% of land occupied).	Same as above.
Population: Initial population was 5,000.	Population grows to more than 44,000.	Urban land reserves are increasingly used to build new factories (70% of land available used).	For 75 years, potential factory growth exceeds available labor force, suggesting full factory employment. However, accelerating growth in the labor force after that leads to significant job shortfalls and unemployment.
Population: Increase “Migrants in” to 10 per thousand.	Population grows to more than 46,000.	Same as above.	Same as above.
Land: Cut Urban Land Area setting to 50% of initial.	Population growth slows; totals are only 24,000 after 100 years.	Limited land boosts % occupied with factories to 72%.	Same as above.
Technology: Increase new factories by 5% per year.	Unchanged from initial run.	Accelerated factory creation increases demand on urban land reserves (82% of land available used).	Potential factory growth throughout the period creates more jobs, thereby allowing factory work force to grow. Near the end of the 100 years, however, limits on land reduce the growth rate of potential jobs, while accelerating growth in the work force leads to a shortage of jobs.
Jobs: Increase factory size by 50%.	Unchanged from initial run.	Less land is occupied than in the initial run (48% vs. 60%).	Throughout the entire 100-year period, potential factory growth exceeds the available labor force, indicating full factory employment.

STEP 3. Analyze Your Findings

Use the insights generated from these different scenarios to describe in general terms the conditions under which populations, land, and jobs and technology combine to create pull dynamics.

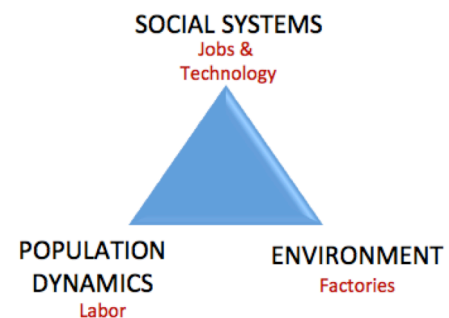
The storyline for urban growth focuses on the powerful draw or pull the city has on immigrants (both foreign and rural).

In testing a number of different scenarios using this simulation, students should be able to identify that the optimization of urban growth is achieved where:

1. the jobs and technology (Social Systems) sector fosters factory growth through both (a) a high factory creation rate (where existing factories lead to others, whether using related technologies or benefiting from existing urban networks or markets) and (b) an increase in the size of factories (likely the outgrowth of technology or economies of scale); and
2. the population sector is growing due both to natural increase (higher birth than death rates) and immigration; and
3. the land sector maintains sufficient reserves to meet the growing needs for new factories to be developed.

In contrast, limits to urban growth may result from slower growth in (a) factories being created or enlarged; (b) limits on available land to build new factories.

In all cases, students should be able to see the relationships between the three core sectors highlighted at the start of the simulation. This provides a general conceptual frame for thinking broadly about the dynamics of urbanization. Of course jobs in industries other than manufacturing (e.g., trade, transportation) were very important to the growth of urbanization. Nevertheless, the examples in this lesson focused on manufacturing labor, jobs and resources provide a powerful example of both the magnitude and character of the urban transition.



Student Guide – Part C, #2

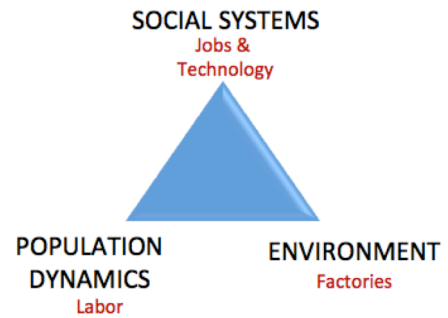
How Do Population Dynamics Create Push and Pull Forces in an Urban Setting?

This handout will guide you through a problem-solving exercise that uses a simulation to help you understand how interconnections between changing populations, factories, jobs, and technology influence push (people leaving) and pull (people entering) dynamics in an urban setting.

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

STEP 1. What Factors Contribute to Push and Pull Forces in an Urban Setting?

Open Sim 2 and read Page 1. Using the triangle visual describe how population dynamics (labor), environment (factories), and social systems (jobs & technology) create push and pull forces in an urban setting.



Social Systems

Population Dynamics

Environment

STEP 2. How Does the Simulation Extend Your Understanding of Urban Push and Pull Dynamics?

Open Page 2 and carefully familiarize yourself with how the simulation is set up to include population dynamics (labor), environment (factories), and social systems (jobs and technology):

- There is an initial urban population of 2500 that is growing because the annual birth rate (30 per 1000) is higher than the death rate (initially, 15 per 1000); and migrants are arriving at a rate of 5 per 1000 in the population.
- There are 50 factories, each having an average of 25 jobs and, as a result of new technology, new factories are growing at a 3% annual rate.
- There are significant urban land reserves to build more factories (initial setting is only 10 of 500 potential acres).
- The factory labor force is calculated as half of the entire urban population.

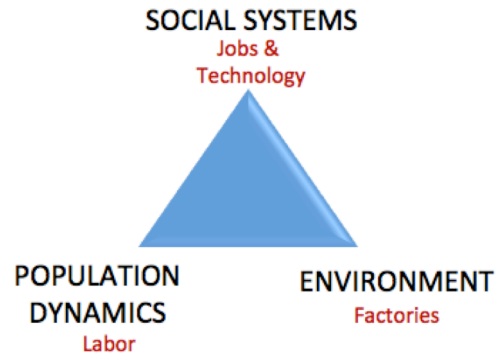
Run the simulation under the different “what if” conditions listed below and record what happens in each sector as a result. Make sure you “Reset” the simulation before starting the next scenario. When you’re finished, reflect more generally on push (labor exceeds jobs) or pull (jobs exceed labor) dynamics within an urban community.

Record Changes in:	Population	Land	Jobs & Technology
Run simulation as initialized.			

Scenario	Impacts on:		
What Ifs:	Population	Land	Jobs & Technology
Population: Set immigration at 0 (no immigration).			
Population: Increase death rate to 25 per 1000.			
Population: Initial population was 5,000.			
Population: Increase “Migrants in” to 10 per thousand.			
Land: Cut Urban Land Area setting to 50% of initial.			
Technology: Increase new factories by 5% per year.			
Jobs: Increase factory size by 50%.			

STEP 3. Analyze Your Findings

Use the insights generated from these different scenarios to describe in general terms the conditions under which populations, land, and jobs and technology combine to create pull dynamics.



Teacher Guide – Part C, #3

How Did Push and Pull Dynamics Population Dynamics Affect American History from 1820 to 1920?

This handout will guide you through a series of problem-solving exercises that:

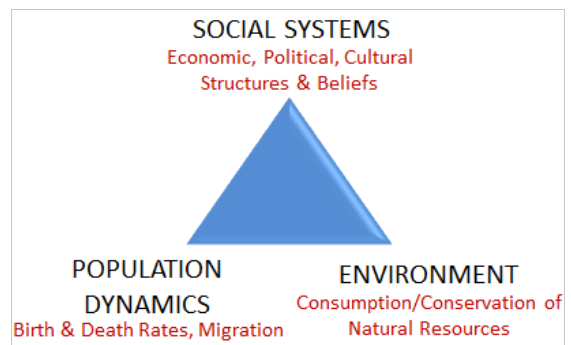
- *Examine the role of changing populations, environments, and social systems in fostering unprecedented urban growth in America during this period;*
- *Use a simulation to recreate both what happened and what might have happened had immigration, land, or technological innovation been different.*

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

Using what students have learned in Sims 1 and 2 about how changing population dynamics (including labor and immigration), land, jobs and technology can push (where labor exceeds jobs) or pull (where jobs exceed labor) people from one place to another, this simulation focuses on the circumstances that shaped America's successful urban transition between 1820 and 1920.

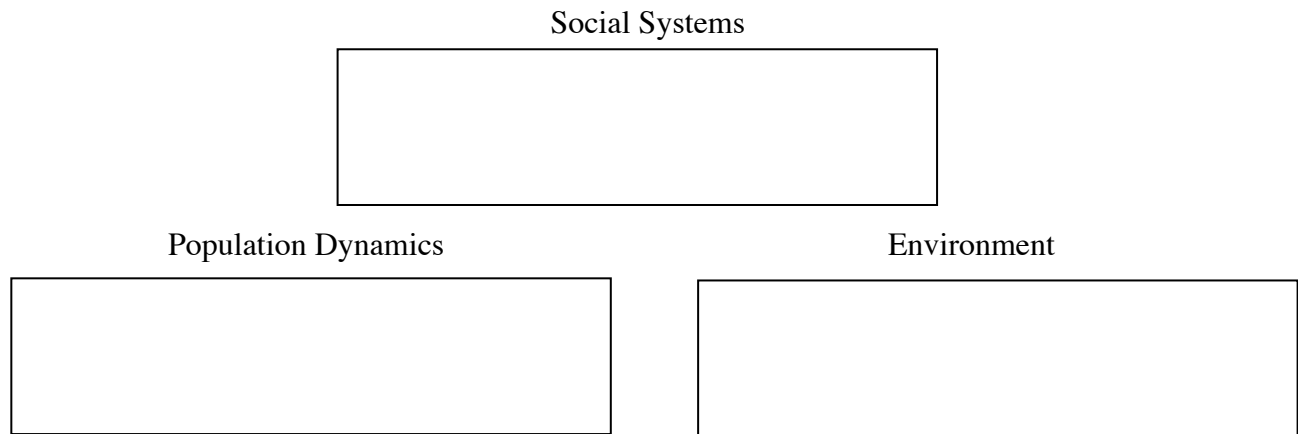
The lesson consists of three parts:

1. The first asks students to review and then synthesize a diverse collection of historical information involving major developments in rural and urban America during the period.
2. Students can then use the simulation to see how populations, jobs, and land changed over time (highlighting the three major interacting sectors shown in the diagram to the right); and then run historical counterfactuals (what if one or more factors, such as immigration, land, or technology had been different), to gain a better appreciation of a broader range of possible scenarios.
3. Finally, in putting all the pieces together that drive push and pull dynamics, students are asked to apply what they've learned in thinking about what is happening in different places around the world today and the likelihood that the urban transition will be a smooth and productive one (where population and job growth go hand-in-hand).



STEP 1. What Was Happening to Farming in the U.S. between 1820 and 1920?

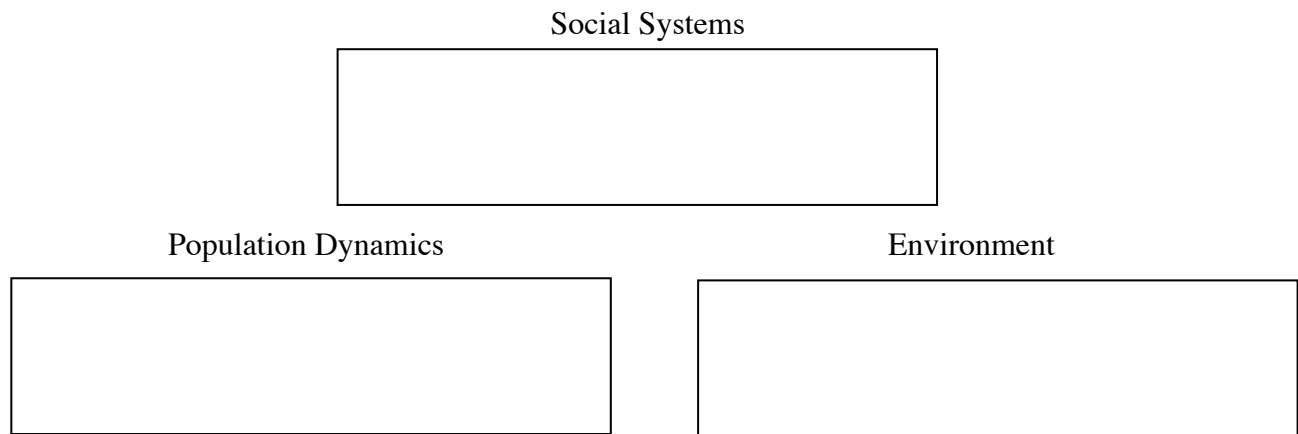
Open Sim 3 and read Page 1. Using the triangle visual, briefly describe how population dynamics, the environment, and social systems contributed to changes that included both farm growth and shrinkage during the period.



Students should recognize that, in absolute numbers, rural populations and land use grows continuously, suggesting that there's enough land to sustain an ever-growing rural population. At the same time, the continuing drop in farm jobs as a percent of the overall U.S. workforce makes clear that other labor sectors (presumably urban) are growing much more quickly. So, too, where jobs peak and then fall after 1900, it would appear that improved technologies and inventions that improve farm worker productivity translate into a need for fewer workers overall, even on larger amounts of land.

STEP 2. What Was Happening to Urbanization in the U.S. between 1820 and 1920?

Read Page 2. Using the triangle visual, briefly describe how population dynamics, the environment, and social systems combined to foster unprecedented urbanization in America between 1820 and 1920.



Urban growth far outpaces rural growth and at an ever-accelerating rate. In part, this reflects the fact that existing cities in 1820, like New York, Philadelphia, and Boston, are able to grow enormously as their combined role as manufacturing and trade centers is dramatically improved through the growth of new technologies and more jobs. At the same time, as a result of the transportation revolution and territorial expansion, new cities continue to grow throughout the century. Each begins with some comparative advantage: possibly as a transportation or market hub, or a manufacturing center, then grows over time.

Again, it is the extraordinary growth of urban populations that characterizes America's urban transition -- from fewer than 700,000 city dwellers in 1820 to more than 54,000,000 in 1920.

STEP 3. How Did Push and Pull Dynamics Affect American History from 1820-1920?

Read Page 3. How did each of the three major developments (immigration, land, technology & the transportation revolution) unfolding between 1820 and 1920 affect America's population dynamics, environment, and social systems? Use the boxes below to briefly describe connections between each pair.

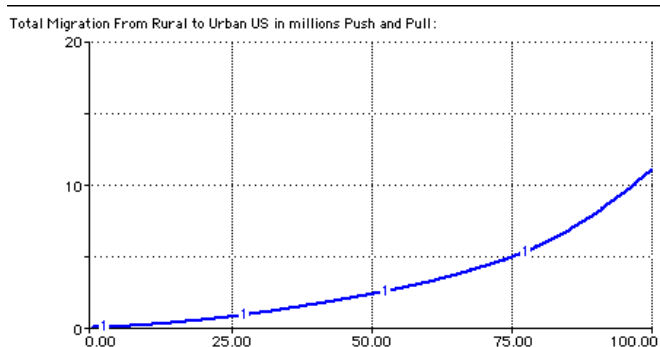
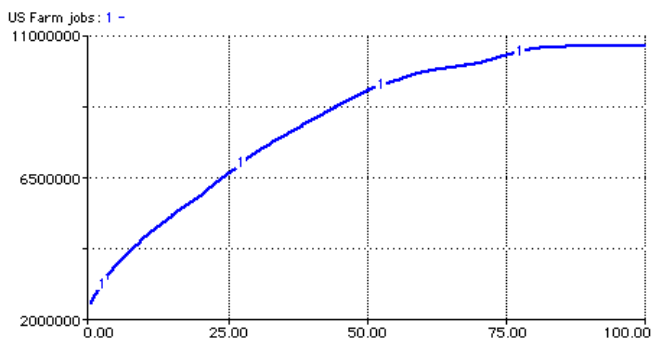
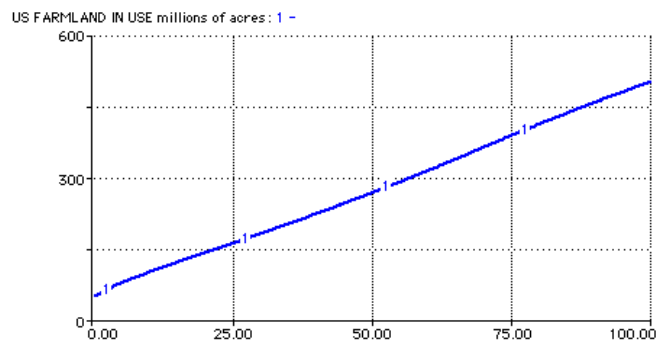
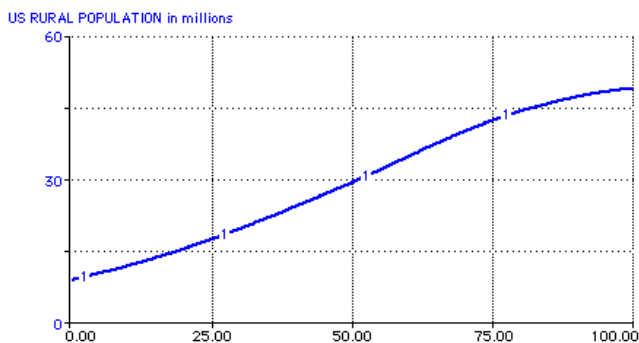
How are developments below connected to ➔	Population Dynamics (Immigration and Rural Migration)	Environment (Land)	Social Systems (Transportation and Technology)
Growing Waves of Immigration	The 30 million added immigrants over this period clearly contributed to America's population growth.	Some immigrants, particularly early on, settle in rural areas and increase land demands. Later urban settlers need jobs.	Indirect connection (e.g., infrastructure to accommodate quickly growing population).
U.S. Territorial Expansion	Greater availability of land affords an opportunity to accommodate more people.	More available farmland for potential farm workers; and, eventually, new cities.	Clearly creates incentives for transportation and communication to connect the regions and thereby foster greater opportunities for job growth.
Invention and Technology	No direct connection	Agricultural technologies improve opportunities to develop new farms; other technologies support the development of new cities.	Technologies build on new inventions, facilitating growth in urban and rural jobs.
The Transportation Revolution	No direct connection	Connect regions, thereby fostering new rural and urban opportunities.	Connections between rural and urban sectors foster economic growth.

STEP 4. Use the Simulation to Explore “What Ifs” Involving Different Rates of Immigration, Land Availability, Jobs and Technology.

Open Page 4 and run the simulation without making any changes. Carefully review what happened in rural America (left graph) to its population (Page 1), labor force (Page 2), land (Page 3), and out-migration (Page 4). Access Pages 2-4 by clicking on the dog-ear under Page 1 at the bottom left corner of the graph. Describe below what was happening in all cases, with specific focus on if or when people were pushed out for reasons related to land, technology, and/or jobs.

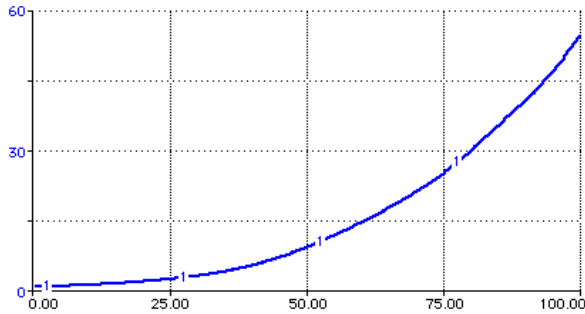
As noted earlier, the total rural population and the total area of improved farmland in use were growing throughout the period. Note, though, that the growth in farm jobs was slowing in later years, as a result of improved technologies and farm labor productivity.

This explains in the final graph why larger numbers of rural residents were being pushed, in later years, off the land and into cities.

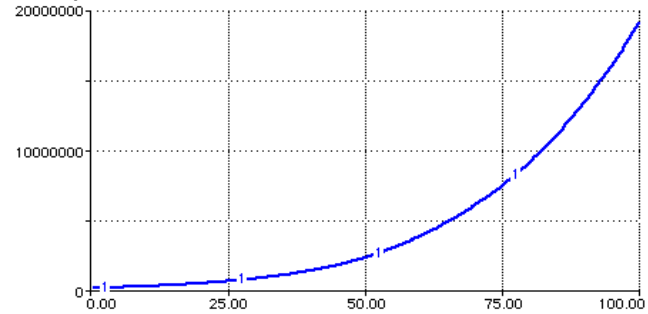


Now focus on the graphs on the right. Do the same with the urban sector, focusing on pull dynamics.

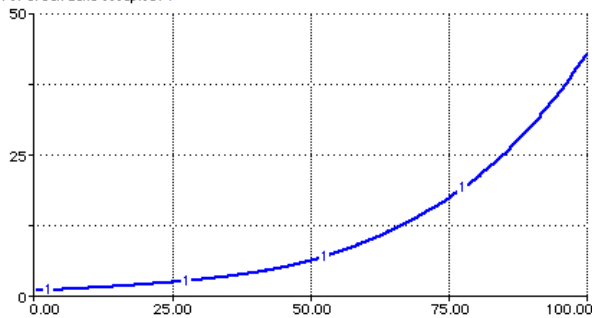
US URBAN POPULATION in millions



US urban jobs: 1 -



Percent of Urban Land occupied: 1 -



The fact that all three graphs show increasing rates of growth underscores that jobs are growing at a rate consistent with the population. Urban residents and their children, together with immigrants from abroad and from rural America, generally are successful in finding jobs within the constantly growing manufacturing and other sectors.

Now, let's use the simulation to rethink American history. Assume one or another of the developments that contributed to the American experience had either not been present or present in a different way. How might America's urban transition have been different? And how would the push and pull dynamics have differed? Consider several scenarios, and record major changes, rural or urban, in America's historical populations, jobs, and land.

	Rural America	Urban America
Population Sector: What if there had been no immigration?	The impact is small, given that the overall number of immigrants who settle here is small, and the farm sector is predominantly influenced by natural births and deaths.	In the cities, the impact is major, with overall growth in population and jobs cut by half. This reflects the influx of 30 million immigrants. In larger part, this shows growth generated by subsequent generations.
Land Sector: What if America had less land (reduce potential farmland from 900 to 100 million acres)?	Without land to meet the needs of a growing rural population, rural growth would have been stunted and many more people would have been pushed into cities.	The model assumes cities could have handled upwards of 20 million more residents. That's a question for discussion.
Farm Jobs and Technology: What if farm workers experienced no productivity gains due to technology?	The impact is somewhat small, since America retained sufficient land reserves. Fewer people in later years, though, would have been pushed off the land.	No significant change
Urban Jobs and Technology: What if factories didn't expand jobs due to improved technologies?	Urban pull is diminished.	Factory growth is limited by urban space, forcing far more land to be used and, in later years, fewer jobs. Though population grows, there appears to be significant unemployment.

STEP 5. Analyze What You've Learned

Review Page 5, which explains how the absence of immigrants, reduction of available farmland, and/or a lack of ongoing technological invention/innovation may have impacted its rural and urban jobs and, subsequently, the success of its growth and urban transition. Using everything you've learned in this lesson, explain how changing population dynamics (especially immigration and rural migration), land, and technology combine as a system to foster push and pull dynamics. For modern countries currently undergoing an urban transition, what drives future hopes and fears?

It is clear that America enjoyed a number of advantages that helped foster urban growth accompanied by job growth. These factors are best understood as functioning in a system:

1. **Factory Growth 1:** Where technologies allowed individual factories to expand their capacities and enlarge their work force, there was a cycle of ever-growing factories within urban centers.
2. **Factory Growth 2:** In addition, where technologies led to the diversification of factories (factory creation rate), such that one factory in effect “created” opportunities for others, there was yet another cycle supporting factory growth in cities.
3. **Rural Growth:** Where there was available land that could be converted for productive farming, that land could accommodate growing rural populations.
4. **Rural Dynamics:** While rural technologies rendered workers more efficient and therefore reduced the number of farm workers needed, efficiencies associated with farming allowed farmers who remained on the land to produce more, thereby presumably improving the financial benefits of farming. For those who were no longer needed to work the farms, urban job growth in factories and associated urban businesses offered an alternative living.
5. **Population Dynamics:** Because urban jobs were growing, opportunities presented themselves to both immigrants from abroad and, particularly in the later period, to rural immigrants.

What is evident from the “what ifs” is that any one of these productive and reinforcing cycles could have been affected by the loss or reduction of one variable, be it immigrants, land, or technology and, by the consequent loss in jobs.

Student Guide – Part C, #3
How Did Push and Pull Dynamics Population Dynamics Affect American History
from 1820 to 1920?

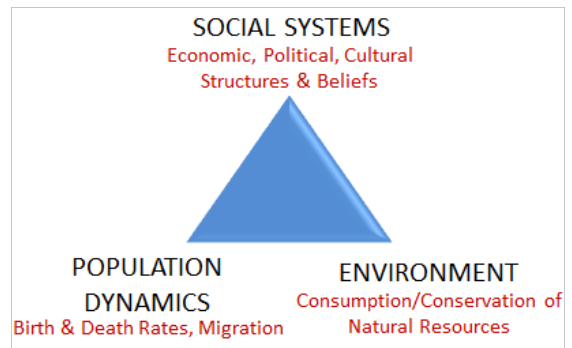
This handout will guide you through a series of problem-solving exercises that:

- *Examine the role of changing populations, environments, and social systems in fostering unprecedented urban growth in America during this period;*
- *Use a simulation to recreate both what happened and what might have happened had immigration, land, or technological innovation been different.*

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynC.asp>

STEP 1. What Was Happening to Farming in the U.S. between 1820 and 1920?

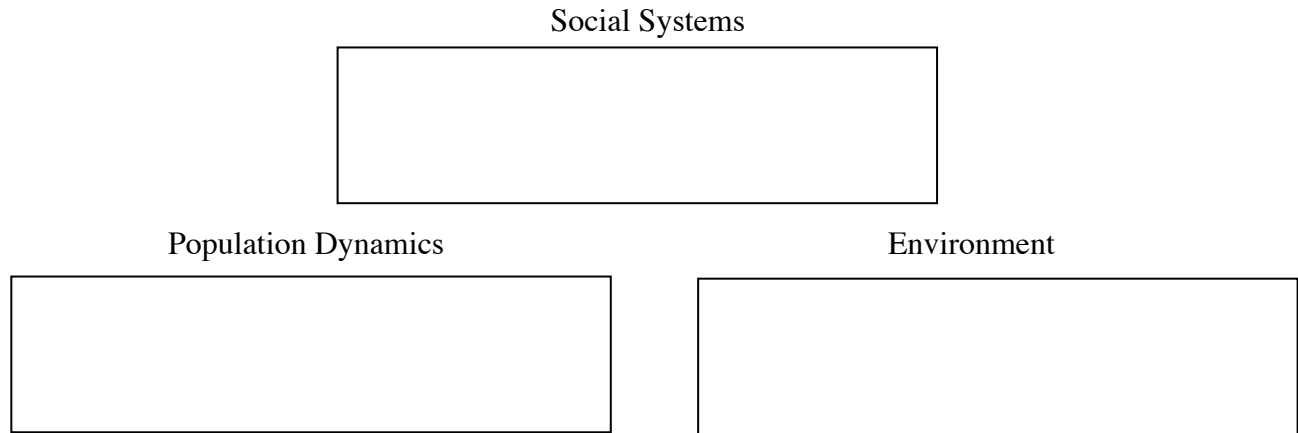
Open Sim 3 and read Page 1. Using the triangle visual, briefly describe how population dynamics, the environment, and social systems contributed to changes that included both farm growth and shrinkage during the period.



Social Systems	
Population Dynamics	Environment

STEP 2. What Was Happening to Urbanization in the U.S. between 1820 and 1920?

Read Page 2. Using the triangle visual, briefly describe how population dynamics, the environment, and social systems combined to foster unprecedented urbanization in America between 1820 and 1920.



STEP 3. How Did Push and Pull Dynamics Affect American History from 1820-1920?

Read Page 3. How did each of the three major developments (immigration, land, technology & the transportation revolution) unfolding between 1820 and 1920 affect America's population dynamics, environment, and social systems? Use the boxes below to briefly describe connections between each pair.

How are developments below connected to →	Population Dynamics (Immigration and Rural Migration)	Environment (Land)	Social Systems (Transportation and Technology)
Growing Waves of Immigration			
U.S. Territorial Expansion			
Invention and Technology			
The Transportation Revolution			

STEP 4. Use the Simulation to Explore “What Ifs” Involving Different Rates of Immigration, Land Availability, Jobs and Technology.

Open Page 4 and run the simulation without making any changes. Carefully review what happened in rural America (left graph) to its population (Page 1), labor force (Page 2), land (Page 3), and out-migration (Page 4). Access Pages 2-4 by clicking on the dog-ear under Page 1 at the bottom left corner of the graph. Describe below what was happening in all cases, with specific focus on if or when people were pushed out for reasons related to land, technology, and/or jobs.

Now focus on the graphs on the right. Do the same with the urban sector, focusing on pull dynamics.

Now, let's use the simulation to rethink American history. Assume one or another of the developments that contributed to the American experience had either not been present or present in a different way. How might America's urban transition have been different? And how would the push and pull dynamics have differed? Consider several scenarios, and record major changes, rural or urban, in America's historical populations, jobs, and land.

	Rural America	Urban America
Population Sector: What if there had been no immigration?		
Land Sector: What if America had less land (reduce potential farmland from 900 to 100 million acres)?		
Farm Jobs and Technology: What if farm workers experienced no productivity gains due to technology?		
Urban Jobs and Technology: What if factories didn't expand jobs due to improved technologies?		

STEP 5. Analyze What You've Learned

Review Page 5, which explains how the absence of immigrants, reduction of available farmland, and/or a lack of ongoing technological invention/innovation may have impacted its rural and urban jobs and, subsequently, the success of its growth and urban transition. Using everything you've learned in this lesson, explain how changing population dynamics (especially immigration and rural migration), land, and technology combine as a system to foster push and pull dynamics. For modern countries currently undergoing an urban transition, what drives future hopes and fears?

