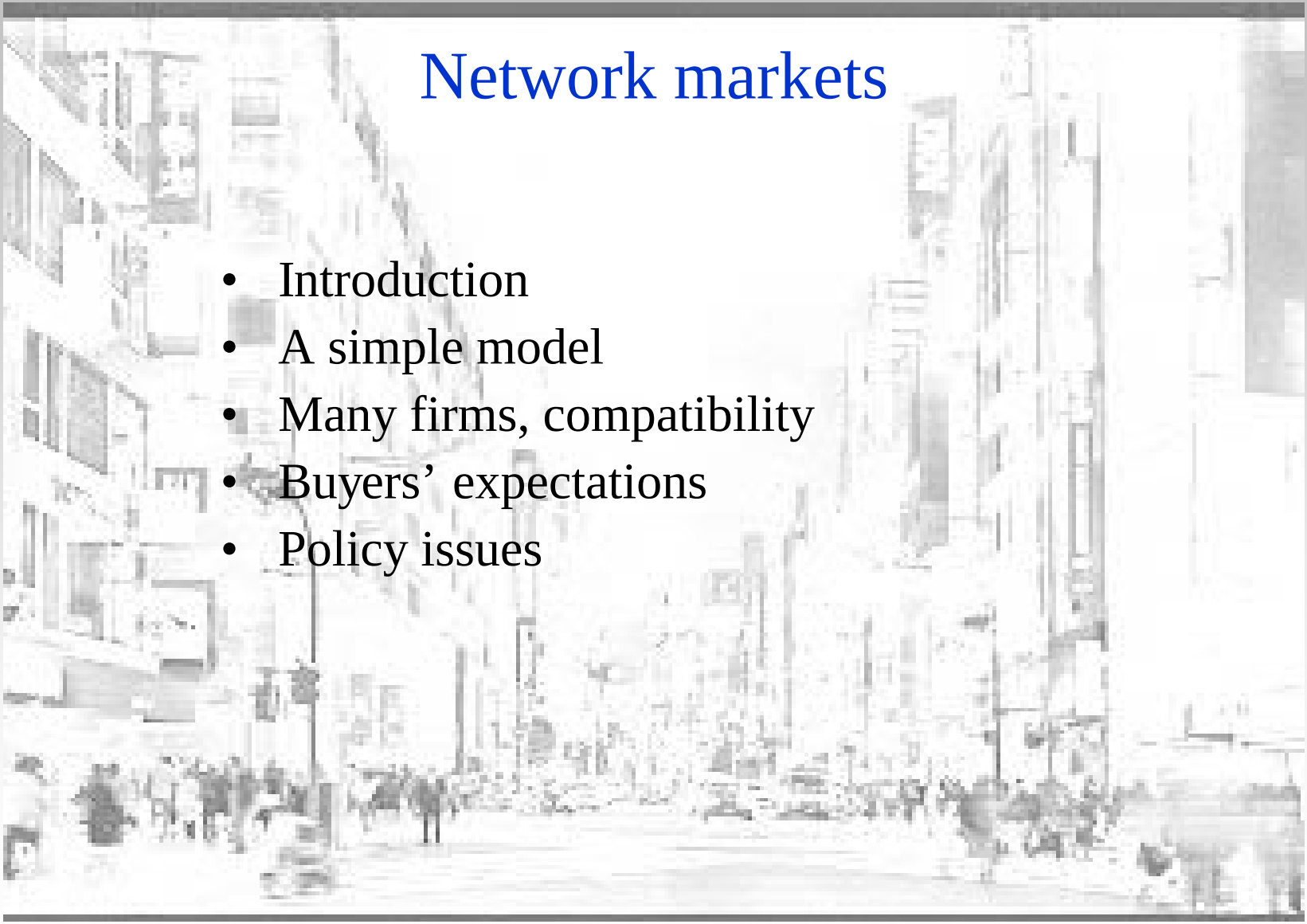




Network markets

- Introduction
- A simple model
- Many firms, compatibility
- Buyers' expectations
- Policy issues

Introduction

- Some products are popular with individual consumers precisely because each consumer places a value on others using the same good
 - A telephone is only valuable if others have one, too
 - Each user of Microsoft **Windows** benefits from having lots of other **Windows** users
- Network Effects or network externalities: each consumer's willingness to pay for a product rises as more consumers buy it

Monopoly Provision of a Network Service

- Rohlfs (1974)
- Imagine some service, say a network, where consumers “hook” up to the system but the cost of providing them service after that is effectively zero
 - **Provider is a monopolist charging a “hook up” fee but no other payment**
 - **The basic valuation of the product v_i is uniformly distributed across consumers from 0 to \$100. Consumer willingness to pay is fv_i where f is the fraction of the consumer population that is served**
 - **The i th’s consumer’s demand is:**

$$q_i^D = \begin{cases} 0 & \text{if } fv_i < p \\ 1 & \text{if } fv_i \geq p \end{cases}$$

Monopoly Provision of a Network 2

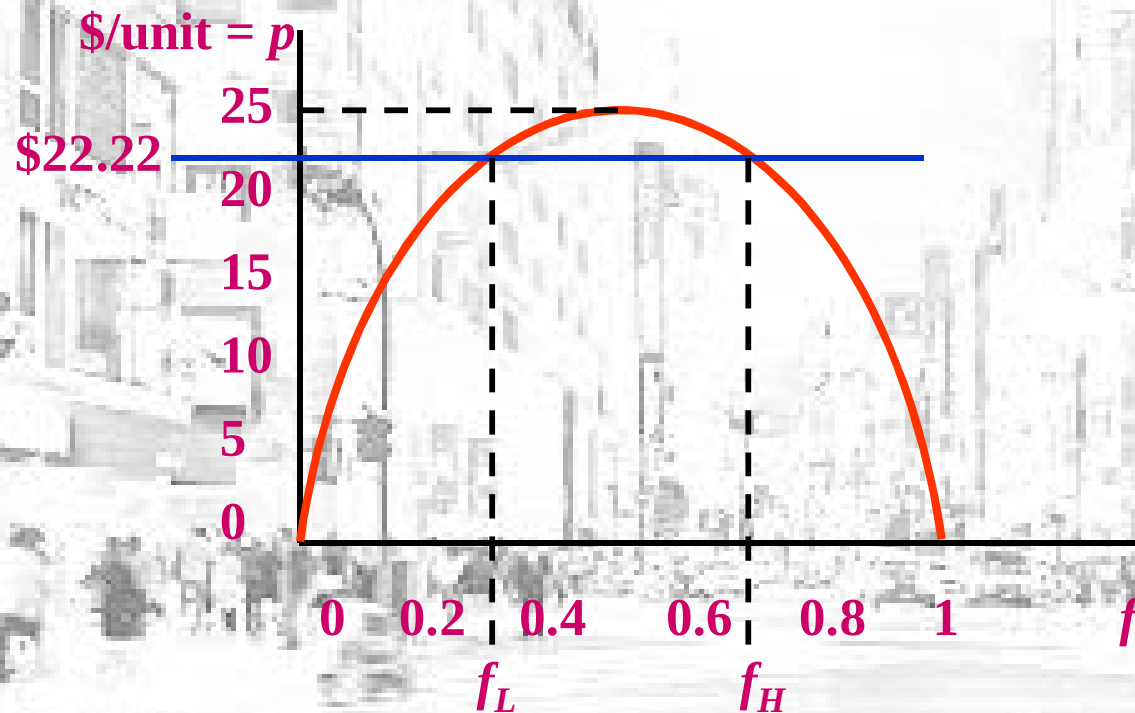
- Consider the marginal consumer with basic valuation $\tilde{v} = \frac{p}{f}$
- The firm will serve all consumers with valuations $\geq \tilde{v}$
- With 100 consumers, solving for the number of consumers served we have:

$$100f = 100 - \tilde{v} = 100 - p/f$$

- So, the inverse demand function is: $p = 100f(1 - f)$

Monopoly Provision of a Network 3

- The inverse demand curve has both upward and downward sloping parts. This means that there are two possible values for the fraction of the market served at any price p .

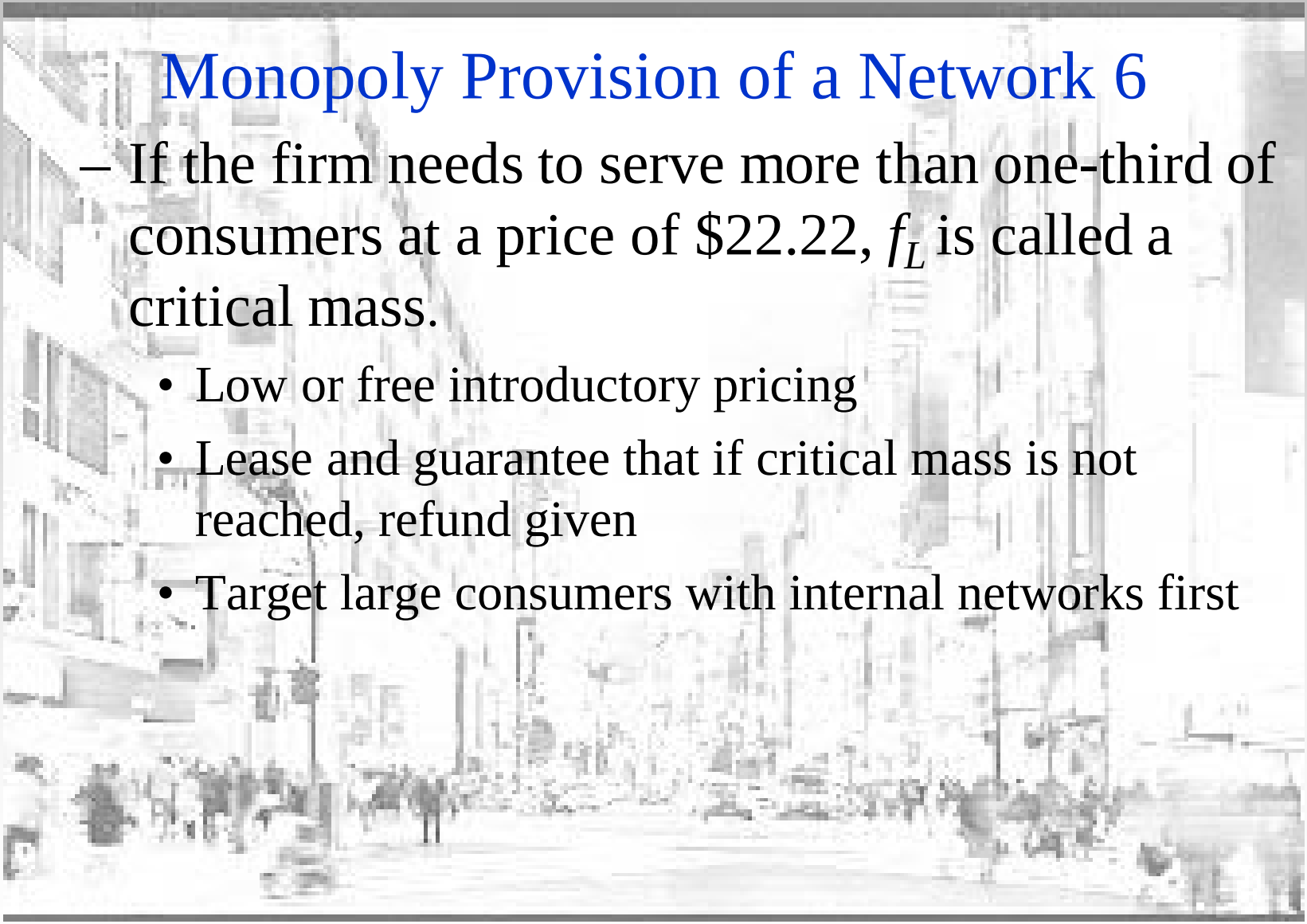


Monopoly Provision of a Network 4

- The Rohlfs model makes clear many of the potential problems that can arise in markets with network effects
- 1. The market may fail altogether
 - Suppose the firm must set a fee over \$30 perhaps to cover fixed costs
 - Network will fail even though it is socially efficient
 - **When half the market is served, the customers hooking up have v_i 's that range from \$50 to \$100 or fv_i values that range from \$25 to \$50**
 - **Average value is then \$37.50, well above \$30**
 - **But as p rises to \$30, f falls and so does average willingness to pay**
 - **There is no price at which sufficient numbers of consumers sign on that yields an average willingness to pay of \$30**

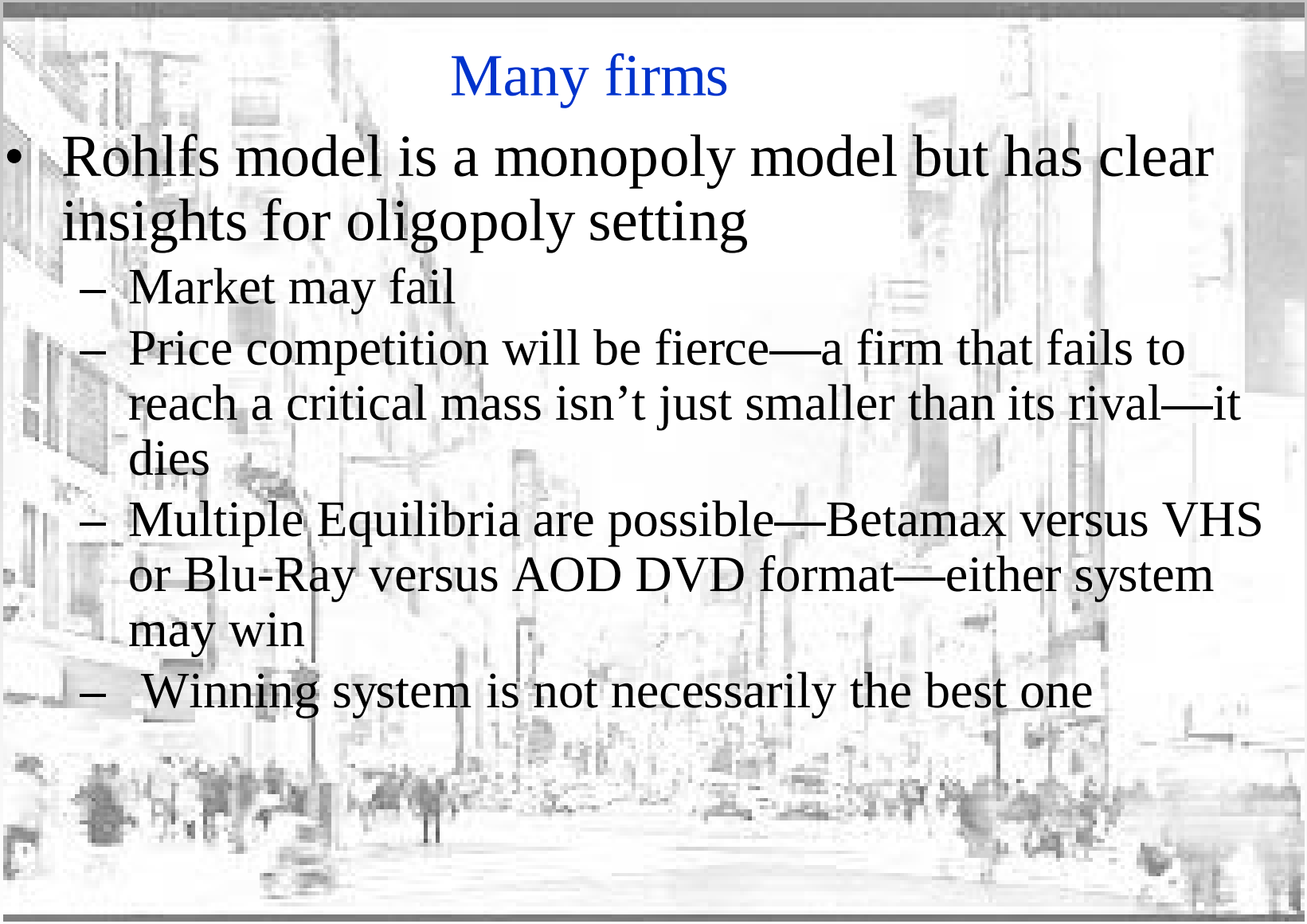
Monopoly Provision of a Network 5

- 2. There are multiple equilibria
 - At $p < \$25$, there is more than one equilibrium value of f
 - At $p = \$22.22$ both $f_L(p) = 1/3$ and $f_H(p) = 2/3$ are possible f values
 - Lower fraction may be unstable (tipping)
 - This group is comprised of consumer with top one-third of v_i values
 - The addition of one more consumer will raise willingness to pay sufficiently that consumers with the next highest third of v_i values will be willing to pay and we will move to the f_H equilibrium
 - The loss of one consumer will lower the willingness to pay of that same top one-third and demand will fall to zero at $p = \$22.22$



Monopoly Provision of a Network 6

- If the firm needs to serve more than one-third of consumers at a price of \$22.22, f_L is called a critical mass.
 - Low or free introductory pricing
 - Lease and guarantee that if critical mass is not reached, refund given
 - Target large consumers with internal networks first



Many firms

- Rohlfs model is a monopoly model but has clear insights for oligopoly setting
 - Market may fail
 - Price competition will be fierce—a firm that fails to reach a critical mass isn't just smaller than its rival—it dies
 - Multiple Equilibria are possible—Betamax versus VHS or Blu-Ray versus AOD DVD format—either system may win
 - Winning system is not necessarily the best one