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4 **The Economic Impact of One to Two-way Street Conversions: Advancing a Context**
5 **Sensitive Framework**

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7 By

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1 **ABSTRACT**

2 As many communities across the US convert one-way streets to two-way traffic flow, a growing
3 body of work seeks to understand the implications. While some work indicates that there can be
4 road safety and performance benefits to these conversions, only a small number of papers deal
5 with the economic implications. This paper examines the economic impact of one to two-way
6 street conversions, using 6 case studies between 2004 and 2011. Researchers analyzed these
7 cases, looking at relative job growth in conversion areas as compared to the local economy on
8 both an aggregate and job sector basis. The results illustrate a mixed outcome, more negative
9 than positive. In some cases, job growth in the conversion area exceeded that in the local area,
10 but in other cases it was far lower. These results suggest that street conversions are not a panacea
11 or for redevelopment, but can be effective regeneration strategy for certain sectors.

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13 **KEYWORDS**

14 street design, two-way, community development, economic development, regeneration

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2 INTRODUCTION

3 Over the past years, many cities in the US that have been rethinking their street configurations
4 (*1–3*), converting one-way streets to two-way. Such conversions have become fashionable in
5 many planning and development circles (*4, 5*). Many of the converted streets were once two-
6 way, and are being converted back to their original configurations (*6–9*). Authors have claimed
7 that one-to-two way conversions can promote redevelopment (*2, 10*). However, there is little
8 evidence in transportation literature to support the regenerative or economic impacts of two-way
9 streets over their one-way counterparts. Studies do show that one-way streets often have higher
10 speeds (*11*), lead to more collisions (*12*), and pose increased risk to cyclists and pedestrians (*13*).
11 Yet, no work looks at the economic impact of this street typology. This paper addresses the lack
12 of knowledge about economic impacts. We first provide a brief background to introduce the
13 literature in this area. We then explain our methods. We follow with results, and a discussion of
14 the implications of these results as well as opportunities for research and practice in the field of
15 transportation.

16

17 BACKGROUND

18 In mid-20th century American cities, one-way streets emerged to facilitate quick auto traffic
19 between central cities and suburbs (*6, 8*). Many one-way streets were first created from two-way
20 streets in the 1930s through the 1950s, in urban areas with narrower streets and smaller blocks, in
21 an attempt to accommodate increasing auto traffic while seeking to lower collision rates. For
22 example, contrary to current thinking, a 1950 before-and-after study in Baltimore found,
23 “implementation of one-way streets results in a 10%-15% reduction in traffic accidents, a 75%-
24 90% reduction in traffic delay, and 100% increase in traffic volume. (*14*) They found that one
25 way streets helped to control traffic speed.”

26 More sophisticated recent research contradicts this finding, indicating that two-way streets are safer
27 than their one-way counterparts (*12, 15*). One-way streets allow for higher speeds in downtown
28 areas, generating negative safety implications for the overall community (*16, 17*). Some of the
29 best work, on the traffic functionality of two-way vs. one-way streets, indicates that two way
30 streets can actually be superior in terms of vehicular level of service (*18–20*). This traffic
31 performance benefit is confirmed by micro-simulation (*21*) and by studies that show drivers
32 engage in inefficient circling behavior when on one-way streets, making the street configuration
33 less functional than originally envisaged (*20, 22, 23*). Furthermore, evidence shows that one-
34 ways can discourage non-automotive travel and can sometimes facilitate illegal contraflow riding
35 behavior (*12*).

36 The Question of One-Way vs. Two-Way

37 In the 1970s, reducing air pollution emerged as a goal, leading to a wave of conversions of two-
38 way streets to one-way. Since cars pollute at slower speeds and in stop-and-go traffic, one-way
39 streets were believed to generate significantly less pollution than two-way, since they appeared
40 to promise smoother flows of traffic, aided by the deployment of additional tactics such as signal
41 synchronization (*24*).

1 In the midst of these conversions, and emerging controversies in 1970s, Donald Appleyard,
2 author of the seminal work on street livability, took a middle-of-the-road approach on the One-
3 Way or Two-Way question (6, 25).

4 “There is considerable debate in the transportation field over the efficiency of
5 one-way and two-way streets. No studies, to our knowledge, have looked in detail at the
6 impact on residents. When our respondents were asked to choose between one and two-
7 way in the case of a heavy traffic street, there was an almost even split, with a slight
8 preference for one-way from those on the heavy streets and some preferences for two-
9 way on the medium streets... Those on light streets preferred by an overwhelming
10 majority (74 percent) to have their streets remain two-way. Had they been offered one-
11 way streets that would have reduced traffic, as in some London schemes, they might, of
12 course, have rated them differently.”

13 A notable insight or perhaps counterpoint supporting one-way street design stems from Donald
14 Appleyard’s research. He found that if residents along one-way streets were exposed to traffic
15 during only one commute period a day, their level of neighborhood satisfaction and “livability”
16 was higher than residents on two-way streets with similar traffic volumes.

17 The debate around one-way streets began anew in the early 2000’s when Peter Calthorpe
18 published his 2002 article, “The urban network: a radical proposal,” in *Planning* magazine.
19 Calthorpe’s article outlined the benefits of one-way streets in high-intensity suburban,
20 commercial/mixed-use contexts. (26)

21 Some of the reasons conversion to one-way streets made sense to some of the founding thinkers
22 of the New Urbanist movement, were the realities of working in the suburbs. Matthew Taecker,
23 who worked with Calthorpe on these ideas, provides useful insight:

24 “Much depends on the extent you can accomplish a distributed network with parallel
25 routes, so livable traffic volumes can be maintained. Distributed networks are not the
26 reality of many developed suburbs, where a hierarchical street network forces traffic –
27 and the commerce that it supports – on arterial roads. Calthorpe’s use of one-way streets
28 allows pedestrian-scaled town center to be created. Multi-lane boulevards are also an
29 option, but they present wide pedestrian crossing distances, widely-spaced crosswalks,
30 and end up as “single-sided” pedestrian experiences with a huge roadway in between.”
31 .(27)

32 An additional consideration is that, in suburban environments, retail follows the traffic flow, both
33 through design (zoning), and by meeting key objectives of developers. Consequently, the design
34 processes for roads around suburban commercial areas can easily lead to congestion that
35 prohibits comfortable pedestrian and bicycle travel (especially when including left-turn-lanes,
36 etc.).

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2 **Figure 1. Calthorpe’s “radical proposal”**

3 Figure 1 illustrates the dichotomy Calthorpe’s firm was facing in the case of their work on
 4 Issaquah Highlands, near Seattle, WA. Faced with the prospect of a massive two-way suburban
 5 arterial, the idea of a set of one-way streets and supportive network made sense. One-way streets
 6 could be narrower, provide regular gaps in traffic for pedestrian and bicycle crossings, and
 7 function better for both left and right turns. That said, the team remained concerned that traffic
 8 would travel too fast to be livable and comfortable, unless care was taken to keep traffic speeds
 9 low.

10 Lessons for how to make one-way streets work can be found in downtown Portland, OR.
 11 According to GB Arrington, of GB Place Making, “Portland’s very walkable world class
 12 downtown is a tight grid of narrow, slow, safe one-way streets.,” serving a vibrant, high
 13 intensity, mixed use downtown with a tight network of one-way streets. The Portland model
 14 works because the blocks are short (about 200 ft.), crosswalks are close to each other, (every 200
 15 feet) and the traffic signals slow traffic—timed so traffic travels no faster than about 20 MPH (an
 16 easy speed for a bicyclists). Also, the one-way streets are no wider than 3-lanes (and do not
 17 require extra space for turning lanes).

18 The proposal to reconsider one-way streets, by one of the key founders of the new Urbanist
 19 movement, disrupted some commonly held beliefs in the New Urbanist community. In the period
 20 following, several new research initiatives were forged, between CNU and ITE, to develop
 21 guidance on Context-Based Design for Major Urban Streets. The initial direction for the ITE-
 22 CNU study came out of preliminary work done at the first CNU Transportation Summit in
 23 Oakland, California, in December 2002, attended by an author of this paper. By December 2003,
 24 the ITE-CNU research initiative was sponsored in a major national effort by FHWA and EPA,
 25 which led to the creation of the 2010 ITE report of “Recommended Practices” titled, *Designing*
 26 *walkable urban thoroughfares: A context sensitive approach* (28) (29).

27 Although the one-way street debate was a key reason for this new initiative, the resulting ITE
 28 report does little to fully address the one-way/two-way question. One-way streets, for example,
 29 are mentioned in this 229 page document, only 12 times overall (7 times, if not counting the 5
 30 times they are mentioned as one-way, side access streets of multi-way boulevards). Three of the
 31 times one-way streets are mentioned are in the paragraph below:

1 “Where there is insufficient network travel lane capacity and right of way to meet
2 thoroughfare design objectives, consider converting two parallel streets into a pair of one-
3 way streets (couplet) to increase capacity before considering widening thoroughfares.
4 While sometimes the subject of debate and controversy, one-way couplets have
5 appropriate applications under the right circumstances. Strive to keep the number of lanes
6 in each direction to three or less. This measure requires a comprehensive study of the
7 ramifications for pedestrian and bicycle safety, transit and vehicle operations, economic
8 issues and so forth (28) P. 137.

9 This benefit is achieved based on the short blocks suggested in the ITE-CNU research; however,
10 this kind of small-block urban morphology most likely operates as a two-way street.

11 **Other Research**

12 In the social realm, some work reports increases in property values and decreases in crime after
13 converting one-way streets to two-way (15). Other work suggests that one-way streets tend to
14 marginalize the elderly and those with disabilities (30–32). A large number of studies,
15 professional reports and books suggest that these two-way conversions have an economically
16 regenerative effect (2, 10, 33–36); however, there is little quantitative assessment on one
17 important question – does conversion from a one-way to a two-way street regenerate an area and
18 improve it economically? Many US cities experience public movements and popular sentiment,
19 as shown in Figure 2, in favor of two-way streets as the answer for stronger and economically
20 resilient downtowns. This growing trend underscores the importance of the question this paper
21 investigates.



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2 **FIGURE 2. A neighborhood sign advocating for two-way streets in New Albany, Indiana**

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4 **METHODOLOGY**

5 Based on this literature, we focus on case studies of documented conversions occurring in the 8-
6 year period from 2004 to 2011. These case studies are gathered using meta-analysis, and by
7 scanning planning reports from across the U.S. We find 6 case studies with adequate information
8 available in this period. We then gather Census Longitudinal Employer-Household Dynamic
9 (LEHD) employment data on both the locations of the conversion and their respective cities. We
10 use primary jobs as our proxy variable to measure economic growth and regeneration, evaluating
11 the change over time between 2002 and 2012.

12 The LEHD program is run by the Center for Economic Studies at the U.S. Census Bureau and
13 provides some of the best longitudinal economic and local employment data available. Data is
14 collected from 90% of all wage and salary jobs in 48 participating states, and provides an
15 integrated and comprehensive comparison of employment, earnings, and job flows at detailed
16 levels of geography and industry sector in the US (37). The data is highly accurate and validated
17 by state employment departments, as well as the federal Bureau of Labor Statistics. It is provided
18 in map-based format on a web-tool called On-the-Map (<http://lehd.ces.census.gov/>).

1 After looking at the cases from a job growth perspective, as compared to their respective cities,
2 changes are analyzed on a sector basis using a location quotient (LQ) analysis. Location
3 quotients were first used by Robert Haig (38) and are commonly used tools for determining the
4 strengths of a local economy. The location quotient calculation is normalized to 1 and can be
5 thought of as a form of concentration analysis describing the relative share of a subarea's
6 strength, as compared to a larger area. For example, if the relative share of subarea's population
7 of retail workers, relative to the regional share of retail workers, is equal to 1, then there is an
8 equal share of retail workers in the subarea as compared to the region. If the $LQ > 1$, then the
9 retail workers sector is a strength and there is a larger share than the region. If the $LQ < 1$, then
10 there is less of a concentration as compared to the region. The higher the number, the more
11 concentrated the activity in the smaller location.

12

13 **RESULTS**

14 When looking at one-way to two-way conversions, the results are mixed. In examining job
15 growth in each city, we see that, in some cases, the number of jobs went up in the conversion
16 area; however, in other cases, jobs did not rise in the same way. For example, as shown in Table
17 1, in downtown Minneapolis and Des Moines, the conversion areas experience a 5.86% and
18 2.05% increase in jobs, respectively, compared to each city as a whole. Conversely the
19 conversion areas in Austin, Vancouver, Louisville and Charleston not only experienced a net loss
20 in jobs; they lost jobs while the economies around them appeared to gain jobs. The discrepancy
21 suggests we create a better lens for looking at growth and contraction in these areas, by
22 evaluating individual sectors.

23

1 **TABLE 1: Street Conversion Cases and Economic Growth**

City	Year	Location	Results	Source	Total Jobs in City 2012	Total Jobs in City 2002	Jobs in Conversion Area 2012	Jobs in Conversion Area 2002	Percent Change City	Percent Change Conversion Area	Difference Between Conversion Area & City
Vancouver, WA	2008	Broadway, Main and C Streets	- Increase in volume by 2x; decrease in congestion - Anecdotal increase in business traffic; increase 10-20% retail sales	(34, 39)	74,796	65,689	3,242	5,371	13.86%	-39.64%	-53.50%
Minneapolis, MN	2009	Hennipin and 1st	- Increase in cycling - Decrease in intersection failures (esp. AM)	(40)	296,249	259,672	75,973	63,340	14.09%	19.94%	5.86%
Louisville, KY	2011	Brook & First	- Increase in volume; decrease in collisions - Decrease in crime - Potential increase in business activity	(15)	178,480	165,793	6,414	6,630	7.65%	-3.26%	-10.91%
Des Moines, IA	2006	Court & Walnut; Avenues & Locust Street	- Increase in volume - Increase in development	(41)	128,717	131,281	28,748	28,711	-1.95%	0.13%	2.08%
Austin, TX	2008	Cesar Chavez Street	- Increase in development - Improvement in traffic function - Bicycle improvements	(42)	545,282	486,726	19,402	50,784	12.03%	-61.80%	-73.83%
Charleston, SC	2008	Wentworth Street & Beaufain (2004) Rutledge & Ashley (2008)	- Increase in development - Improvement in traffic function	(36)	83,010	74,895	28,051	29,986	10.84%	-6.45%	-17.29%

1 **Sector Analysis**

2 In each case study city, there were sectors that exceeded job creation over time, as compared to
3 their respective cities. For example, as Table 2 shows, accommodation and food sectors
4 experienced growth relative to the wider economy in all but two of the conversion areas.
5 Likewise, arts and entertainment were growth areas in many of cities, implying investment in
6 downtowns as social attractors, similar to the what might be suggested by Florida and others
7 (43–45). For example while the conversion area in Austin experienced a dramatic drop in the
8 educational sector, its economy in the arts and entertainment sectors grew, alongside the
9 accommodation and food and professional services sectors.

10

11 In general, these three sectors (Arts, Entertainment, and Recreation, Accommodation and Food
12 Services and Professional) appear to be the most consistent growth areas consistent with the
13 conversions. And while these results seem to indicate that while street conversions are not a
14 panacea or single fix to urban problems, they can be effective in certain sectors, and that the
15 context and economic development goals of a municipality are important considerations when
16 thinking about a conversion.

17

1 **TABLE 2 Sector Analysis of Conversions Using Location Quotient**

Job Sector	Vancouver		Louisville		Minneapolis		Austin		Des Moines		Charleston	
	2012	2002-2012	2012	2002-2012	2012	2002-2012	2012	2002-2012	2012	2002-2012	2012	2002-2012
Agriculture, Forestry, Fishing and Hunting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mining, Quarrying, and Oil and Gas Extraction	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.50	0.00	0.00	0.00	0.00
Utilities	0.00	0.00	0.00	0.00	3.48	1.23	0.00	-3.44	1.75	-1.08	2.00	1.67
Construction	1.82	0.36	1.29	-0.18	0.24	-0.12	0.32	0.16	0.41	0.01	0.23	0.08
Manufacturing	8.30	-0.13	0.80	0.09	0.06	-0.19	0.50	0.45	0.08	-0.02	0.23	-0.92
Wholesale Trade	2.75	0.16	0.69	-0.01	0.68	0.20	0.24	0.15	0.56	0.14	0.39	-0.01
Retail Trade	3.08	-0.01	1.12	0.39	0.76	-0.46	0.26	0.18	0.12	-0.06	0.41	-0.04
Transportation and Warehousing	3.00	0.28	0.14	-0.08	0.13	-0.27	0.21	0.00	0.05	-0.02	0.55	0.05
Information	2.15	0.20	1.10	-0.52	0.35	-0.17	0.53	0.31	0.59	0.30	0.09	-0.03
Finance and Insurance	0.54	0.51	0.18	-0.09	1.88	-0.57	1.74	-0.48	2.50	0.06	0.97	0.09
Real Estate and Rental and Leasing	0.43	1.38	0.92	0.32	1.93	-0.02	1.00	0.59	1.00	-0.39	0.67	-0.05
Professional, Scientific, and Technical Services	0.53	1.22	0.89	0.25	2.07	-0.06	1.96	1.15	2.00	-0.10	0.41	-0.25
Management of Companies and Enterprises	0.82	-0.08	0.20	0.20	1.53	-0.32	0.57	0.57	1.18	0.84	0.08	0.08
Administration & Support, Waste Management and Remediation	0.97	0.50	1.50	-0.96	1.78	0.76	0.68	0.44	0.82	-0.33	0.40	0.01
Educational Services	27.00	0.03	4.24	2.24	0.06	0.01	0.19	-3.06	0.02	0.00	2.06	-0.03
Health Care and Social Assistance	2.63	-0.15	1.04	-0.40	0.08	-0.04	0.22	0.08	0.27	0.15	1.53	0.23
Arts, Entertainment, and Recreation	8.00	0.01	0.60	-0.98	1.57	0.49	1.00	0.82	0.70	-0.43	0.17	-0.35
Accommodation and Food Services	1.11	0.30	0.32	-0.28	1.18	0.06	3.58	2.46	0.84	0.10	1.11	0.22
Other Services (excluding Public Administration)	1.39	0.05	0.96	-0.40	0.61	-0.15	1.24	0.85	1.04	-0.06	0.67	0.04
Public Administration	0.14	-2.66	0.94	0.84	0.38	0.29	1.47	0.81	2.28	-0.15	0.60	0.19

2 **Note: Darkening red indicated higher LQ 2012; darkening green indicated higher change in LQ 2002-2012.**

1 **DISCUSSION**

2 The data collected for this study showed that one-way street conversions may impact traffic
3 flow and collisions, but do not always result in job creation and economic growth. Certain
4 economic sectors such as food services, real estate, professional and educational services, always
5 seem to benefit relative to the local economy, but only in two of our cases was there total growth
6 across the conversion area relative to the city-wide economy. While our study is limited in that it
7 involves a small number of cities over a limited time period when the US economy was
8 recovering from a recession and four of the six corridors showed an absolute decline in jobs
9 respective to their regions, it provides an important counterbalance to the current dialogue on the
10 economic benefits of two-way streets..

11
12 Public investment in streetscape and roadway infrastructure is a tool— one of the many
13 economic levers that local governments have at their disposal. Conversion to two-way streets
14 must be applied appropriately – even if there are ancillary benefits of a project (e.g. reduced
15 collision, increased safety, etc.) Herein lies the primary point underscoring what many academics
16 have said before us— context matters (28, 29, 46–50),
17

18 **Toward a context sensitive framework**

19 Clearly, an appreciation of context is needed. The surrounding land use, and transport street
20 network, emerges as an important consideration in helping researchers and practitioners deal
21 with the one-way, two-way question. Our work suggests that two-way conversions are not
22 always a direct roadmap to economic regeneration and prosperity. Nevertheless, context matters
23 and should be considered; and while this is not a new phenomenon in light of recent trends, it is
24 important to re-emphasize.

25 Useful work in this regard is Garrick and Wang’s 2005 article (29), which accentuates the need
26 to address the issues of (a) how to define context better and (b) how to design for appropriate
27 operations (including speed). Furthermore, they lay out the arguments for a comprehensive and
28 coherent design framework that ties together a street’s urban (or place) and mobility functions,
29 including multimodal accommodation.

30 Garrick and Wang also discuss the use of typologies for guiding street design (29), but not to
31 address the one-way, two-way street question that we examine in this paper.

32 On this topic, the ITE/CNU Design manual provides guidance for both “Context Zones” (place)
33 and “Thoroughfare Types” (mobility function), presenting a full range of context zones for
34 roadways. It should be noted that the ITE report focuses on urban contexts (C-3 through C-6) as
35 determined by “distinguishing characteristics” (e.g., the overall relationship between buildings
36 and landscape that contributes to context). In addition to the distinguishing characteristics and
37 general character, four attributes assist the practitioner in identifying a context zone:

- 38 (1) building placement—how buildings are oriented and set back in relation to the
39 thoroughfare;
- 40 (2) frontage type—what part of the site or building fronts onto the thoroughfare;
- 41 (3) typical building height; and
- 42 (4) type of public open space.

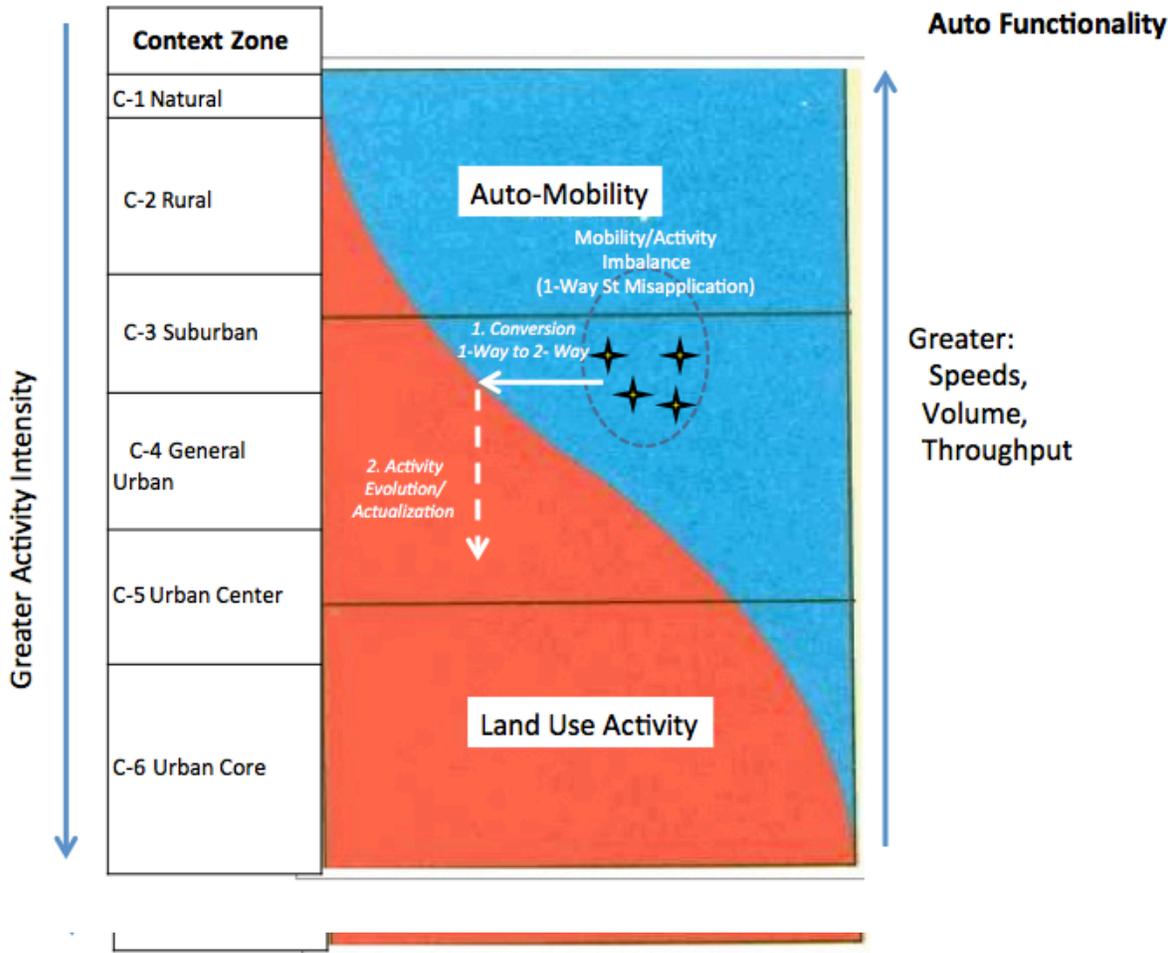
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For transportation typology, the ITE Report suggests practitioners use both the standard functional classification (Major Arterial, Minor Arterial, Collector, Local), as well as a new collection of thoroughfare types to classify streets (including Boulevards, Avenues, and Streets). According to the report, as functional classification “defines a thoroughfare’s function and role in the network, in addition to governing the selection of certain design controls,” the report recommends a practitioner uses functional class to determine the following:

- Continuity of the thoroughfare through a region and the types of places it connects (such as major activity centers);
- Purpose and lengths of trips accommodated by the thoroughfare;
- Level of land access and level of access management;
- Type of freight service; and
- Types of public transit services (for example, bus, bus rapid transit, fixed guideway and so forth).

In light of our results, we offer a context-sensitive framework for analysis and guidance of conversions. Starting with the commonly used “Highway Functional Classification System” graphic, which for years has helped provide guidance on how to balance between “mobility” and “land access.” Figure 3 provides guidance on how practitioners can seek a balance between auto-mobility and community context, when facing the one-way/two-way question. By showing the activity context along the street shown in the Y axis, Figure 3 provides an important functional tool by classifying what is happening contextually, against the red and blue field depicting the underlying dichotomous choice between a one- or two-way street (the red essentially representing the domain of two-way streets, the blue one-way). Within this context, there is an additional policy consideration. If a community desires to choose auto-mobility, there may be a role for one-way streets. That said, as land use activity increases and multi-modal goals come in to play, there may be more benefit for building two-way streets.

We believe this framework can help enrich understanding of the appropriate applications of one vs. two-way streets. Many in the CNU community continue to believe that one-way streets make sense for intense urban settings, citing examples in downtowns (Portland) and suburban high activity centers (Issaquah Highlands). We would not contest that point. We would just add a condition; again, context matters. The urban morphology, block lengths, policy and economic goals of a community all play a role in this decision, and it is important that local policy makers consider all factors when investing in conversions in their respective communities.



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4 **Figure 3 Transportation/Land Use Context Typological Framework for One-Way**
5 **Street Analysis and Policy Guidance**
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7

8 **CONCLUSIONS**

9 This paper examines the economic impact of street conversions, investigating 6 case studies
10 between 2004 and 2011, using Census Longitudinal Employer-Household Dynamics data. These
11 cases are first examined looking at job growth in the relative conversion area, as compared to
12 their respective cities, and then on job sector basis using a location quotient analysis. We find
13 that the results are mixed, more negative than positive, showing that in some cases job growth
14 in the conversion area exceeded that of local area but in other cases it was far lower. That said, in
15 each case there were sectors that exceeded job growth over time as compared to their respective
16 cities.
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18 These results seem to indicate that while street conversions are not a panacea for urban problems,
19 they can be effective in certain situations. This therefore justifies the potential for a contextual
20 guide for conversions, and provides room for future research. It also leaves room for future
21 research and in that realm we recommend continued work on comparing the impacts of business
22 growth, permits pulled and property tax gained, in converted areas. By continuing this work,

1 planners and practitioners can continue to better understand how and when to use two-way street
2 conversions as a regenerative tool.

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