Public Choice **99:** 403–437, 1999.

Market failure, government failure, and the private supply of public goods: The case of climate-controlled walkway networks*

MICHAEL R. MONTGOMERY[1] & RICHARD BEAN[2]
[1]*Department of Economics, Stevens Hall, University of Maine, Orono, ME 04469-5774, U.S.A.;* [2]*Department of Economics, University of Houston, Houston TX 77204-5882, U.S.A.*

Accepted 1 September 1997

Abstract. Two opposing models of public-goods undersupply are those of "market failure" and "government failure". Empirical work on the relative explanatory power of these two frameworks has been limited by the scarcity of acceptable data. The case of climate-controlled walkways in major urban cores is a rare instance where such difficulties can be overcome. We investigate the supply of CCWs in 55 large city-cores in North America. We find that (1) CCW networks are well-supplied by market forces, when (2) such forces are not frustrated by government policy. We also find evidence that (3) *rules-based* regimes dominate *discretion-based* regimes. These results are consistent with the position that the "government-failure" paradigm is a viable alternative to the traditional "market failure" paradigm.

1. Introduction

Ever since Samuelson's (1954) seminal contribution, the collective- or public-goods problem has been one of the most influential arguments confronting free-market institutions. In this paradigm, "free-riders" and high transactions costs to cooperative production lead to undersupply of public goods under market-based supply arrangements. Government is needed: [a] to force payment on such goods, and/or [b] to cut through the prohibitive transaction costs hampering private production.[1]

However, in more recent years a countervailing literature has developed around the theme that private arrangements can be successful at supplying public goods. On this view, it is government impediments to their production – not "market failure" – that is the decisive factor causing undersupply of public goods (e.g., Coase 1974, Beito and Smith 1990, Benson 1994, Foldvary 1994, Gunderson 1989; see also the articles in Cowen 1992). In this "government

* We thank an anonymous referee, Gordon Tullock, Randall G. Holcombe, Wayne M. Babovich, and participants in a session at the 1995 Public Choice Association annual meetings where an early version of this work was presented. We also thank the many City, Chamber of Commerce and other officials, too numerous to thank individually, who participated in our survey and interview process. Responsibility for any errors rests solely with the authors.

failure" framework, government fails by placing barriers in the way of free-market initiatives which would otherwise coordinate the private production of public goods.

Empirical evidence concerning the debate over market failure vs. government failure has been slow to accumulate, due largely to the difficulty of acquiring acceptable data. Many otherwise promising areas for study already are dominated by government, so that alternative private supply arrangements are uncommon (for example, local roads). Historical studies of cases which pre-date the government role are interesting and suggestive (e.g., Olasky 1992), but the quality of historical data often are poor, hampering formal testing. Finally, many of the most interesting modern cases involve the supply of local public goods, but local data frequently are unavailable and, again, of poor quality.

The case of Climate-Controlled Walkway [CCW] networks in major urban cores is a rare instance where these difficulties can be overcome. CCWs are weather-conditioned pedestrian bridges or tunnels linking buildings, which allow pedestrians to move between buildings without using city streets. A "CCW network" is a connected series of such CCWs. Prominent examples are the mixed tunnel/skywalk systems of Houston, Edmonton, and Dallas, the skywalk systems of Minneapolis, Des Moines, Calgary, and Cincinnati, and the tunnel systems of Montreal and Toronto. CCWs offer advantages to urban pedestrians (e.g., protection from inclement weather and crime, and separation from automobiles).[2]

CCW networks meet the traditional public-good classification criteria: Their production is subject both to free-riding problems and high transactions costs among their builders (see Section 2). Further, since the fundamental unit of a CCW network is the individual link connecting two buildings, and since the existence of such a link is nearly always a far more significant fact than is its length or other features, quantifying a CCW network's size is a relatively noncontroversial task (when compared with many public goods). Finally, city policies concerning such systems vary widely from outright bans to full financial support (with many intermediate cases) – so that one can study their supply (or nonsupply) over a wide range of existing institutions. In particular, a number of such networks (e.g., Houston, Minneapolis) are private in their inception and development, while others (e.g., Des Moines, St. Paul, Calgary, Cincinnati) are public. Moreover, cities differ dramatically in their regulatory attitude towards CCWs, some adopting essentially a "rules-based" approach, others opting for a more traditional "discretion-based" regulatory framework.

Thus, CCW networks are a fruitful source to turn to in seeking additional information pertaining not only to the controversy over "market failure" vs. "government failure", but pertaining also to the question of how differ-

ent institutional settings promote private-sector participation in the supply of public goods.[3] Accordingly, this paper investigates the institutional arrangements leading to the creation (or noncreation) of CCW networks. We investigate the supply of CCWs in 55 large city-cores in North America. We find that (1) CCW networks are well-supplied by market forces, when (2) such forces are not frustrated by government policy. We also find evidence that (3) *rules-based* regimes dominate *discretion-based* regimes. These results are consistent with the position that the "government-failure" paradigm is a viable alternative to the "market failure" paradigm.

2. Public-good characteristics of CCW networks

In this section we briefly establish the public-good characteristics of CCW networks, and look at policies that are based on the market-failure premise. We focus on the fundamental issue of free-riding, in two contexts.[4] (1) It is difficult and costly for suppliers of CCWs to exclude nonpayers from consuming the services provided by the network. (2) It is difficult and costly for suppliers of CCWs to reach agreement with other suppliers (and potential suppliers) on issues relating to the expansion and coordination of the network. Thus, undersupply results without government assistance (in the traditional view).

"Free-riding" consumers: Consumers of the network's services pay no toll for using the system.[5] While owners can extract payment indirectly through various "tying" arrangements (e.g., they receive higher rents from tenants, they lease retail space connected to CCW pathways and acquire a portion of the proceeds through rents), an owner's ability to "tie" is limited to those who contract business in that part of the network.[6] Any user may free-ride by (a) not working in the building, and (b) not purchasing enough retail items to generate rents equal to the shadow user fee. In general, one expects high numbers of "nonpaying" relative to "paying" customers.[7] Given that "tying" arrangements are not fully efficient, an argument for undersupply emerges naturally (some CCWs are not built because all who benefit cannot be forced to pay).

"Free-riding" suppliers: In a free-market CCW network, the various parts of the network will be supplied by a number of different building owners. "Market-failure" theory implies that such an institutional arrangement will be inefficient, as some owners of CCWs free-ride on the activities of owners of other links, and as high transactions costs frustrate attempts to coordinate action favorable to the network as a whole.

Once a CCW owner is linked to the network, (s)he stands to reap a free windfall as the system grows. Consider a proposal for a new, strategically-

placed link (perhaps linking two previously-unconnected smaller networks). In a free-market network, typically the costs of construction would be borne by the owners of the two buildings physically connected by the new link, while most of the network gains cannot be captured by the two owners. An owner contemplating a new link may seek to extract a part of the gain jointly accruing to all network owners by attempting to negotiate a mutually favorable agreement with other network owners. However, since this involves extracting gains from a large number of owners, transactions costs – including demand-revelation problems – in these situations will be high, and a strict Coase (1960) type of solution difficult to reach (e.g., Dahlman 1979: 159).[8]

Strategically-placed owners (or a cartel of such owners) might also attempt to extract exorbitant rents in exchange for a crucial link, hampering its construction. There is also the difficulty of inducing owners who are already hooked up to allow a competitor to join the system.[9] These "rent-seeking" strategies place barriers in the way of a network's growth to its socially optimal size, and can be cited to support the centralization of the route-planning process in City Hall. One can also point to some coordination problems: The traditional view would be that free-market cities tend to invest inefficiently by producing CCWs that tend not to be linked to each other. The prospective CCW system is poorly-integrated in the absence of a central authority which can "internalize" the positive externalities stemming from a single, interconnected network.[10] Traditional market-failure theory thus implies coercive government power is needed to bring order to the "chaotic" environment brought on by the invisible hand.

The view that CCW networks are public goods which the private sector both undersupplies and supplies in poorly-integrated form is widespread among city planners, and it has strongly influenced supply arrangements in several cities that favor such networks. Four cities with substantial systems – Des Moines, Calgary, Cincinnati, and St. Paul – are *publicly-owned* systems, with control and coordination of network expansion, as well as CCW financing and construction, under direct city control. Networks in several other cities (e.g., Milwaukee, Winnipeg, and Wichita) are predominately owned privately, but the cities offer substantial subsidies to CCW construction and exercise considerable control over network development. Such arrangements are partly in response to the perceived undersupply problem: "[T]he presence of existing buildings on many potential skywalk links and other situations which would otherwise create gaps in the network has necessitated continued City involvement" (City of Milwaukee 1989: 5–6).

In return for their financial contributions, cities acquire control over the network planning process: "Responsibility for the coordination of the [CCW] system rests with the City of Calgary" (City of Calgary 1984: 6). Central

control is seen as crucial to a well-integrated system: "The key to the success of Cincinnati's skywalk is that it was conceived and implemented as a walkway system of interconnected routes rather than isolated individual bridges" (Urban Land Institute 1979). City policies promoting a well-integrated network take many forms. Des Moines, Calgary, Dallas, and other cities have established "skywalk districts" in their downtowns, for which these cities have developed long-range plans specifying in detail the desired locations of future links. (In these cities, such plans are important determinants of whether new links proposed by building owners are approved/financed or rejected.) Calgary requires developers to supply basic skywalk system amenities in order to obtain a base building density; additional density allowances then are granted if further city-defined system needs are met (City of Calgary, 1991).

Additional policies in place combat perceived high transactions costs associated with private-sector bargaining over new links. Des Moines, St. Paul and several other "public"-network cities condition the approval process on the owner's agreeing in advance to an easement "for public pedestrian travel through and over any future skywalk corridor" such that agreement to link one skywalk to your building automatically commits you also to a link to the next block (City of Des Moines 1986: 11). Calgary has established a skywalk fund, to which developers within the downtown core are required to contribute in order to achieve base density (City of Calgary 1991).[11] Using the fund, Calgary "will intervene to pay part of the cost where necessary to complete a crucial connection" (City of Regina Working Committee 1991: 14).

3. Public vs. private networks: What do the data say?

The last section described a variety of city policies designed to combat the presumed tendency of free markets to undersupply CCW networks. Is there evidence that such a tendency exists? To find out, we contacted 71 U.S. and Canadian cities asking about basic city facts, the size and scope of any CCW presence in their city "core", and city policies towards CCWs. Responses were received from 62 cities, from which a data set of 55 cities was constructed. Survey results are reported in Table 1.[12] Despite the formidable array of difficulties that *appear* to impede free-market systems, the private sector can be quite good at supplying CCW networks. The two largest systems, Houston and Minneapolis, are privately supplied and considerably larger than all but two of their publicly-supplied counterparts. Further, good-sized private systems (Columbus, Atlanta, Cleveland) exist in other large and midsize cities, and a surprising number of such systems are found in smaller cities (Ft. Worth, Spokane, Chattanooga). At the other extreme, a number of large cities subject

to cold and/or hot and humid weather have very few CCWs in comparison to what one might plausibly expect (New York City, Boston, Tampa).

While such direct comparison of CCW numbers and city policies is informative, more can be learned after controlling for factors likely to affect CCW-presence in city-cores. These factors are of three types: (i) a city's stated policy toward CCWs; (ii) "control" variables capturing the "structural" features of a city's nonpolicy environment as it may relate to CCWs; and (iii) general political variables. CCW-formation is predicted to be directly related to: whether a city actively encourages the development of CCWs (CYES, Type i), downtown-core size (SPACE, ii), downtown-core density (DENSITY, ii), severity of weather conditions (WEATH, ii), newness of downtown skyline (AGE, ii), and the severity of a city's crime problem (CRIME, ii). CCW-formation is predicted to be inversely related to: whether a city actively discourages CCW development (CNO, i), the "softness" of a city's economic climate (U, ii), building construction cost (COST, ii), and the percent of all metro-area workers employed by a city (CITYEMP, iii; it proxies for city-government activism).[13] We also investigate (without priors) the impact of political-party control of the Mayor's office (years held by: Democrats [MDEM, iii]; Republicans [MREP, iii]; and city-managers plus nonpartisan mayors [CMNP, iii]). Finally, the prominence of public transportation (PUBT, ii) can have inverse or direct impact depending on whether it is a substitute or complement to CCWs. All these variables (and their sources) are described further in Table 1 and the Appendix. Those not available in comparable form across U.S. and Canadian cities are studied in the U.S. portion of the sample.

Tables 2a and 2b give correlation coefficients for the data set. Correlations with CCW are in the direction predicted (except for the crime measure). Cities actively discouraging CCWs tend to be Democratic cities, with higher employment rolls per capita, higher crime rates, more public transportation, better weather and less dense "cores". (That policies of discouragement are correlated both with better weather and less "core" density suggests that policy decisions are somewhat "price"-sensitive.) Cities actively encouraging CCWs tend to be "apolitical" cities run by city managers and/or nonpartisan mayors, with lower crime rates, worse weather and a [weaker] tendency towards lower employment rolls per capita. Democratic cities tend to discourage CCWs and tend to be neutral towards policies encouraging their development, while "apolitical" cities tend to encourage CCWs and are negative towards policies of discouragement. Republican cities tend to be negative towards policies both of encouragement and discouragement.[14]

We carried out regression analysis for, (1) all cities, and, (2) U.S. cities only – this last allows us to assess the explanatory power of those "control" variables that are available only for U.S. cities. The Akaike selection proce-

Table 1. Data (series available for all cities)

	Number of CCWs in "core"	Buildings linked consecutively by CCWs, as a percent of number of CCWs	Millions of square feet of office space in "core"	weather index	City encourages CCWs (= 1)	City discourages CCWs (= 1)	Unemployment rate, 1970–90 Ave.	Percent of "core" tall building stories built during 1970–90	"Core" tall building stories as a percent of SPACE
City	CCW	INTEG	SPACE	WEATH	CYES	CNO	U	AGE	DENSITY
Houston (0,0)	78	76	51.0	1.467	0	0	6.3	85.3	40.3
Minneapolis (0,0)	70	143	19.0	1.164	0	0	5.2	79.2	33.6
Calgary (1,0)	67	34	33.9	0.955	1	0	6.9	80.9	39.1
Montreal (1,0)	65	49	24.7	1.291	1	0	9.8	76.3	28.9
Dallas (1,0)	54	48	40.8	1.205	1	0	5.2	77.4	31.0
Toronto (1,0)	53	102	31.4	0.989	1	0	6.0	84.7	57.1
Des Moines (1,0)	52	94	7.4	1.130	1	0	5.4	100.0	14.1
Edmonton (1,0)	46	83	14.5	1.026	1	0	7.1	55.9	26.1
St. Paul (1,0)	46	120	6.7	1.164	1	0	5.2	71.3	29.0
Oklahoma City (1,0)	37	103	8.5	1.033	1	0	5.2	71.0	21.5
Winnipeg (1,0)	36	92	17.0	1.563	1	0	7.4	48.2	11.7
Chicago (1,0)	34	71	60.0	1.042	1	0	8.1	45.4	59.8
Columbus (0,0)	31	39	19.3	0.952	0	0	6.3	84.3	23.4
Cincinnati (1,0)	27	93	17.0	0.925	1	0	8.0	51.5	23.8
Milwaukee (1,0)	26	65	12.0	1.155	1	0	7.4	72.6	15.8
Ft. Worth (0,0)	25	52	7.9	1.205	0	0	6.0	75.5	31.7
Atlanta (0,0)	20	105	14.0	0.799	0	0	7.0	72.3	97.1
Cleveland (0,0)	20	40	20.0	1.056	0	0	9.7	44.5	21.5
Louisville (0,0)	20	65	5.4	0.948	0	0	7.1	87.2	42.0

Table 1. Continued

City	Number of CCWs in "core"	Buildings linked consecutively by CCWs, as a percent of number of CCWs	Millions of square feet of office space in "core"	weather index	City encourages CCWs (= 1)	City discourages CCWs (= 1)	Unemployment rate, 1970–90 Ave.	Percent of "core" tall building stories built during 1970–90	"Core" tall building stories as a percent of SPACE
City	CCW	INTEG	SPACE	WEATH	CYES	CNO	U	AGE	DENSITY
Spokane (0,0)	19	84	1.5	0.907	0	0	8.4	0.0	0.0
St. Louis (0,1)	16	81	30.0	1.042	0	1	8.4	55.4	13.8
Indianapolis (0,0)	14	64	6.5	1.018	0	0	6.3	62.1	36.9
Pittsburgh (0,1)	14	21	30.0	0.945	0	1	7.7	42.5	25.0
New Orleans (0,0)	13	23	24.6	1.192	0	0	8.7	77.9	25.8
Richmond (0,0)	13	31	6.0	0.884	0	0	4.9	59.7	21.5
Vancouver (0,0)	13	62	24.0	0.600	0	0	8.7	56.1	50.9
Charlotte (1,1)	10	140	9.0	0.881	1	1	4.5	82.0	19.8
Seattle (0,1)	10	30	28.9	0.463	0	1	7.6	80.7	34.5
Chattanooga (0,0)	9	33	1.2	1.029	0	0	6.7	0.0	0.0
Denver (0,0)	9	22	25.0	0.757	0	0	5.9	89.3	36.8
Halifax (0,0)	9	156	5.0	1.306	0	0	8.5	0.0	6.2
Regina (0,0)	9	156	2.8	1.618	0	0	6.4	0.0	0.0
St. John (1,0)	9	67	0.9	1.362	1	0	9.7	0.0	0.0
Kansas City (0,0)	8	113	7.0	1.061	0	0	6.3	49.5	68.1
Phoenix (0,0)	8	25	5.0	1.013	0	0	6.5	54.6	45.4
Wichita (1,0)	8	125	3.4	1.074	1	0	6.2	0.0	0.0
Buffalo (1,1)	7	71	6.7	1.333	1	1	10.5	32.0	18.7

Table 1. Continued

City	Number of CCWs in "core" CCW	Buildings linked consecutively by CCWs, as a percent of number of CCWs INTEG	Millions of square feet of office space in "core" SPACE	weather index WEATH	City encourages CCWs (= 1) CYES	City discourages CCWs (= 1) CNO	Unemployment rate, 1970–90 Ave. U	Percent of "core" tall building stories built during 1970–90 AGE	"Core" tall building stories as a percent of SPACE DENSITY
Little Rock (0,0)	7	43	4.6	1.164	0	0	5.3	70.6	33.3
Tulsa (0,0)	7	71	9.9	1.093	0	0	5.5	61.3	35.8
Birmingham (0,0)	5	40	5.0	1.099	0	0	9.1	82.1	30.2
Omaha (0,0)	5	140	4.7	1.136	0	0	5.2	0.0	6.4
Orlando (0,1)	5	80	7.4	1.247	0	1	6.1	100.0	8.5
Newark (1,0)	4	100	4.0	0.879	1	0	10.7	77.7	65.0
Norfolk (1,1)	4	100	3.6	0.748	1	1	6.2	0.0	0.0
San Francisco (0,1)	4	150	60.0	0.123	0	1	7.1	53.2	27.8
Tampa (0,1)	4	75	6.2	1.288	0	1	6.7	100.0	23.9
Madison (0,1)	3	67	2.5	1.092	0	1	4.0	0.0	0.0
Portland [OR] (0,1)	3	100	13.4	0.504	0	1	7.7	59.7	13.1
Wilmington (0,1)	3	133	4.5	0.847	0	1	7.7	0.0	0.0
Boston (0,1)	2	150	42.0	0.911	0	1	6.7	68.7	28.1
Jacksonville (0,1)	2	100	6.2	1.114	0	1	5.5	79.9	22.4
Saskatoon (0,0)	2	100	2.7	1.334	0	0	7.9	0.0	0.0
Ottawa (0,1)	1	200	10.6	1.232	0	1	7.4	0.0	10.0
San Diego (0,0)	1	200	10.4	0.069	0	0	7.5	72.3	18.1
Providence (0,0)	0		6.1	0.834	0	0	7.4	37.5	13.1

Table 1. (Cont. Data (series available for U.S. cities only, except COST)

City	Construction building cost index 1970–90 ave. COST	Percent of journeys to work using public transportation, 1970–90 Ave. PUBT	Serious crimes known to police per 100,000 residents, 1970–90 Ave. CRIME	Number of democratic mayor years, 1970–1990 MDEM	Number of republican mayor years, 1970–1990 MREP	Number of city manager plus non partisan-mayor years, 1970–90 CMNP	Percent of total city workforce employed by city, 1970–90 Ave. CITYEMP
Houston (0,0)	96.6	6.4	7541	3	0	18	2.32
Minneapolis (0,0)	98.6	18.9	9312	12	0	9	2.72
Calgary (1,0)							
Montreal (1,0)	94.0						
Dallas (1,0)	93.1	8.5	11508	0	0	21	3.03
Toronto (1,0)	103.8						
Des Moines (1,0)	95.3	5.4	8080	0	0	21	2.36
Edmonton (1,0)	101.5						
St. Paul (1,0)	98.7	13.2	7408	16	0	5	2.42
Oklahoma City (1,0)	93.6	1.7	8601	0	0	21	2.31
Winnipeg (1,0)	99.9						
Chicago (1,0)	100.6	32.8	6604	21	0	0	3.43
Columbus (0,0)	98.7	7.9	8361	2	19	0	2.47
Cincinnati (1,0)	99.6	13.8	7806	0	0	21	4.89
Milwaukee (1,0)	98.4	14.8	6337	19	0	2	3.21
Ft. Worth (0,0)	94.1	3.4	10982	0	0	21	2.63
Atlanta (0,0)	90.5	21.9	12552	21	0	0	4.21
Cleveland (0,0)	106.4	18.6	8482	5	16	0	4.65
Louisville (0,0)	95.2	10.7	6306	21	0	0	3.84
Spokane (0,0)	103.1	5.8	7621	0	0	21	2.68

Table 1. Continued

	Construction building cost index 1970–90 ave.	Percent of journeys to work using public transportation, 1970–90 Ave.	Serious crimes known to police per 100,000 residents, 1970–90 Ave.	Number of democratic mayor years, 1970–1990	Number of republican mayor years, 1970–1990	Number of city manager plus non partisan-mayor years, 1970–90	Percent of total city workforce employed by city, 1970–90 Ave.
City	COST	PUBT	CRIME	MDEM	MREP	CMNP	CITYEMP
St. Louis (0,1)	100.1	17.4	12363	21	0	0	5.49
Indianapolis (0,0)	98.3	5.4	6443	0	21	0	3.23
Pittsburgh (0,1)	102.2	26.7	7049	21	0	0	3.54
New Orleans (0,0)	93.0	23.0	8341	21	0	0	4.87
Richmond (0,0)	88.7	17.9	9174	0	0	21	9.67
Vancouver (0,0)	106.4						
Charlotte (1,1)	84.2	7.1	9167	5	2	14	2.43
Seattle (0,1)	104.5	16.7	10280	8	0	13	3.84
Chattanooga (0,0)	89.0	6.5	8174	6	7	8	8.93
Denver (0,0)	98.7	8.8	9551	19	0	2	4.77
Halifax (0,0)							
Regina (0,0)							
St. John (1,0)							
Kansas City (0,0)	99.1	8.5	10047	0	3	18	3.24
Phoenix (0,0)	98.3	2.6	9183	0	0	21	2.42
Wichita (1,0)	91.7	2.0	7676	0	0	21	2.09
Buffalo (1,1)	104.0	17.4	7011	21	0	0	8.60

Table 1. Continued

City	Construction building cost index 1970–90 ave. COST	Percent of journeys to work using public transportation, 1970–90 Ave. PUBT	Serious crimes known to police per 100,000 residents, 1970–90 Ave. CRIME	Number of democratic mayor years, 1970–1990 MDEM	Number of republican mayor years, 1970–1990 MREP	Number of city manager plus non partisan-mayor years, 1970–90 CMNP	Percent of total city workforce employed by city, 1970–90 Ave. CITYEMP
Little Rock (0,0)	89.6	3.7	11554	0	0	21	2.63
Tulsa (0,0)	94.2	2.6	7516	2	17	2	2.20
Birmingham (0,0)	87.2	7.2	9635	15	6	0	3.19
Omaha (0,0)	95.6	6.6	6145	10	1	10	1.89
Orlando (0,1)	87.5	5.1	10266	11	0	10	5.51
Newark (1,0)	104.2	29.7	11576	16	0	5	9.04
Norfolk (1,1)	86.6	8.2	7154	0	0	21	11.63
San Francisco (0,1)	118.6	35.9	9168	19	0	2	6.62
Tampa (0,1)	92.8	3.6	12267	6	0	15	3.53
Madison (0,1)	94.5	10.8	6444	6	1	14	4.18
Portland [OR] (0,1)	103.7	12.7	11943	4	0	17	2.57
Wilmington (0,1)	99.6	12.4	10260	17	4	0	5.63
Boston (0,1)	104.5	34.8	11078	21	0	0	9.01
Jacksonville (0,1)	89.4	4.9	7927	21	0	0	3.75
Saskatoon (0,0)							
Ottawa (0,1)							
San Diego (0,0)	108.7	4.7	6772	2	0	19	2.14
Providence (0,0)	98.1	10.8	8890	11	8	2	6.32

Table 2a. Correlation matrix, series available for all cities

	AGE	CCW	CNO	CYES	DEN-SITY	INTEG	SPACE	U	WEATH
AGE	1.00	0.39	–0.08	0.06	0.56	–0.32	0.32	–0. 16	–0.15
CCW	0.39	1.00	–0.43	0.45	0.26	0.07	0.42	–0. 13	0.27
CNO	–0.08	–0.43	1.00	–0.18	–0.28	–0.05	0.09	–0. 03	–0.23
CYES	0.06	0.45	–0.18	1.00	0.01	0.20	0.07	0. 09	0.17
DENSITY	0.56	0.26	–0.28	0.01	1.00	–0.14	0.37	0. 05	–0.21
INTEG	–0.32	0.07	–0.05	0.20	–0.14	1.00	–0.27	–0. 27	0.32
SPACE	0.32	0.42	0.09	0.07	0.37	–0.27	1.00	0. 08	–0.24
U	–0.16	–0.13	–0.03	0.09	0.05	–0.27	0.08	1. 00	–0.02
WEATH	–0.15	0.27	–0.23	0.17	–0.21	0.32	–0.24	–0. 02	1.00

dure chose the same specification for both samples.[15] Estimates are given as Equations 1 and 3 of Table 3 (t-statistics are in italics under coefficients).[16] All coefficients are signed as predicted and, except for age-of-skyline for U.S. cities, all are statistically significant at the 5% significance level or lower. Larger cities with younger skylines, worse weather, and more robust economies, tend to have more CCWs. Further, active policies both of encouragement and discouragement of CCWs are important determinants of a city's CCW presence, with policies of discouragement being more effective (particularly for U.S. cities).[17]

One of this paper's objectives is to identify cities that are more, and less, successful in attracting CCWs to their downtown core, so that policies of these cities towards CCWs can be examined more closely in the next two sections. To do this, a quantitative measure of "success" is needed. Our measure uses the residuals of the estimated regression equations – each city's CCW-count minus the model's predicted CCW-count for each city. Figures 1 and 2 rank and graph the residuals of Equations 1 and 3 respectively as circles (triangles in the figures are discussed below). Cities near the top, and bottom, of the figures are "outlier" cities: They do either much better, or much worse, than the model predicts.[18]

The largest residual (by far) is that of the "free-market" CCW regime in Minneapolis, with nearly forty more CCWs than predicted by the model. The next highest four cities are a pair of "free-market" regimes (#3 Houston and #5 Spokane) and a pair of cities subsidizing CCWs (#2 Montreal and #4 Calgary), with residuals for these four ranging from 19 to 25. Three more "active encouragement" cities (Edmonton, Des Moines and St. Paul) follow with residuals ranging from 9 to 14. Thus, three of the top five cities

Table 2b. Correlation matrix, selected series available for U.S. cities only

	AGE	CCW	CITYEMP	CMNP	CNO	CYES	CRIME	DENSITY	INTEG	MDEM	MREP	PUBT	SPACE	U	WEATH
AGE	1.00	0.31	–0.19	–0.03	–0.04	0.01	0.32	0.41	–0.16	0.06	–0.05	–0.05	0.20	–0.15	0.05
CCW	0.31	1.00	–0.31	0.19	–0.44	0.36	–0.11	0.20	0.26	–0.15	–0.07	–0.00	0.33	–0.20	0.38
CITYEMP	–0.19	–0.31	1.00	–0.30	0.34	–0.14	0.14	–0.14	–0.37	0.36	–0.08	0.50	0.14	0.27	–0.09
CMNP	–0.03	0.19	–0.30	1.00	–0.23	0.20	0.15	–0.16	0.20	–0.80	–0.36	–0.51	–0.25	–0.40	0.01
CNO	–0.04	–0.44	0.34	–0.23	1.00	–0.14	0.29	–0.30	–0.01	0.38	–0.23	0.30	0.14	0.11	–0.20
CYES	0.01	0.36	–0.14	0.20	–0.14	1.00	–0.26	–0.09	0.39	–0.06	–0.22	–0.02	0.05	–0.06	0.22
CRIME	0.32	–0.11	0.14	0.15	0.29	–0.26	1.00	0.24	–0.11	–0.03	–0.20	0.05	0.10	–0.01	–0.08
DENSITY	0.41	0.20	–0.14	–0.16	–0.30	–0.09	0.24	1.00	–0.02	0.16	0.01	0.25	0.30	0.01	–0.02
INTEG	–0.16	0.26	–0.37	0.20	–0.01	0.39	–0.11	–0.02	1.00	–0.08	–0.19	–0.15	–0.20	–0.35	0.19
MDEM	0.06	–0.15	0.36	–0.80	0.38	–0.06	–0.03	0.16	–0.08	1.00	–0.27	0.64	0.34	0.38	–0.04
MREP	–0.05	–0.07	–0.08	–0.36	–0.23	–0.22	–0.20	0.01	–0.19	–0.27	1.00	–0.18	–0.13	0.06	0.05
PUBT	–0.05	–0.00	0.50	–0.51	0.30	–0.02	0.05	0.25	–0.15	0.64	–0.18	1.00	0.69	0.38	–0.29
SPACE	0.20	0.33	0.14	–0.25	0.14	0.05	0.10	0.30	–0.20	0.34	–0.13	0.69	1.00	0.19	–0.20
U	–0.05	–0.20	0.27	–0.40	0.11	–0.06	–0.01	0.01	–0.35	0.38	0.06	0.38	0.19	1.00	–0.14
WEATH	0.05	0.38	–0.09	0.01	–0.20	0.22	–0.08	–0.02	0.19	–0.04	0.05	–0.29	–0.20	–0.14	1.00

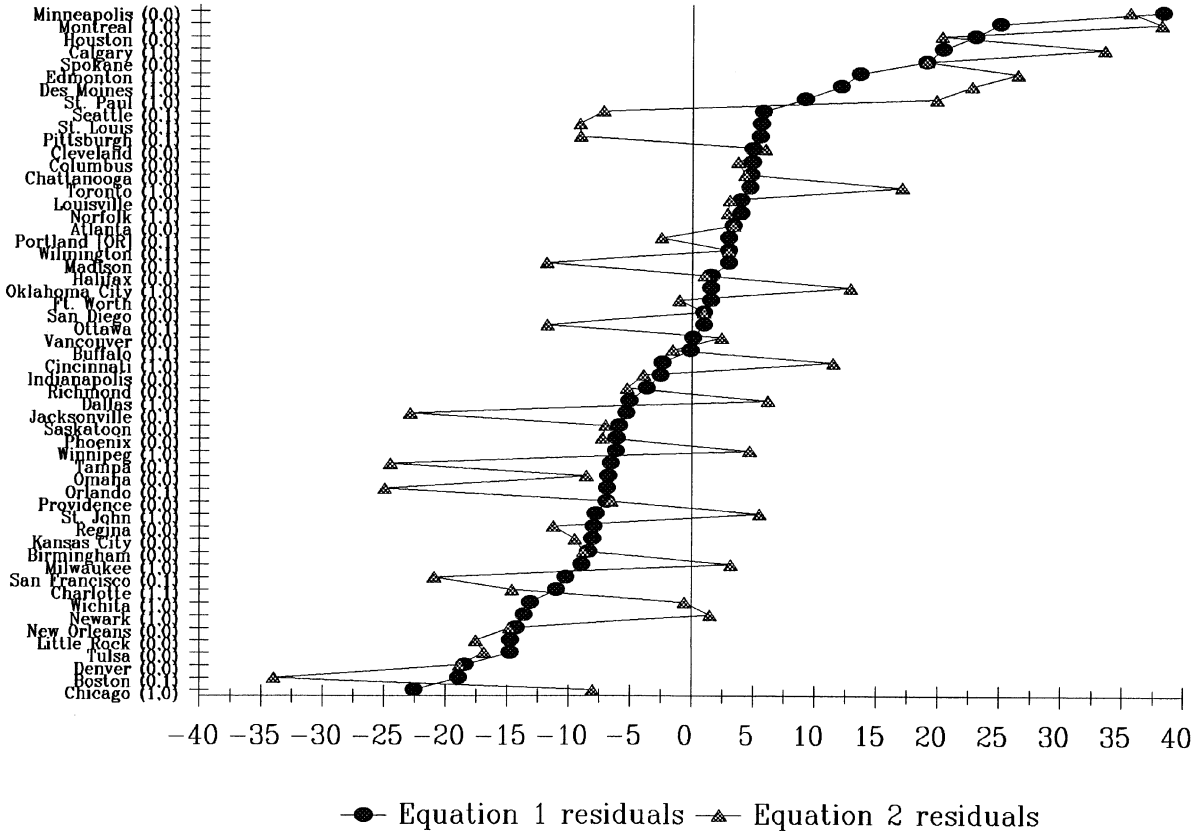
Minneapolis (0.0)
Montreal (1.0)
Houston (0.0)
Calgary (1.0)
Spokane (0.0)
Edmonton (1.0)
Des Moines (1.0)
St. Paul (1.0)
Seattle (0.1)
St. Louis (0.0)
Pittsburgh (0.1)
Cleveland (0.0)
Columbus (0.0)
Chatlanooga (0.0)
Toronto (1.0)
Louisville (0.0)
Norfolk (1.0)
Atlanta (0.0)
Portland TOR (0.1)
Wilmington (0.1)
Madison (0.1)
Halifax (0.0)
Oklahoma City (1.0)
Ft. Worth (0.0)
San Diego (0.0)
Ottawa (0.1)
Vancouver (0.0)
Buffalo (1.0)
Cincinnati (1.0)
Indianapolis (0.0)
Richmond (0.0)
Dallas (1.0)
Jacksonville (0.1)
Saskatoon (0.0)
Phoenix (0.0)
Winnipeg (1.0)
Tampa (0.1)
Omaha (0.0)
Orlando (0.1)
Providence (1.0)
St. John (1.0)
Regina (0.0)
Kansas City (0.0)
Birmingham (0.0)
Milwaukee (1.0)
San Francisco (0.1)
Charlotte (1.0)
Wichita (1.0)
Newark (1.0)
New Orleans (0.0)
Little Rock (0.0)
Tulsa (0.0)
Denver (0.0)
Boston (0.1)
Chicago (1.0)
−40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30 35 40
Equation 1 residuals
Equation 2 residuals

Figure 1.

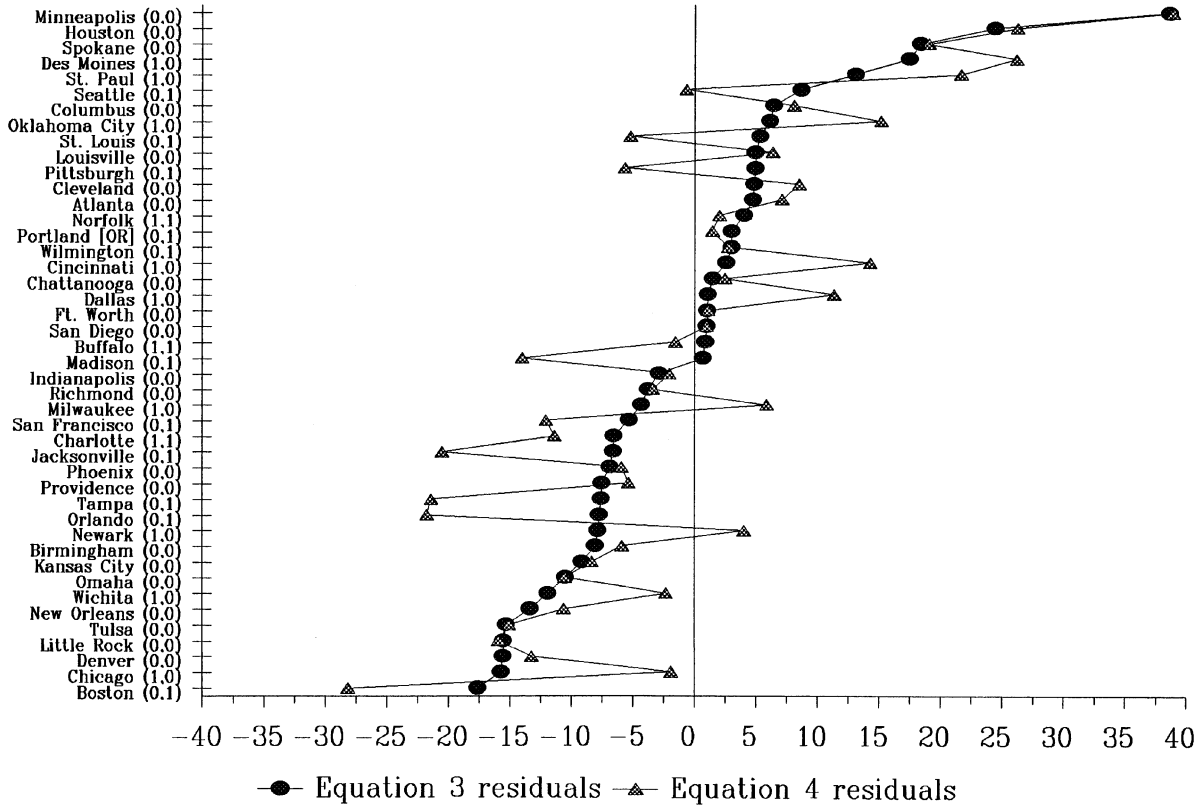
Minneapolis (0.0)
Houston (0.0)
Spokane (0.0)
Des Moines (1.0)
St. Paul (1.0)
Seattle (0.1)
Columbus (0.0)
Oklahoma City (1.0)
St. Louis (0.1)
Louisville (0.0)
Pittsburgh (0.1)
Cleveland (0.0)
Atlanta (0.0)
Norfolk (1.1)
Portland [OR] (0.1)
Wilmington (0.1)
Cincinnati (1.0)
Chattanooga (0.0)
Dallas (1.0)
Ft. Worth (0.0)
San Diego (0.0)
Buffalo (1.1)
Madison (0.1)
Indianapolis (0.0)
Richmond (0.0)
Milwaukee (1.0)
San Francisco (0.1)
Charlotte (1.1)
Jacksonville (0.1)
Phoenix (0.0)
Providence (0.0)
Tampa (0.1)
Orlando (0.1)
Newark (1.0)
Birmingham (0.0)
Kansas City (0.0)
Omaha (0.0)
Wichita (1.0)
New Orleans (0.0)
Tulsa (0.0)
Little Rock (0.0)
Denver (0.0)
Chicago (1.0)
Boston (0.1)
−40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30 35 40
Equation 3 residuals
Equation 4 residuals

Figure 2.

Table 3. Regression results

Equation	1	2	3	4	5	6	7
Sample	ALL	ALL	US	US	ALL CCW>4	ALL CCW>4	U.S. CCW>4
Sample size	55	55	44	44	42	42	33
Dependent variable	CCW	CCW	CCW	CCW	INTEG	INTEG	INTEG
CONSTANT					102.966	107.093	128.283
					2.445	*2.467*	*2.937*
SPACE	0.608	0.586	0.548	0.493	–0.558	–0.346	–0.988
	4.735	*3.625*	*4.182*	*3.238*	*–1.292*	*–0.791*	*–2.004*
WEATH	18.727	23.132	22.690	25.852	57.359	55.095	45.774
	3.825	*3.778*	*4.012*	*3.976*	*2.214*	*2.147*	*1.461*
CYES	13.533		8.901		19.652		22.141
	3.616		*2.077*		*1.821*		*1.883*
CNO	–15.050		–13.877		21.617		19.218
	–3.918		*–3.414*		*1.374*		*1.314*
U	–2.362	–2.955	–2.464	–3.089	–10.596	–9.606	–10.133
	–3.009	*–3.028*	*–2.916*	*–3.216*	*–2.919*	*–2.592*	*–2.313*
AGE	0.135	0.148	0.093	0.097	–0.618	–0.519	–0.346
	2.574	*2.215*	*1.486*	*1.324*	*–2.904*	*–2.421*	*–1.692*
DENSITY					0.636	0.382	
					1.836	*1.149*	
CITYEMP							–8.279
							–2.602
PUBT							1.846
							1.802
R-squared	0.653	0.416	0.599	0.418	0.421	0.339	0.515
Adj. R-squared	0.618	0.382	0.546	0.375	0.302	0.247	0.353
s.e. of regression	12.562	15.979	12.436	14.590	32.235	33.473	29.815
F-statistic	18.478	12.128	11.328	9.585	3.532	3.692	3.180

are “free market” cities, and the top three U.S. cities all are “free-market” in their orientation towards CCWs. Free-market CCW supply arrangements thus seem quite effective, a finding belying the traditional “market failure” interpretation of the public goods problem (Section 2 above).

At the other extreme are cities with large negative residuals. Of the 10 cities with residuals of –10 or below, four are “free market” cities, four have policies of “active encouragement” and three have policies of “active discouragement”.[19] The three cities with the largest shortfalls are a mixed bag:

Chicago (active encouragement of CCWs), Boston (active discouragement), and "free market" Denver all have residuals ranging from –17 to –22. We examine outlier cities' policies further in Sections 4 and 5.

Equations 2 and 4 report results of omitting the policy variables CYES and CNO from the regressions. Coefficients and t-statistics are similar to those in Equations 1 and 3, although dropping the policy variables leads, predictably, to a marked reduction in explanatory power. Next, to assess the importance of policy regime to CCW-supply, we compare the residuals of Equations 2 and 4 (the triangles in Figures 1 and 2) with the residuals of Equations 1 and 3 (the circles in the figures).[20] Triangles show how well cities do if the predicting model omits city policy towards CCWs and captures only "structural" features like weather, city-size, etc. The importance of incorporating city policy into the analysis is evident from the figures. Several cities that are large negative outliers before policy is factored in (Madison, Ottawa, and the three Florida cities) become quite ordinary in performance once the presence of active policies of discouragement in those cities is recognized. The same is true regarding policies of active encouragement for Toronto, Oklahoma City, Cincinnati and several other cities which officially encourage CCWs. Of particular interest are "crossover cities". For example, Cincinnati, Dallas, Winnipeg, St. John, Milwaukee and Newark all have more CCWs than are predicted by the nonpolicy model and thus look quite successful by that criterion. However, once the presence of policies of active encouragement is taken into account, all these cities have negative residuals – they are less successful at encouraging CCW formation than are their policy cohorts Montreal, Calgary, Edmonton, Des Moines and St. Paul.[21] These results suggest that comparing policy particulars across better-performing and worse-performing "active encouragement" cities might yield insights about more, and less, successful models of public-goods subsidization. We return to this theme in Section 5.

Analysis so far has focused on number-of-CCWs as the sole quality-measure of a CCW network. However, an additional factor frequently emphasized as a goal for CCW networks is that they be well-integrated systems. By "well-integrated" we mean: How extensively can a pedestrian move about the downtown core in CCWs without having to go outdoors? Our measure of network integration is INTEG: the maximum number of buildings a pedestrian can visit without leaving the network, expressed as a percentage of total number of CCWs in the downtown core.

Regression results for cities with sufficiently large[22] systems are presented as Equations 5 through 7 in Table 3. Specification procedures are the same as described previously for the CCW equations. The fit for the INTEG equations is worse than for the CCW equations, but coefficient magnitudes and signs are consistent with "priors".[23] Smaller, denser cities, with worse weather,

stronger economies, and *older* skylines tend to have better integrated CCW networks.[24] Both policies of encouraging and discouraging CCWs tend to promote network integration. Encouragement likely is the intentional result of policy (network integration is emphasized in the planning documents of "pro-CCW" cities). Policies of CCW discouragement likely have their impact indirectly, since (i) "anti-CCW" policies shrink CCW presence to the point where what remains is easier to hook up, and (ii) cities discouraging CCWs tend more to make their exceptions only in certain parts of a city (i.e., where "view corridors" are not restricted).

Equation 7 redoes the analysis for U.S. cities only. Here city density is less important than is (1) city workforce as a percent of area working population (CITYEMP) and, (2) the public transportation presence in the city (PUBT). The former has a strong and negative impact on network integration, consistent with the argument that a more activist city is more prone to interfere with the formation of integrating CCW links (e.g., to protect "view corridors"). The positive coefficient on public transport suggests that better-integrated CCW networks and public transportation are complements rather than substitutes in the U.S.

The residuals of Equations 5 and 6 can be ordered, charted and compared as previously discussed for Equations 1 through 4. The result is graphed in Figure 3. "Free-market" cities dominate on the issue of network integration: Of the leading eight cities, five are *laissez faire* in their attitudes towards CCWs. Again contrary to the conventional market-failure view, well-integrated CCW networks are supplied very effectively by the private sector.[25]

4. The private supply of CCW systems

How is it that free-market institutions have proven to be so effective at supplying CCW networks? In Minneapolis, Houston, and Spokane – the three highest-performing "free-market" cities in Figures 1 and 2 – the city's attitude toward CCWs "has been to follow a policy of minimum regulatory intervention aimed at securing the health, safety, and welfare of its citizens" (City of Houston 1977: 5). Thus, the cities do not finance CCWs (unless a city building is being linked), and network coordination is left to the private sector. Inspection and permit fees are nominal (City of Houston 1977: 6; Owen 1990). Building codes and safety standards are easily met, are clear and concise, and frequently differ little if any from those governing structures on purely private property. There is no interest by the city in CCW aesthetic design except to insure structural soundness.[26] The approval process is highly streamlined, involving few steps and little expense. The city consistently views its appropriate role as one of facilitator rather than regulator. In all three cities, CCWs

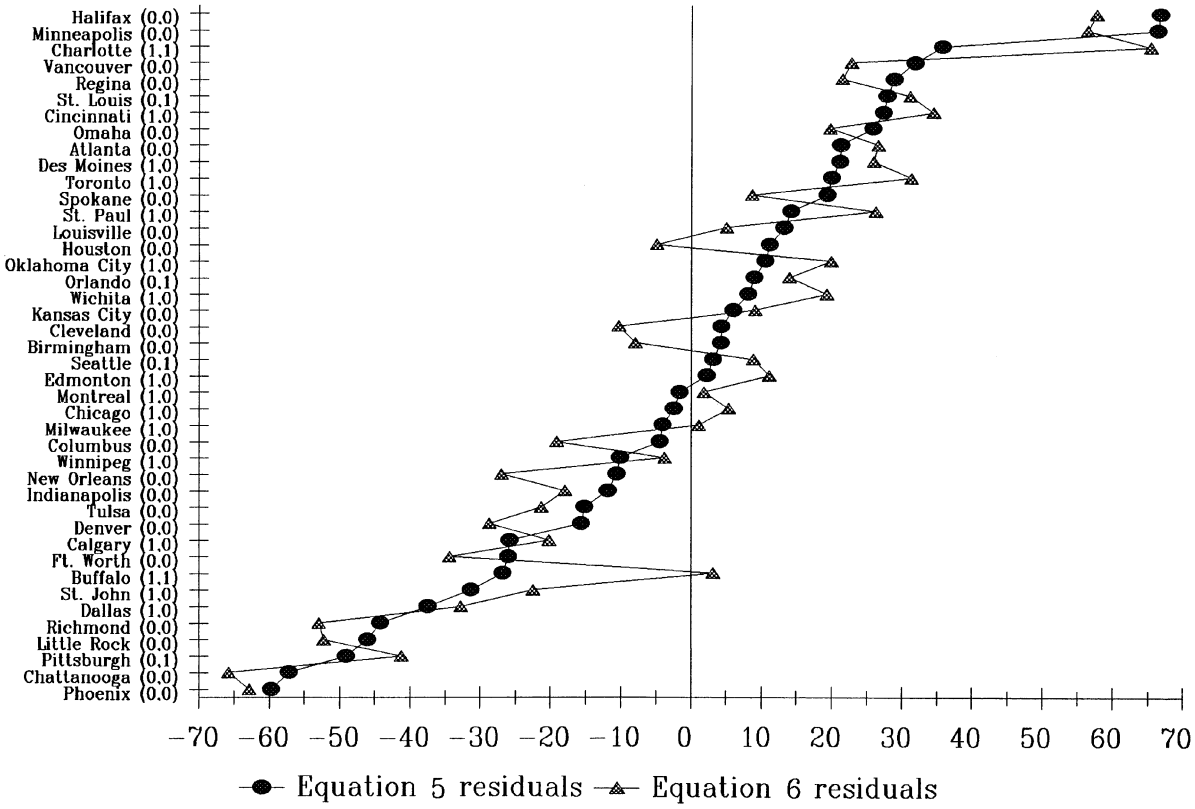
Halifax (0.0)
Minneapolis (0.0)
Charlotte (1.1)
Vancouver (0.0)
Regina (0.0)
St. Louis (0.1)
Cincinnati (1.0)
Omaha (0.0)
Atlanta (0.0)
Des Moines (1.0)
Toronto (1.0)
Spokane (0.0)
St. Paul (1.0)
Louisville (0.0)
Houston (0.0)
Oklahoma City (1.0)
Orlando (0.1)
Wichita (1.0)
Kansas City (0.0)
Cleveland (0.0)
Birmingham (0.0)
Seattle (0.1)
Edmonton (1.0)
Montreal (1.0)
Chicago (1.0)
Milwaukee (1.0)
Columbus (0.0)
Winnipeg (1.0)
New Orleans (0.0)
Indianapolis (0.0)
Tulsa (0.0)
Denver (0.0)
Calgary (1.0)
Ft. Worth (0.0)
Buffalo (1.1)
St. John (1.0)
Dallas (1.0)
Richmond (0.0)
Little Rock (0.0)
Pittsburgh (0.1)
Chattanooga (0.0)
Phoenix (0.0)
−70 −60 −50 −40 −30 −20 −10 0 10 20 30 40 50 60 70
Equation 5 residuals
Equation 6 residuals

Figure 3.

are built on the initiative of building owners and are paid for by cost-sharing formulas reached by negotiations among such owners (when a city building is involved, the city acts as just another building owner). For example, an especially long (570-foot) skywalk in Minneapolis was built in 1982 connecting two buildings and passing conveniently close to the edge of a third. The third building paid for the first 400 feet of construction, and the two other connecting buildings split the rest evenly (Rybak 1982). A second (remarkable) example of private-sector initiative was the early-1980s construction in Minneapolis of a nine-story building for the explicitly-stated purpose of closing a crucial gap in the skywalk system.[27] This case of the "tail wagging the dog" is representative of the private sector's ability to solve CCW-supply problems through piecemeal negotiations among interested parties when unaided (and unhindered) by city government.

Such negotiations, however, need a certain type of "institutional soil" in which to prosper. Free-market CCW growth has been most pronounced in downtowns satisfying two key conditions. First, the city's attitude is easily identifiable by building owners as non-hostile and as likely to remain so. Echoing Houston (above), the Spokane Municipal Code "declares that it is the policy of the City to approve, in principal, the construction of pedestrian skywalks over City streets and alleys" (Owen 1990: App. B). Minneapolis' commitment to its system as a development tool has been consistently articulated and emphasized by the city since the early 1960s. City actions reinforce city statements: In Houston and Spokane, every CCW application has been approved, while in Minneapolis rejections are very rare. None of the cities has ever caused a CCW's removal. The fact that the attitude of the public sector is known to be favorable and predictable in these cities has removed a main source of uncertainty from private sector calculations.[28]

Second, free-market networks prosper best in cities where the institutional structure gives CCW owners additional long-term legal protection. All three cities grant developers long-term permits to use the space under or over city streets (Spokane for 25 years, Houston for 30, and Minneapolis *in perpetuity*), while rental rates for use of air- and underground-space are zero or of nominal value.[29] Thus developers are legally guaranteed plenty of time to reap a return on their investments. Minneapolis (via leases issued in perpetuity) and Houston (see below) also have strong legal guarantees built in against leases being revoked by a future city government with different attitudes toward CCWs. Spokane's legal protections against this contingency also are substantial: While the city retains the right to revoke permits if it needs the airspace for "public use", it also agrees to remove the skywalk at its own expense, and also to compensate the owner for the loss. Moreover, a rigidly defined arbitration procedure is carefully laid out, explicitly defining

the owner's rights *vis-á-vis* the city (Spokane Municipal Code, from Owen 1990). These policies have been in place while Spokane has accumulated 19 links, a remarkably high total for a city of such small size.

Perhaps the most striking free-market model of CCW supply is that of Houston, which has the largest (see Table 1) and the oldest system on the continent. In Houston, the absence of a zoning code through the mid-1990s – a characteristic making it unique among major cities – has given the private sector additional legal guarantees. One other aspect of Houston's legal environment is especially noteworthy, and (to our knowledge) unique among urban downtowns. This is a peculiarity in the property rights of landowners that is embedded in the original survey of downtown Houston. Specifically:

> property owners within the area originally platted retain ownership of land to the center of the street. *The City is granted an easement* for streets and utility purposes." (City of Houston 1977: 5)

While in other cities all rights over and under the streets are retained by the city and *easements are granted to developers*, in Houston it is the building owners who retain all rights not specifically denied them.[30] This does not eliminate the need to seek approval from the city for CCW construction, since such construction must be consistent with public-street/utility needs, but it does circumscribe grounds for refusal markedly. CCWs in Houston thus have nearly the same legal status as do corridors in office buildings, with all the private control and flexibility that this implies. The impact of such guarantees should not be underestimated: The unique legal situation in Houston surely would make it more difficult for a suddenly activist City Hall to overcome determined private-sector opposition. Thus the property-rights and legal situation in Houston is highly encouraging to development of CCWs.

The experiences of Houston, Minneapolis, Spokane, and other free-market CCW cities belie the traditional view that *laissez-faire* institutional setups will lead to an inadequate supply of public goods. On the contrary, the near-absence of government as a third party in these cities has not apparently impeded CCW development, and, in contrast, it has surely reduced transactions costs among private parties. The absence of burdensome government-imposed construction requirements – such as the highly-detailed design specifications of Cincinnati (see Section 5) – has cut building costs. The absence of government mandates on access and hours reduces the expected operating costs and increases the expected benefits of owning a CCW.[31] While orthodox public-goods theory would argue that private returns on public goods are too small to lead to efficient supply of such goods, a study of free-market cities shows that – in a favorable regulatory and legal environment – the gains to investment in

CCWs can be substantial. There is a bandwagon effect in that, as the size of the system increases, the gains to being "connected" grow also. Connection raises the rental value of office space in a building, yielding prospective gains which often are enough alone to justify a CCW's expense.[32] Further, a CCW connection typically converts low-value basement or second-floor space into prime retail property.[33] In a favorable legal and institutional environment, such considerations seem more than sufficient to overcome the problem of "market failure".

Finally, examination of the free-market systems show some obvious variations from what one might imagine to be an "optimal" system. Some large buildings on the edges of cores are not yet connected. Strategic bargaining behavior by some property owners has continued to block some links. In spite of these apparent shortfalls, the private systems compare very favorably with those cities where more activist governments have not opted for a policy of "benign neglect". As with lighthouses, so with CCWs: The real world deviates from theoretical utopias in surprising and unpredictable ways.[34]

5. "Government failure": City policies discouraging CCWs

Given the success of free-market institutions in Houston, Minneapolis, Spokane and elsewhere at supplying CCW networks, market failure seems an inadequate explanation for why such networks are absent in a number of cities with conditions naturally favoring CCW development. Is the alternative of "government failure" a more plausible explanation? We believe the evidence is strong that such is the case.[35]

The pronounced influence of city policies discouraging CCWs already has been documented in Section 3. Of the 16 city-cores with five or fewer CCWs, 10 actively discourage CCW development (see Table 1). City policies designed to frustrate CCWs are wide-ranging in variety. Portland (Oregon), Tampa, and Ottawa have passed laws which take a hard line, opposing all "encroachments in the public right-of-way" on principle. In New York City, Boston, San Francisco, Seattle and Los Angeles among others, CCW policy is unwritten and at the discretion of city officials, and officials have aggressively discouraged CCWs in informal fashion. The likely adverse effects of such regimes on CCW construction are clear. Our survey, however, uncovered a number of cities which claim not to discourage CCWs, but which nonetheless embrace policies reserving to the city vaguely-defined regulatory powers. The likely effects of such a regime is the primary focus of this section.

The "rules versus discretion" literature pioneered by Hayek (1944, 1960) and Simons (1936) furnishes a useful conceptual framework within which to pursue these issues further. Discretionary regimes grant the regulatory author-

ity "powers to make and enforce decisions in circumstances which cannot be foreseen and on principles which cannot be stated in generic form" (Hayek 1944: 83). In contrast, rules-based regimes require regulators to credibly commit in advance of action to announced, easily interpretable rules, meaning that private-sector uncertainty about future policies is reduced markedly. While binding the regulatory authority in this fashion may appear counterproductive (especially to regulators!), the "idiosyncratic" investments (like CCWs) stressed by Williamson (1979) and Gifford (1991) are safe from expropriation via sudden policy-changes by [rent-seeking?] city officials, implying more production of these goods by optimizing private agents. In contrast, discretionary regimes are characterized by greater uncertainty about future policy, which creates problems for the "evolution of cooperation" necessary for the private supply of public goods.

The Hayek/Simons framework predicts that cities with more successful CCW networks should be those embracing rules-based regulatory regimes, and vice versa. We have already seen how successful "free-market" cities conduct themselves in this fashion (see Section 4). The same is true for cities which are successful at actively encouraging CCWs. Montreal, by far the leading such city in Figure 1, has made little effort to coordinate the growth of its extensive tunnel network or otherwise involve itself in its development. The sole "active encouragement" element in the city's policy is a zoning-bonus subsidy, offered to all comers on an impartial basis (a classic example of a Hayekian "rule-based" policy).[36] Edmonton (the third-ranked "active encouragement" city in Figure 1) is more activist than Montreal, but resembles it in relying on private-sector initiatives for financing and coordinating the bulk of its system (70% of CCWs are privately owned/financed).[37] Both cities reassure CCW developers by issuing long-term leases at nominal fees for private use of city-owned space above and below streets.

Calgary, Des Moines and St. Paul (ranked second, fourth and fifth respectively among "activist" cities in Figure 1), are more representative of the traditional model of public-goods supply. All three cities own the vast majority of CCWs in the network, and all are actively engaged in their networks' financing, planning and design. On a number of key fronts, however, these cities promote the cooperation of private building-owners by eschewing a discretionary model of direction in favor of a more rules-based approach. This is particularly evident for Des Moines and St. Paul.[38] Both have standardized skywalk designs (some variation within basic design parameters is allowed) which emphasize a small number of specific architectural and structural standards, so that design-approval criteria are particularly clear to the private sector. The rights of building-owners *vis-á-vis* the City during the negotiation process are carefully laid out by both cities. In St. Paul, proposals to change

the location of a building's skywalk corridor must be accepted or rejected by the City within 90 days of submission, and in the case of rejection the City must write down "in detail the valid reasons for such rejections" (City of St. Paul 1987: 9). In Des Moines, both the building-owners' *and the City's* responsibilities to the skywalk system are explicitly laid out in writing, and an arbitration process, to be adopted in case of disagreement between the City and private-sector network participants, is set forth in elaborate detail.

By contrast, cities with CCW counts placing them at the bottom of Figures 1 and 2 are regimes with pronounced discretionary elements. A good example is Denver, which claims no policies pro or con regarding CCWs, and for which 90% of its CCWs are initiated and financed privately (City of Denver 1992a, 1992b). However, there is a remarkably intricate CCW approval process requiring that a skywalk proposal be circulated to twenty-five [!] different city agencies, any one of which apparently can raise objections that could delay (and possibly derail) the approval of the proposed CCW. Further, CCW permits are revocable *with 30-day notice* "at any time that the [City-County] Council shall determine that the public convenience and necessity or the public health, safety or general welfare require such revocation" (City of Denver, 1982, 1992b). Moreover, upon revocation the licensee "shall pay all costs of removing the said structure from the encroachment area and return the street to its original condition under the supervision of the City Engineer" (*ibid*). These policies are strikingly at variance with Denver's more successful policy cohorts (see Section 4). It is not difficult to see why the private sector might shy away from supplying CCWs under such conditions.[39]

The large and negative residuals of Boston and Chicago also appear to be associated with substantial amounts of discretion-based regulatory authority retained by these cities. Boston, at the city's discretion, "discourages skywalks and wants to promote active pedestrian activity on sidewalks" (presumably the same holds for pedestrian tunnels – there are none in Boston) (Boston Redevelopment Authority 1991). In Boston (and similar cities), where zoning is well-entrenched and where the city has strong discretionary control over development, unwritten city opposition likely exerts a formidable discouraging influence. While we have little information at present on the complexity of the approval process in Chicago or the legal environment for CCW owners there, the city does have a remarkably complex funding and regulatory environment. Half the CCWs are supplied privately (some of these aided by state subsidies), while the other half are supplied by the city and various other public agencies, often using bond funding. At least four separate incentive schemes are in place (City of Chicago 1992). Transactions costs in such a system appear potentially daunting.[40] Additional hidden disincentives exist in the city's planning priorities. Chicago plans the system in detail by identi-

fying and encouraging/financing construction of critical unbuilt connections, defined primarily as those connecting to subways and major activity centers. However, "[a]dditional sections not key to the basic system should not be encouraged", and "[r]etail uses in the pedways should not compete with street-level uses" (City of Chicago 1991: 40). Further, Chicago "strongly prefers tunnels to skywalks and discourages skywalks. . . ". (City of Chicago 1992).[41] Since tunnel-construction is 3-to-4 times as expensive per linear foot as is skywalk-construction (City of Saint Paul 1986), such a policy likely would inhibit CCW-development in Chicago's city core (especially given the large amounts of urban infrastructure already in place beneath Chicago's streets). Thus city policies seem able to account for the large and negative residuals observed for Chicago.

In closing this section, it is worth asking how well "public" network-cities tend to do when matched against their "free-market" cohorts (where two cities are similar enough to allow a "head-to-head" comparison). Consider, for example, the case of Cincinnati – in the planning literature among the most celebrated of "public" CCW networks (e.g., Urban Land Institute 1979, Forusz 1981). We, however, are struck by how Cincinnati's system is outperformed in Figures 1 and 2 by a number of "free-market" cities as well as by quite a few of its policy cohorts. Upstate "free-market" rivals Columbus and Cleveland both rank more highly (Columbus also has more CCWs, although it and Cleveland's integrated systems are smaller). Further, Cincinnati retains several skywalks open to the elements, despite the long-time expressed wish of the city to enclose these links (Forusz 1981: 341–342).[42]

These results correspond to a policy-regime that gives Cincinnati substantially more discretionary power than is retained by its more successful policy cohorts. Cincinnati approves skywalk proposals on a case-by-case basis and typically engages building-owners in lengthy and complex negotiations concerning skywalk design, maintenance and repair clauses, and utility costs (in the late 1970s, the entire process from initial discussion to completion averaged about three *years* in duration [Forusz 1981: 308]). Skywalk design is regulated in elaborate detail by the city (City of Cincinnati 1982: 1–5). High transactions costs, and substantial private-sector uncertainty, likely are unwanted byproducts of such a complex process.[43] A further consequence is that Cincinnati's skywalks are quite expensive: In 1986, they were twice the cost of typical skywalks in St. Paul and Des Moines (City of St. Paul 1986). In the face of these figures, we cannot help wondering what type of system Cincinnati would have today had it adopted a *laissez-faire* model and not a public-sector model.[44] We think such questions also carry over to a number of the lower-performing "public" cities in Figures 1 and 2.

6. Conclusion

It is commonly held as a truism that free-market institutions encounter serious and pervasive problems in seeking to supply the "right" amounts of collective goods. We find little evidence supporting this proposition in the case of CCW networks. "Undersupply" of CCWs seems associated mainly with government impediments to their profitable supply, rather than with the types of factors commonly alleged to impede the private production of public goods. Government impediments can be as overt as an outright ban, or as indirect, subtle and complex as a vaguely-defined regulatory ordinance interpretable at the discretion of city officials. On the other hand, an investigation of successful "free-market" CCW systems points to the types of policies likely to promote the private supply of public goods. By lowering transactions costs of private-sector coordination and supply, such cities create an atmosphere which allows great latitude for the striking of Coase-type bargains between building owners. Interestingly, successful "active encouragement" cities also embrace many of these same institutional features.

The relation between theory and evidence is fundamental to economic science. A number of purely theoretical inquiries into the nature of the public-goods problem have found that, in the absence of uncertainty, a rigorous application of the theory of choice need not imply that the private-sector's supply of public goods necessarily will be inefficient. The record of CCW-supply in North American cities is consistent with such findings.

Notes

1. Such costs stem not only from demand-revelation problems (e.g., Samuelson, 1954) but also from the task of coordinating and monitoring a proposed contribution scheme (e.g., Olson, 1965; Buchanan, 1967; see also Williamson, 1979).
2. Less clear to the general public, but of prime concern to many city planners and urban-design specialists, are the *perceived* drawbacks: reduction in the quality of street life, aesthetic compromises (in the case of skywalks), social stratification (as white-collar workers "desert the streets"), competition with rail and other public mass-transit systems, and (in some cities) worry about "encroachments" in the public right-of-way. These claims represent another dimension of the attack on free-market institutions: that unfettered *laissez faire* creates massive negative externalities that must be controlled by government. These issues are discussed little in this paper, but we plan to address them in detail in future work.
3. CCW systems have attracted considerable attention in the planning and architectural literature, but to our knowledge they have not been studied by economists.
4. We do not discuss the nondepletability/nonrival-consumption issue (which we take as self-evident).
5. As is true for local roads, tolls would be too costly to enforce in a network of many links and entrances (we know of no case where tolls have been charged in CCW networks).

6. This is the key difference between CCW networks and office corridors. All who use the corridor (or for that matter an isolated CCW) have business there, so that owners exploit "tying" possibilities with great efficiency.
7. An offsetting effect is that more users means more paying customers even as the proportion of paying-to-nonpaying customers declines.
8. Dallas' network is a notable example: For years it was split into two segments due to the relatively great expense of constructing an integrating link (Central Dallas Association 1991).
9. We know of one case in Houston where a strategically-placed building's owner charged a hefty "access fee" in exchange for allowing a neighboring building to link to it.
10. Further, free-market forces might cause several links to develop quite close together, raising the specter of "wasteful duplication". This is a frequently-expressed concern in city documents.
11. A developer who does not wish to participate in the network may make a financial contribution (set by the city) to the city CCW fund instead (City of Calgary 1984: 7).
12. Four cities were omitted because data were incomplete or of poor quality. New York City (for which we received separate surveys for Midtown (reporting no CCWs) and Lower Manhattan (reporting 8 CCWs) had very large values for office-space square-footage and very low CCW values, and was a large outlier which seemed better treated outside the context of a general model (New York strongly discourages CCWs). Baltimore was omitted because only walkways open to the elements are allowed there (a number have been built).
13. More "activist" cities are presumed to throw up more regulatory barriers to productive private-sector activity (including CCW construction), so that, *ceteris paribus*, a more activist city implies fewer CCWs for a given announced policy toward CCWs.
14. Democratic cities have strong positive correlations with public transportation, and tend also to have higher unemployment rates and larger city employment rolls per capita. "Nonaligned" cities have strong *negative* correlations with public transportation, and tend to have lower unemployment rates and lower city employment rolls per capita. Republican cities are only very weakly correlated with these factors. For whatever reason, Democratic cities and "nonaligned" cities have sharply different profiles.

    Correlation of course does not imply causation, and the discussion above should be viewed as a description of the data.
15. Specification was determined starting with the most inclusive equation and then using the Akaike criterion to guide the elimination of variables. Selection of variables was robust across several different initial specifications. A structural model with supply and demand equations could be constructed, but is unlikely to be useful because many variables plausibly affect both supply and demand (particularly policy variables: see Section 5), so that identifying structural parameters from the reduced form is problematic.
16. For all equations in Table 3, White's heteroskedasticity test failed to reject the null hypothesis of no heteroskedasticity in the residuals.
17. Other candidate variables failed to achieve sufficient explanatory power for inclusion by the Akaike criterion. Across both samples, city-core density had fair explanatory power – with positive sign and t-statistics around one. Several measures of a city's activist tone fared similarly: CITYEMP regularly had negative sign and t-statistic somewhat greater than one, and coefficients on Democratic mayoral frequency (MDEM) and "nonaligned" mayoral frequency (CMNP) were, respectively, negative and positive, again with t-statistic around one. Other candidate variables (COST, PUBT, CRIME, MREP) had little explanatory power; neither did a constant term.
18. For a few cities, predicted network sizes were negative. In such cases, the predicted value was set to zero.

19. Here Charlotte is counted twice, since it has some policies encouraging CCWs and others discouraging them.
20. Lines connecting triangles in the figures are there merely to aid the eye.
21. Cincinnati and Dallas retain small positive residuals in the U.S.-cities sample once policy is allowed for (see Figure 2).
22. All cities with less than five CCWs were judged to have systems too small to relate to the integration question and were dropped from this analysis. The cut-off could be set higher than five, but we estimated an equation like equation 5 for a more restricted sample (CCW > 9) and found that results altered little.
23. All variables used in the CCW equation also are selected for the INTEG specifications by the Akaike criterion. A constant term also is selected (not surprising given that the sample is restricted to cities where there are five or more CCWs). DENSITY, while not significant at the 5% level, still has considerable explanatory power and is included.
24. Smaller cities are easier to "hook up", and presumably cities with newer skylines are more likely to find themselves with "splintered" CCW networks.
25. The evidence of this section should be interpreted carefully. To show that CCWs are *well*-supplied by free-market institutions when compared with public-sector supply models is not to show that free-market arrangements must therefore be supplying a "*socially-optimal*" number of CCWs (a much stronger proposition). To evaluate the possibility of CCW oversupply, we would need an accurate measure of the external costs of CCWs. And without a benefits measure, assessing the undersupply possibility is also nebulous. These thorny problems, however, are implicit in any examination of the public-goods issue. We are content to compare private with public systems, on the premise that the crucial issue is not one of achieving the theoretically (zero-transactions-costs?) optimal supply – a problem at least as hard to solve for government bureaucrats as for the private sector. Rather, the key issues are: Do free-market institutions do well enough so that the traditional view of public-goods is called into question? And: What types of institutional structures are more, and less, successful in solving the problems implicit in supply of CCWs?
26. In Spokane, structural guidelines on the books (those unrelated to safety issues) are routinely waived (City of Spokane 1992).
27. Originally, the "missing link" was to have been routed through a small existing building, but the building's owners subsequently had decided that the link was not beneficial enough for their business. Shortly thereafter, a neighboring bank built the nine-story structure (judged the minimum cost-efficient size) on adjacent property to close the network gap (Blade 1980). Another small building was built for the same purpose elsewhere in the network several years later (Rybak 1984).
28. In fact, the cities have been so *laissez faire* in granting air rights that, in addition to skywalks, a number of *buildings* have been built over their streets.
29. Sources are, respectively, Owen (1990), City of Houston (1977), and City of Minneapolis (1997).
30. Beito and Smith (1990) discuss how similar institutional arrangements promoted the development of urban residential infrastructure in St. Louis during the late 19th and early 20th centuries.
31. We know of several cities where a proposed CCW has foundered because the private sector did not wish to agree to city-mandated hours and public-access conditions.
32. Chattenooga is an example of a CCW system with no retail (City of Chattanooga 1992).
33. "A 1979 study revealed that the annual noontime expenditure per downtown employee in the Twin Cities (Minneapolis and St. Paul – both have large skywalk systems) was $1500 compared with $700 in other cities of comparable size" (City of Milwaukee 1989: 21). Such figures are common in the city literature on CCWs (cf. City of Regina Working Committee 1991).

34. The comparative success of cities adopting the free-market model of CCW supply might be interpreted by some as evidence suggesting that CCWs ought not to be designated as public goods in the first place (Section 2 relates the argument for counting them as such). In a sense, this is the point of the paper (and of the "government failure" literature generally): In the absence of government impediments to their production, so-called "public" goods are well-supplied by the private sector. The Samuelson-type argument, while *theoretically* impressive, turns out to have less impressive real-world implications, and the existence of binding government impediments is a vital contributor to whatever "undersupply" problem is evident in these cases. The above applies especially to situations like the CCW case, where the transactions costs of negotiating and coordinating action among numerous building-owners are an important part of the problem. Such costs have been argued by some to be at the very heart of the public-goods problem (see note 1). Viewed from such a perspective, the ability of free-market institutions to promote the effective striking of Coase-type bargains among building-owners is an essential part of the argument that market failure may be an overemphasized notion (especially for policy purposes). There is inevitably a degree of observational equivalence between a market where there is no intrinsic public-goods problem and one where Coase-type bargaining is so successful that the problem is substantially solved. We believe this is an important reason for confronting the *a priori* arguments for market failure (e.g., Section 2) with both careful case-studies of free-market institutional remedies, and studies of the government-created impediments to these remedies.
35. Many City planners would maintain that the relevant example of "government failure" would be *allowing* skywalks and pedestrian tunnels to come into existence at all, and especially to join spontaneously into a network (see note 2). Interestingly, the general public, when polled on the subject of CCWs, disagrees with this assessment (cf. City of Regina Working Committee 1991; City of Milwaukee 1989: 9)
36. Until 1990, calculation of maximum allowable building density (ratio of total floor space to building area) *did not include* basement space or any underground concourses emanating from basements (City of Montreal 1990). This subsidy is sizable: In telephone interviews, planners from two cities have called it a substantial incentive to underground development. Montreal ended these subsidies in 1990.
37. Sources are: Gerbeau (no date), City of Edmonton ([no date], 1997). Edmonton only helps finance links to government buildings or helps with an occasional longer link. Edmonton also pushes the private-sector in the planning process some to help expand the system and link it with mass transit, and, unlike Montreal, the city is involved in network long-range planning.
38. We have less information about Calgary, but find important "rules-based" features there also.
39. Atlanta's post-1987 policies are similar to Denver's. Faced perhaps with political support for its substantial CCW network that had to be finessed, Atlanta's 1987 ordinance does not openly discourage CCW construction. However, the ordinance: [1] allows the city at its discretion to force CCW owners to dismantle CCWs at owners' expense within 90 days if there are conflicts with city "transportation purposes"; [2] requires vaguely that "[t]he outside appearance of any bridge permitted hereby shall not detract from the adjoining buildings or the neighborhood"; and [3] dictates an air rights lease that the city sets annually at a rate legally constrained only by the opinion of a "competent appraiser" selected by the city (City of Atlanta 1987). All three provisions give substantial discretion to the city. There has been little network expansion under the new policies.
40. Two CCW construction projects from the late 1980s are suggestive. One was a four-block long $31 million dollar proposed tunnel which was to connect two commuter-rail stations, passing under the Chicago river and ending near Sears Tower. It was jointly sponsored by the Department of Public Works' Regional Transit Authority [RTA] and two private real estate firms, with the private firms agreeing to finance nearly 75% of the project. RTA

originally expressed enthusiasm about funding the remainder of the project, had completed a preliminary design, and had also applied for a $500,000 Federal Mass Transit grant *for additional design work*. "John Kramer, former secretary of the Illinois Department of Transportation and onetime chairman of the RTA, [who was] playing a key role", lauded the project as "being a model project for the country . . . show[ing] the public and private sectors can work together". The project fell apart as factions within RTA came to see the project as counter to their interests (Sources: Washburn 1987a, 1987b, 1987c). A second 200-foot walkway linking City Hall with the State of Illinois Center, involved the city, the state, the county, the Illinois Capital Development Board, and the Public Works Commissioner, among others. The project was dogged by numerous cost-overruns and delays (its construction period rivaled that of Sears Tower and New Jersey's 8013-foot Lincoln Tunnel). The state began digging its half in 1984, and the city in 1987. When the two met in mid-1989, the state's section was 9 inches below the city's and 8 inches too far east (Sources: Strong 1987; Kaplan 1989; *New York Times*, 1989).

41. Nevertheless, the City has accumulated seven skywalks in its downtown core (Source: City of Chicago, 1992). Other cities (Montreal, Toronto) also strongly encourage tunnels over skywalks but still have substantial CCW systems. However, their subways lie in one straight line and are not spread through the core like Chicago's.
42. One large open skywalk currently is being replaced with a CCW.
43. The high transactions costs in the process are perhaps suggested by the following statement by a City official: "The next [network] addition will be the Main Street skywalk . . . The cooperation of the Western & Southern Insurance Company, the Federal General Services Administration, and the Prudential Insurance Company, as well as the assistance of Congressman Willis Gradison, were instrumental in making the skywalk possible" (McKillip, 1985).
44. Cincinnati has occasionally denied approval to CCW proposals where it appeared likely that they would take large amounts of pedestrian traffic off the streets (City of Cincinnati, 1991). Such policies should reduce their system's size. Awareness of such policies in the business community also would tend to reduce system size by increasing private-sector uncertainty about the City's long-run commitment to network growth.

References

Beito, D. and Smith, B. (1990). The formation of urban infrastructure through nongovernmental planning: The private places of St. Louis, 1869–1920. *Journal of Urban History* 16(3): 263–303.

Benson, B. (1994). Are public goods really common pools? Considerations of the evolution of policing and highways in England. *Economic Inquiry* 32(2): 249–271.

Blade, J. (1980). Filling the gap: 9-story building to link city skyways. *Minneapolis Star*, 30 December.

Boston Redevelopment Authority (1991). Response to CCW questionnaire, July.

Buchanan, J. (1967). Cooperation and conflict in public-goods interaction, *Western Economic Journal* 5: 109–121.

Central Dallas Association (1991). Response to CCW Questionnaire by Larry Fonts and Mark Stein.

City of Atlanta (1987). *Ordinance to amend the code of ordinances by . . . new regulations governing the erection of bridges, tunnels or similar structures across streets or alleys . . .* Adopted by the City Council, 5 March 1987.

City of Calgary (1984). *+15 policy*. Planning & Building Department.

City of Calgary (1991). Letter from David Gurofsky, +15 Coordinator, Department of Planning & Building, May.

City of Chattanooga (1992). Telephone interview with Steve Leach, City Planning Department, March.
City of Chicago (1991). *Planning principles for Chicago's central area*. Department of Planning.
City of Chicago (1992). Response to CCW Questionnaire, Department of Transportation.
City of Cincinnati (1982). *Skywalk bridge and walkway design criteria*.
City of Cincinnati (1991). Telephone interview with Mark McKillip, Economic Development, June.
City of Denver (1982). *Ordinance #29. A bill for an ordinance granting a revocable permit or license to Stellar Enterprises, LTD., its successors and assigns, to encroach with pedestrian bridge . . .* Passed by the City Council, 25 January.
City of Denver (1992a). Telephone interview with Phil Cummings, City Engineer's Office, Department of Public Works, March.
City of Denver (1992b). Response to CCW Questionnaire by Phil Cummings, City Engineer's Office, Department of Public Works, March.
City of Des Moines, Iowa (1986). *Streets and sidewalks: Subchapter 16, skywalk ordinance*.
City of Edmonton (1997). Telephone interview with Glen Radway, Planning and Development, March.
City of Edmonton (no date). *The city of Edmonton pedway network*.
City of Houston (1977). *Houston downtown tunnel system*. Planning Department, October.
City of Milwaukee (1989). *A planning guide for Milwaukee's downtown skywalk network*. Department of City Development, January.
City of Minneapolis (1997). Telephone interview with George Kissinger. Minneapolis Community and Development Authority, March.
City of Montreal (1990). *Master development plan for the Ville-Marie district*. Bureau du plan d'urbanisme, October.
City of Regina Working Committee (1991). *Background paper: Climate controlled walkways*, February.
City of St. Paul, Minnesota (1986). *A survey of downtown grade-separated pedestrian circulation systems in North America*. Department of Planning and Economic Development, December.
City of St. Paul, Minnesota (1987). *General policy statement for the construction of the Saint Paul skyway system*. Department of Planning and Economic Development, adopted by the City Council on 8 January 1980; revised 10 March 1987.
City of Spokane (1992). Letter from Chris Hugo, Manager, Growth Planning, 19 March.
Coase, R. (1960). The problem of social cost. *Journal of Law and Economics* 3 (October): 1–44.
Coase, R. (1974). The lighthouse in economics. *Journal of Law and Economics* 19 (October): 357–376 (reprinted in Tyler Cowen [ed.], *Public Goods and Market Failures*).
Cowen, T. (ed) (1992). *Public goods and market failures*. New Brunswick, N.J.: Transactions Publishers.
Dahlman, C. (1979). The problem of externality. *Journal of Law and Economics 22* (April): 141–162 (reprinted in Tyler Cowen [ed.], *Public Goods and Market Failures*).
Environment Canada: Atmospheric Environmental Service (1984). *Canadian Climate Normals 1951–1980*.
Foldvary, F. (1994). *Public goods and private communities: The market provision of social services*. Aldershot, England: Edward Elgar.
Forusz, H. (1981). The Cincinnati skywalk, Cincinnati, Ohio: A case study from the viewpoint of users and public authorities. *Contact: Journal of Urban and Environmental Affairs* 13(2).
Gerbeau, M. (no date). *Certain legal information for the benefit of foreign visitors curious about Montreal's underground city . . .* Unpublished manuscript.
Gifford, A. (1991). A constitutional interpretation of the firm. *Public Choice* 68 (January): 91–106.

Gunderson, G. (1989). Privatization and the 19th-century turnpike. *Cato Journal* 9(1): 191–200.
Hayek, F. (1944). *The road to serfdom*. Chicago: University of Chicago Press.
Hayek, F. (1960). *The constitution of liberty*. Chicago: University of Chicago Press.
Kaplan, J. (1989). Tunnel cost overruns draw Daley's attention. *Chicago Tribune*, 3 June.
McKillip, M. (1985). Cincinnati skywalk system. *Cincinnati Business Courier*, 19 April.
Means Mechanical Cost Data (1976–1988). Kingston, MA: R.S. Means Co., Inc., various issues.
New York Times (1989). Inches of error, and dream tunnel deferred. 4 June.
Olasky, M. (1992). *The tragedy of American compassion*. Washington, D.C.: Regnery Gateway.
Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.
Owen, M. (1990). *Air rights structures study: An evaluation of policies, regulations and guidelines related to the development of buildings over city streets*. Prepared for the city plan commission, city of Spokane, December.
Rybak, R. (1982). Work begins on 570-foot skyway. *Minneapolis Tribune*, 27 March.
Rybak, R. (1984). New projects to expand City Center skyway links. *Minneapolis Star*, 2 July.
Samuelson, P. (1954). The pure theory of public expenditure. *Review of Economics and Statistics* 36 (November): 387–389 (reprinted in Tyler Cowen [ed.], *Public Goods and Market Failures*).
Simons, H. (1936). Rules versus authorities in monetary policy. *Journal of Political Economy* 44: 1–30.
Strong, J. After many curves, light appears at end of Loop tunnel project. *Chicago Tribune*, 8 June.
Urban Land Institute (1979). Cincinnati skywalk system, Cincinnati, Ohio. *The Urban Land Institute Project Reference File* 9(20).
U.S. Department of Commerce, Bureau of the Census (1970–1990). *County and city data book: A Statistical Abstract supplement*. Washington, D.C.: U.S. Government Printing Office, various volumes.
U.S. Department of Commerce, National Oceanic and Atmospheric Administration (1983). *Comparative climatic data for the United States through 1982*. Washington, D.C.: U.S. Government Printing Office.
Washburn, G. (1987a). Tunnel vision for commuters: $31 million walkway would link train stations, offices. *Chicago Tribune*, 6 March.
Washburn, G. (1987b). RTA split on Loop underground walkway. *Chicago Tribune*, 8 April.
Washburn, G. (1987c). Metra boss: walkway won't help. *Chicago Tribune*, 29 April.
Williamson, O. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics* 22(2): 233–261.
World almanac and book of facts (1970–1991). New York, NY: Pharos Books, various volumes.

Data appendix

Data are collected from (a) surveys and (b) various standard sources. Selection criteria for cities focused on large cities and a certain number of regional-center cities. There was some bias favoring selection of cities which we knew to have skylines. There was no bias in favor of selecting cities with CCWs (when cities were selected that information was unknown to us for all but three large cities). Surveying took place during 1991–92, and yielded data on city size (square feet of office space in "core"), number of CCWs in the downtown "core", maximum number of buildings consecutively visitable in CCWs, and policies and attitudes towards CCWs (a copy of the survey form is available on request). Respondents included city officials (the most frequent source), plus Chamber of Commerce and other trade group representatives. Sometimes more than one survey was received per city; in addition, a large quantity of city literature (maps, planning documents, CCW leases) also was collected, and a large number of follow-up interviews were conducted, allowing considerable cross-checking of sources. In early 1997 a city-by-city check of the data was carried out to ensure consistent methodology across cities and to ensure that all available information sources were utilized, and additional interviews were carried out where necessary to clear up remaining ambiguities.

Following are variables, definitions, and sources.

CCW: A CCW is a weather-conditioned pedestrian bridge or tunnel linking buildings, which allows pedestrians to move between buildings without using city streets. Multi-level CCWs are counted as multiple CCWs. Building corridors and lobbies, malls, and all open-air walkways are excluded, as are common-wall links. Some CCWs link more than two buildings (for example, when placed in mid-block alleys). We were careful to count not only CCWs crossing public rights-of-way but also those that did not do so.

INTEG: The maximum number of buildings a pedestrian can visit without leaving the CCW network (i.e., without going into non-weather-conditioned environments), expressed as a percent of the total number of CCWs. An alternative measure – square feet of connected building space – was rejected because it was not generally available.

CYES: City "actively encourages" CCWs by subsidizing, financing, or supplying them.

CNO: City "actively discourages" CCWs by explicit bans, or by informal (but clearly stated to us) policies of discouragement; or, city has a documentable history of actions clearly and specifically aimed at restricting CCW development.

For both CYES and CNO, ambiguities occasionally arose with cities where policies had changed sharply. For example, in 1990 Montreal's CCW policy turned highly restrictive. In such circumstances a judgment was made about the most accurate regime designation, based largely on how recent the policy change was and how much of the system was constructed under the old regime (Montreal was judged a non-discouraging city on these grounds). More generally, capturing regimes with a dummy variable based on cities' stated policies could usefully be replaced with an index of city policy towards CCWs. We are not yet in a position to present such measures – the development of which is a substantial task in its own right – but hope to do so in the future.

SPACE: Millions of square feet of office space in the city-core, as supplied by survey respondents. This is a standard city statistic which closely tracks the size of high-rise districts. Any alternative measure of city size (e.g., working-population density) runs up against the fact that cities vary widely in their definition and measurement of "city core" area (in addition "working population in core" is not generally available). We collected such data but found it not to be useful.

WEATH: The weather index [WEATH] utilized is a weighted sum of indexes of [humidity-weighted] heat, [humidity-weighted] cold, rain, and snow conditions. The weights on above-average [humidity-weighted] heat and above-average [humidity-weighted] cold are 35% each; the weight on above-average rain is 20%; and the weight on above-average snow is 10%. "Excess" heat was measured for a city by calculating the number of degrees above 77 degrees Fahrenheit that a city's average monthly maximum temperature was during hot months, relative

to the average such value for all cities; this value was then multiplied by an average humidity measure and this product added to the first value. "Excess" cold was derived similarly, using 57 degrees in winter months as the point below which "excess" cold begins, and substituting a winter-months humidity measure. The "rain" measure was formed by weighting equally an index of inches of precipitation per year and an index of number of days of measurable precipitation per year. The snow measure is annual snowfall relative to average snowfall for all cities. One reason why the snow measure receives a low weight (10%) is that it also is part of the "rain" measure. Sources are: U.S. Department of Commerce 1983, Environment Canada 1984.

AGE: Percent of the "Tall Building" stories in city that was constructed during 1970–90. This is a relevant age measure because it is primarily large structures that generate CCWs, and because most tall buildings are "core" structures (by contrast, a measure of general building activity in a city likely would be dominated by non-"core" construction of smaller buildings). The *World Almanac and Book of Facts* supplies a list of tall buildings, their heights, and number of stories, in major North American cities. By working forward year-by-year we were able to form a picture of downtown construction dates of major structures. "Tall" buildings were defined as those with 24 or more stories. Counting some structures smaller than 24-stories is desirable in principle, but would have biased the estimates, since in the *World Almanacs* larger cities tended to set the cutoff for the "tall" designation higher than did smaller cities.

DENSITY: Total "Tall Building" stories in the "core", expressed as a percent of SPACE. Alternative density measures cannot be constructed due to the problems discussed above under SPACE. The measure used here has the advantage of being a measure closely associated with the downtown "core", unlike standard government density measures.

MDEM, MREP, CMNP: Number of years during 1970–1990 in which a city's chief executive was, respectively: a Democratic-party Mayor; a Republican-party Mayor; or a City Manager or Non-Partisan Mayor. Source: *World Almanac and Book of Facts*, 1970–90. (Available for U.S. cities only.)

COST: City building construction cost index (includes both materials costs and installation costs). Source: *Means Mechanical Cost Data*, even-numbered years from 1976–88. (Available for U.S. cities and several Canadian cities.)

U, PUBT, CRIME, CITYEMP: Variable definitions are, respectively, city unemployment rate, percent of journeys to work using public transportation (all types), serious crimes known to police per 100,000 residents, and percent of total city workforce employed by the city. All are from the *County and City Data Book*, various editions, 1970–90. Data are available for roughly every five years over the period; averages are over these years. (U is available for all cities; others are available for U.S. cities only, since Canadian data were not compatible with U.S. data).