The ARC Effect

How better transit
boosts home values
& local economies
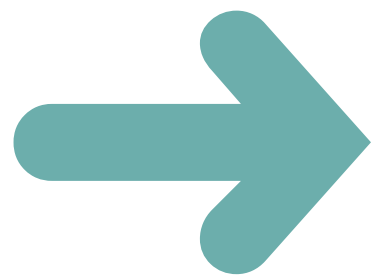
NJ TRANSIT'S PAST PROJECTS HAVE BOOSTED LOCAL ECONOMIES, AND **ARC** WILL TOO

Acknowledgements

Executive Summary

A statistical analysis of the effect of three recent improvements to NJ TRANSIT's rail system on home values predicts that ARC – a new commuter rail tunnel to Midtown Manhattan – could add a cumulative $18 billion to home values within two miles of NJ TRANSIT and Metro-North Port Jervis and Pascack Valley train stations. This, of course, is just one of ARC's several long-term economic benefits, which also include an overall increase in the region's economy, new jobs on both sides of the Hudson, higher personal incomes, higher commercial property values, and reductions in driving and air pollution.

Hedonic price modeling of 45,000 home sales within two miles of train stations shows that three improvements to the NJ TRANSIT rail system – Midtown Direct Service on the Morris & Essex Line, the Montclair Connection for the Montclair-Boonton Line and Secaucus Junction for the Pascack Valley and Main/Bergen/Port Jervis Lines – increased the value of nearby homes by an average of

nearly $23,000 per home (in 2009 dollars). Homes within walking distance of train stations gained the most value – up to $34,000. Value appreciations were less significant farther from stations.

Cumulatively, these three projects boosted home values by $11 billion. This represents $250 million a year in new property tax revenue for municipalities.

→ A detailed comparison of the trip time reductions provided by these three projects with the trip time reductions expected from ARC reveals that **ARC could raise home values by an average of $19,000 per home**, and up to $29,000 for homes within one-half mile of stations.

→ Cumulatively, **ARC could boost home values by $18 billion**, and generate $375 million a year in new property tax revenue for municipalities. This is significant as growing tax bases relieve pressure for municipalities to increase tax rates.

→ **The number of residents west of the Hudson River with a train commute to Midtown of under 50 minutes will double after ARC**, thanks to faster commuting times. The number of people within 70 minutes of Midtown will increase by 25%. This extraordinary improvement in access will have significant positive economic impacts for families and municipalities across New Jersey and New York, as wages are 60% higher in Manhattan than west of the Hudson.
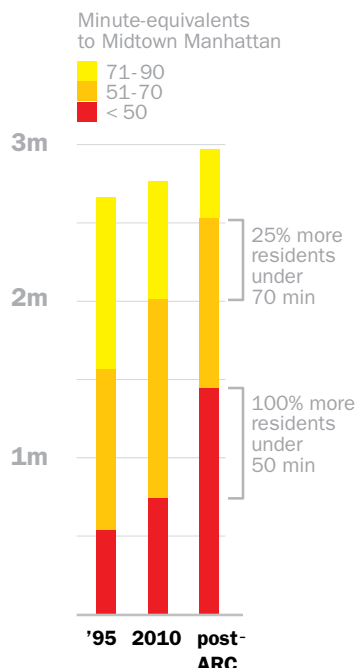
→ **The economic development and quality-of-life-improving potential of better transit can best be harnessed by building new, transit-oriented, mixed-use, economically diverse development around train stations.** NJ TRANSIT, Metro-North, municipalities, and the state of New York and New Jersey should work together to optimize ARC's benefits for the most residents possible.

Homes near train stations significantly gained in value after Midtown Direct, Montclair Connection and Secaucus Junction – an average of $23,000 per home, with the highest gains closest to the stations

$10,286 (2.3%)
$15,287 (3.4%)
$22,524 (5.0%)
$33,852 (7.5%)

.5
1
1.5
2 mi.
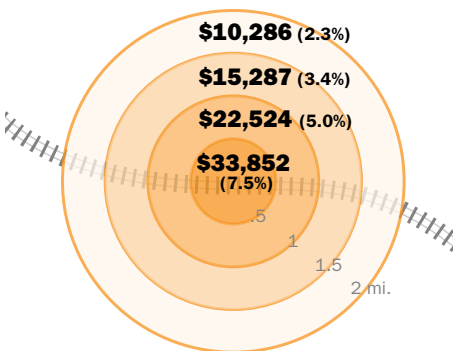
Median sale price (FY09 dollars): $451,000
Average trip-time improvement: 12 minutes
Price increase over 9 years

Thanks to faster commute time, the number of New Jersey and New York residents with a train commute to Midtown of under 50 minutes will double after ARC

Minute-equivalents
to Midtown Manhattan
71-90
51-70
< 50

3m
2m
1m

25% more residents under 70 min

100% more residents under 50 min

'95   2010   post-ARC

See box on page 6 for a definition of minute-equivalents

The median wage earned in Manhattan is 60% higher than in New Jersey
(Source: Bureau of Labor Statistics, 2009)

Manhattan
New Jersey

$80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
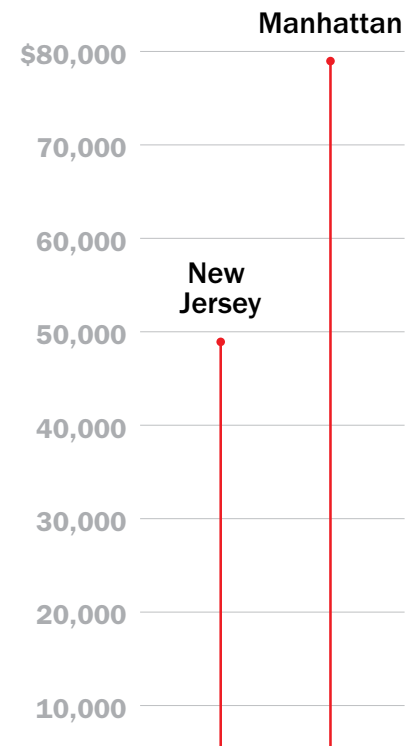
Introduction

ARC is New Jersey and New York's biggest investment in transit ever. It involves the construction of a second commuter rail tunnel that will connect NJ TRANSIT's existing rail network and Metro-North's Port Jervis and Pascack Valley service with a new terminal station at 34th Street in Manhattan. ARC will double the number of trains that can travel every morning into the economic engine of the region from west of the Hudson River. For several train lines that currently terminate in Hoboken or Newark, ARC will provide new, direct service to Midtown. For those lines that already terminate at Penn Station-NY, ARC will significantly increase the frequency and reliability of service.

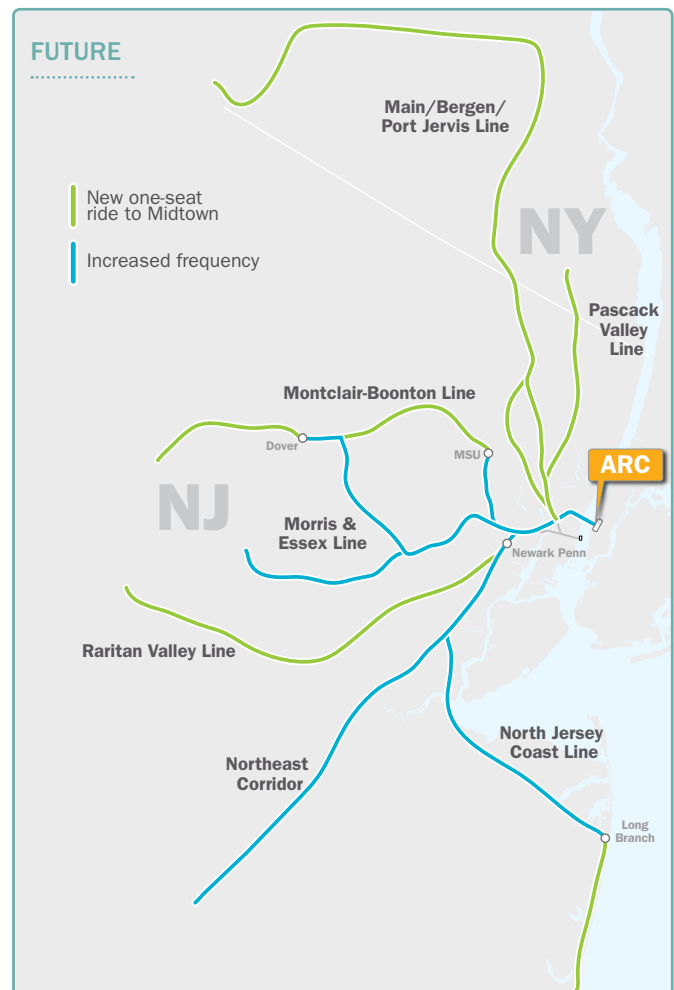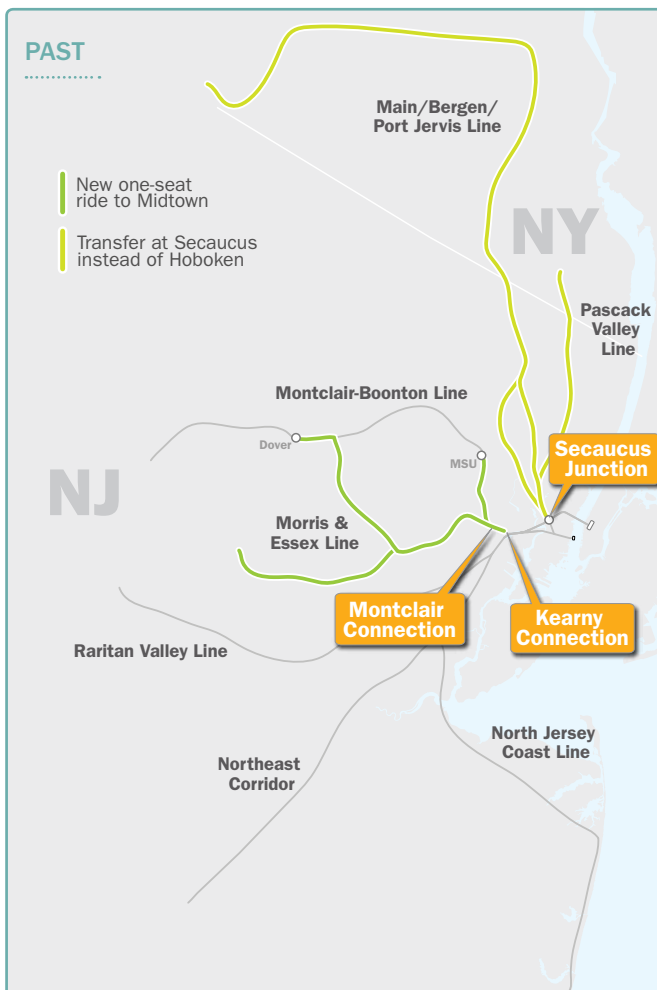The purpose of this analysis is to assess how this increased access to Midtown will increase the attractiveness of transit-accessible housing, as reflected in home values near train stations.
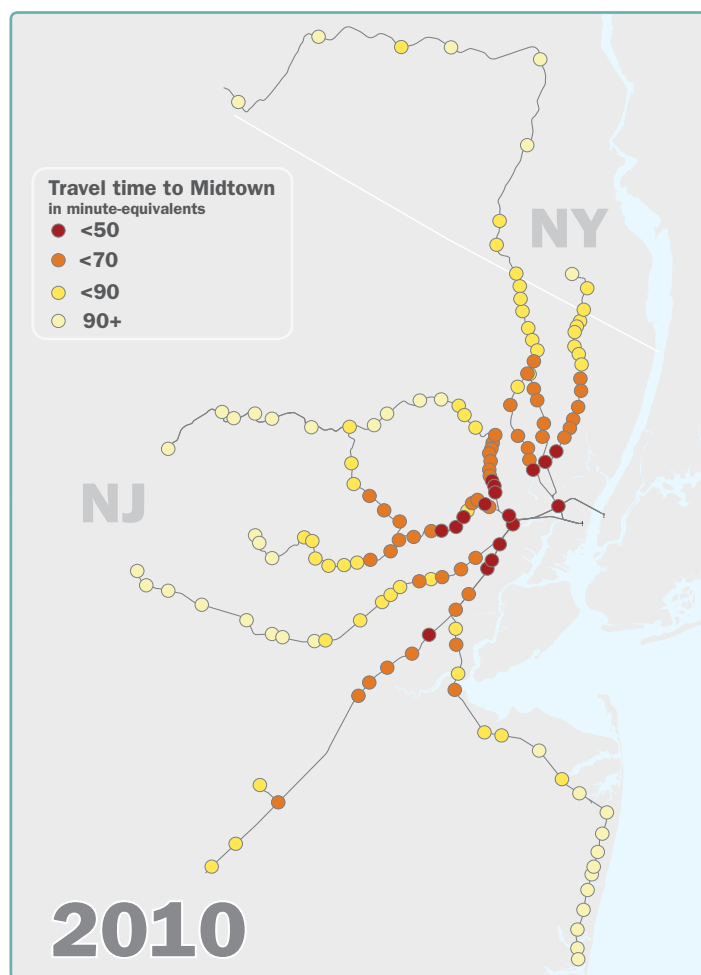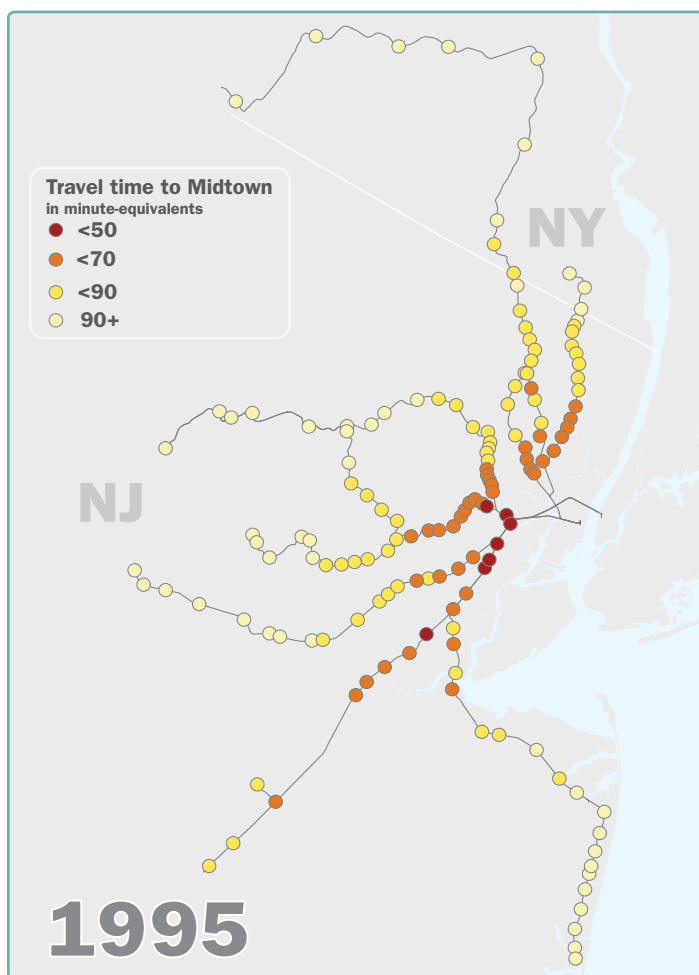
This prospective analysis is based on past experience. In 1996, 2002 and 2003, NJ TRANSIT significantly improved train service with Midtown Direct Service on the Morris & Essex Line, the Montclair Connection for the Montclair-Boonton Line, and Secaucus Junction for the Pascack Valley and Main/Bergen/Port Jervis Lines. Each of these projects shaved up to 20 minutes in travel time to Midtown Manhattan (up to 40 minutes roundtrip). Anecdotally, there is little doubt that most of the communities along these four train lines experienced increases in home values due to the improved service. This statistical analysis attempts to measure quantitatively the relationship between home values and improved train service, all things being equal, as reflected in 45,000 home sales, before and after the projects were built, within two miles of the train stations.

Increase in Hudson River crossings, by mode since 1980

- 200%
- 100
- -6

NJT
bus
PATH
cars
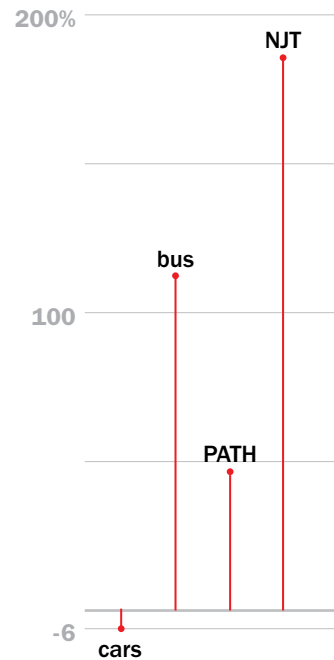
How past and future capital projects have improved, and will further improve, rail access to Manhattan from west of the Hudson.

PAST

New one-seat ride to Midtown

Transfer at Secaucus instead of Hoboken

NY

Main/Bergen/Port Jervis Line

Pascack Valley Line

Montclair-Boonton Line

Dover

MSU

Secaucus Junction

NJ

Morris & Essex Line

Montclair Connection

Kearny Connection

Raritan Valley Line

Northeast Corridor

North Jersey Coast Line

FUTURE

New one-seat ride to Midtown

Increased frequency

NY

Main/Bergen/Port Jervis Line

Pascack Valley Line

Montclair-Boonton Line

Dover

MSU

ARC

NJ

Morris & Essex Line

Newark Penn

Raritan Valley Line

Northeast Corridor

North Jersey Coast Line

Long Branch

1995

2010

Travel time to Midtown
in minute-equivalents
- ● <50
- ● <70
- ● <90
- ○ 90+

A reasonable commute of 50 or 70 minute-equivalents gets passengers much farther into New Jersey and New York now than before Midtown Direct, Montclair Connection and Secaucus Junction. The improvements will be even more dramatic after ARC. (All travel times calculated for the morning peak two-hour period. See box on page 6 for an explanation of minute-equivalents.)

| | Improvement | Lines affected | Travel improvement | | |
			Travel time	Frequency	Transfers
Past	**Midtown Direct**	Morris & Essex	Reduction in travel time due to a) loss of transfer and b) loss of wait time for second train	Same frequency but half the trains now go to Penn Station-NY instead of Hoboken	One-seat ride instead of transfer to PATH at Hoboken
	Montclair Connection	Montclair-Boonton (MSU and east)	Reduction in travel time due to a) loss of transfer and b) loss of wait time for second train	Increased frequency but half the trains now go to Penn Station-NY instead of Hoboken	One-seat ride instead of transfer to PATH at Hoboken
	Secaucus Junction	Main/Bergen/Port Jervis; Pascack Valley	Reduction in travel time due to faster service to Penn Station-NY on NJT via Secaucus than on PATH via Hoboken	Same frequency	One transfer still required – now at Secaucus instead of Hoboken
Future	**ARC**	Northeast Corridor; Morris & Essex (MSU and east); Montclair-Boonton; North Jersey Coast	Slight improvement in travel time due to increased system reliability	Increased frequency	Same one-seat ride
	ARC	Main/Bergen/Port Jervis; Pascack Valley; Raritan Valley	Reduction in travel time due to a) loss of transfer and b) loss of wait time for second train	Increased frequency but some trains will go to Penn Station-NY instead of Hoboken or Newark	One-seat ride instead of transfer to NJT at Secaucus or Newark, or to PATH at Hoboken
	ARC	Montclair-Boonton past MSU; North Jersey Coast past Long Branch; Morristown past Dover	Reduction in travel time due to a) loss of transfer and b) loss of wait time for second train	Increased frequency but some trains will go to Penn Station-NY instead of Hoboken or Newark	One-seat ride instead of same-platform transfer to electrified line

Note: The improvements described above are overall improvements that apply to entire lines. Specific stations are subject to specific service schedules.

Travel time to Midtown
in minute-equivalents
- ● <50
- ● <70
- ● <90
- ○ 90+

NY

NJ

Post-ARC
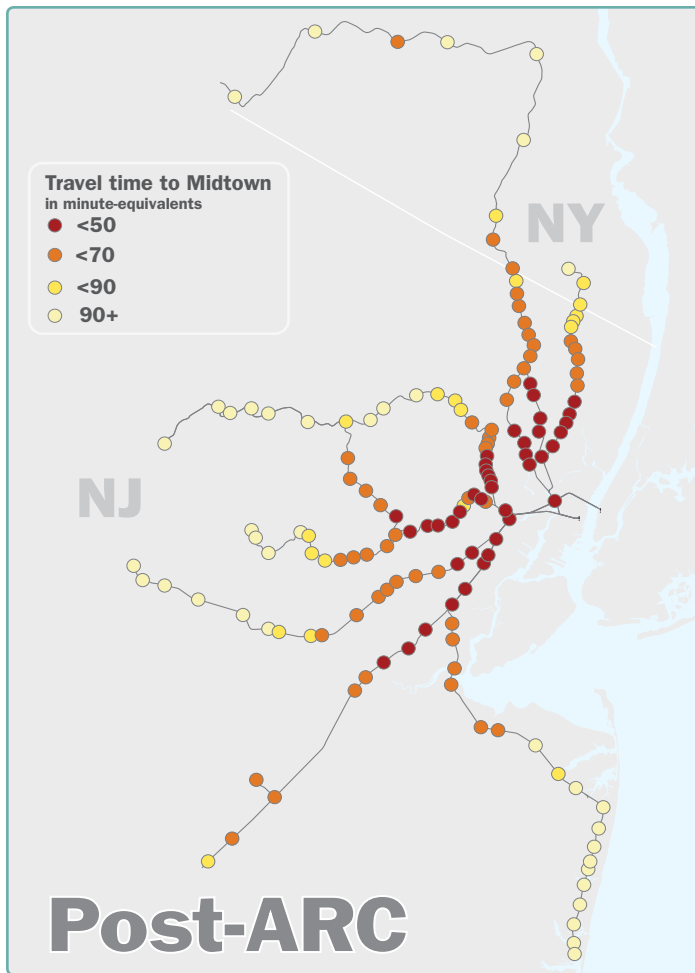
What similar research has shown:

→ Homes within walking distance of stations on the Morris & Essex line increased in value by $90,000 more than homes farther away after direct service to Midtown Manhattan was inaugurated in 1996 (Michaelson, 2004).

→ Houses immediately adjacent to San Francisco's BART sold for nearly 38% more than identical houses in areas not served by BART (Landis and Cervero, 1995).

→ Residential rents decreased by 2.4% for every one-tenth mile further from Washington DC Metro stations (Benjamin and Sirmans, 1996).

→ Single-family houses in communities served by Boston's commuter rail were worth 6.7% more than similar homes in other communities (Armstrong, 1994).

→ In Chicago, the prices of single-family houses located within 1,000 feet of stations were 20% higher than comparable houses located a mile away (Gruen, 1997).

→ Median home prices in the Philadelphia region were 10% higher in census tracts served by PATCO rail line, and 4% higher in tracts served by SEPTA rail line (Voith, 1991).

→ For a complete literature review, please refer to Appendix A.
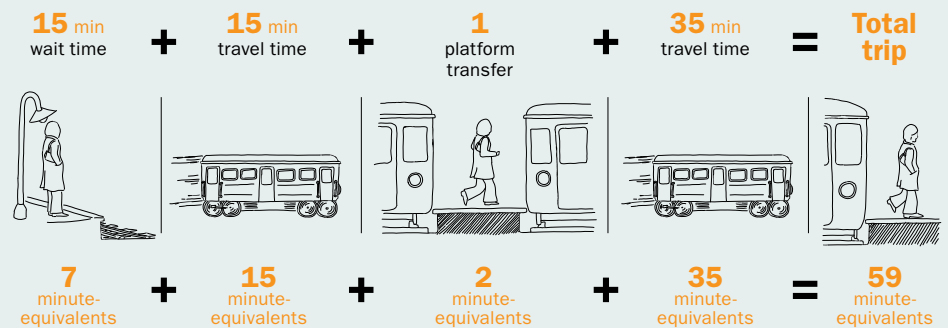
Methodology & Findings

This study relied on a multiple regression analysis of home sales before and after NJ TRANSIT's three projects were inaugurated in order to identify the value of improved transit service among several property characteristics. Once this value was estimated, it was applied to properties that will, in the future, benefit from ARC. The study examined and answered these three questions:

→ How did travel improvements from the three built projects affect home values, on average?

→ What was the cumulative gain in value from these three projects, and how did these gains translate into property tax revenues for municipalities?

→ What might be the effect of ARC on home values and municipal property tax revenues in New Jersey and New York?

What is a minute-equivalent?

In order to compare the different trips that NJ TRANSIT and Metro-North commuters make every day, the value of certain commute factors, such as train transfers and service frequency, was translated into a common currency, called minute-equivalents. The model assigns a "value," in minute-equivalents, to the burden of having to change trains or having to wait for a train in the morning peak, so that this burden can be compared with the actual time spent traveling on a train. This methodology was developed by NJ TRANSIT and has been used in several of their past modeling exercises.

For instance, the value of avoiding a transfer is estimated to be worth 5.3 minute-equivalents; unless the transfer is simply across the platform, in which case it is 2 minute-equivalents. A similar minute-equivalent estimate was included to reflect the frequency of service in the morning peak period. (For a detail description of this methodology, please refer to Appendix B.)

15 min wait time	**+**	**15** min travel time	**+**	**1** platform transfer	**+**	**35** min travel time	**=**	**Total trip**
7 minute-equivalents	**+**	**15** minute-equivalents	**+**	**2** minute-equivalents	**+**	**35** minute-equivalents	**=**	**59** minute-equivalents

How did travel improvements from NJ TRANSIT's three built projects affect home values, on average?

This study relied on a multiple regression analysis of home sales within two miles of stations (by road) and 70 minute-equivalent train commutes (see box on page 6 for definition) to Midtown after the improvements, sold between 3.5 years before the improvement and 5.5 years after the travel improvement occurred, as recorded by the New Jersey Multiple Listing Service and the Garden State Multiple Listing Service. The regression included a total of 45,000 sales, and each was assigned to its closest train station and that station's travel improvement.

Multiple regression analysis is based on the premise that the price of a house represents the value of a set of characteristics, such as number of bedrooms, quality of the school district and access to transit. Since these characteristics can be produced in various combinations, the value of each independent characteristic can be estimated. In this study, the characteristic of interest is trip-time improvement at the property's assigned station. In other words, of all the characteristics that make up the value of a home, what was the value of a commute to Manhattan made shorter by Midtown Direct, Montclair Connection or Secaucus Junction?

The model used in this study includes the sale price of the property in 2009 dollars as the dependent variable, as well as the following explanatory variables:

➔ Property characteristics:
- Number of bedrooms
- Number of full bathrooms
- Number of fireplaces
- Garage capacity
- Whether the home was of a desirable architectural style (Victorian, Colonial or Tudor)

➔ Community characteristics:
- Quality of the school district, i.e. the share of students who are proficient in math and language, per Department of Education statistics
- Density of the road network around the station

➔ Transit access characteristics:
- Distance from the nearest train station by road
- Whether bus service was competitive to Midtown Manhattan with rail at time of sale
- The travel time improvement to Midtown Manhattan after Midtown Direct, Montclair Connection and Secaucus Junction, in minute-equivalents, a composite variable that includes scheduled travel times to either Penn Station-NY or the 33rd Street PATH station, a penalty for train transfers, and a penalty for infrequent service (see box for a full description of minute-equivalents)

➔ Economic characteristics:
- Year of sale, a variable that accounts for overall changes in the real estate market

(For more specifics about the methodology or the variables, please refer to Appendix B.)

Accounting for all of the above characteristics, the average increase in home sale prices that can be attributed to reduced travel times to Midtown is $23,000 for all homes within two miles of stations, or 5% of the median property value in the area. Homes within walking distance of the station (one half-mile) gained $34,000 in value, or 7.5% of the median sales value. (These results assume an average travel improvement of 12 minute-equivalents, and a median home value of $451,000.)

Distance from the station	Average increase in home values per minute reduction in trip times
0 to 2 miles	**$1,959**
0 to 0.5 miles	$2,902
0.5 to 1 mile	$1,931
1 to 1.5 miles	$1,310
1.5 to 2 miles	$882

Homes near train stations significantly gained in value after Midtown Direct, Montclair Connection and Secaucus Junction – an average of $23,000 per home, with the highest gains closest to the stations

$10,286 (2.3%)

$15,287 (3.4%)

$22,524 (5.0%)

$33,852 (7.5% of median sale price)

.5

1

1.5

2 mi.
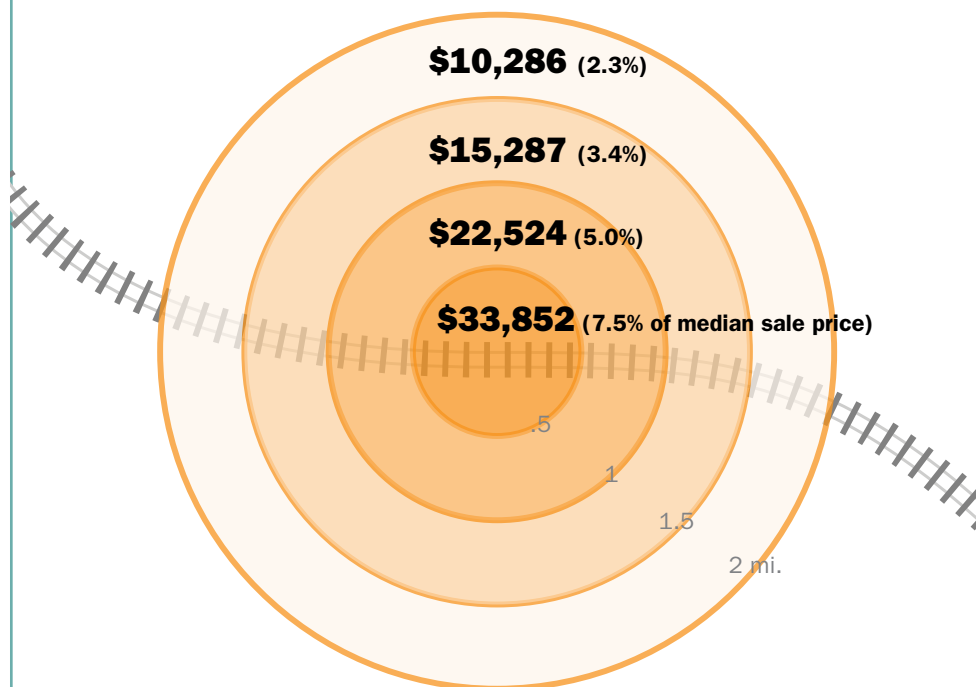
Median sale price (FY09 dollars): $451,000
Average trip-time improvement: 12 minutes
Price increase over 9 years

What was the cumulative gain in value from these three projects, and how did these gains translate in property tax revenues for municipalities?

Average gains in property values for each station area were estimated based on each station's service improvement from the three projects. These average gains were then multiplied by the number of homes within each half-mile distance band of each station. Cumulatively, the value of all homes within two miles of all train stations that benefited from the projects is estimated to be $11.1 billion (graduating the gains for stations farther than 70 minute-equivalents from Midtown after the improvements).

At 2009 property tax levels, that represents an additional $250 million a year in property tax revenue for all municipalities affected, in both New Jersey and New York.

Time savings generated by Midtown Direct, Montclair Connection and Secaucus Junction (in minute-equivalents)	PV	M/B/PJ	Mo-Bo to MSU	Mo-Bo past MSU	M&E to Dover	M&E past Dover	RV	NEC	NJCL to Long Branch	NJCL past Long Branch
Improvement in scheduled trip times	10	10	12	9	12	9	0	0	0	0
Faster travel time to 33rd Street/PSNY on NJT than on PATH	8	8	8	4	8	8				
Transfer at Secaucus instead of Hoboken (walk time)	2	2								
No more transfer at Hoboken (walk time, wait time)			4	4	4	4				
New transfer from diesel line to electrified line (walk time, wait time)				- 3		- 3				
Improvement in transfer penalty	0	0	5.3	3.3	5.3	3.3	0	0	0	0
Improvement in frequency penalty	varies by station									

What might be the effect of ARC on home values and municipal property tax revenues?

Average gains in property values for each station area were estimated based on each station's estimated future service improvement from ARC. (These gains were graduated for stations that were located more than 70 minute-equivalents from Midtown after ARC.) These estimated gains in property values were then multiplied by the number of homes within each half-mile distance band of each station.

Cumulatively, all homes within two miles of train stations along all lines that will benefit from ARC could gain $17.9 billion in value. At 2009 property tax levels, that represents an additional $374 million a year in property tax revenue for all municipalities affected.

The average time savings from ARC was calculated to be nearly 10 minutes, representing an average per-home increase of $19,000 for homes within 2 miles of stations less than 70 minutes away from Midtown. Homes within one half-mile of those stations could gain $29,000 in value.

Anticipated time savings generated by ARC (in minute-equivalents)	PV	M/B/PJ	Mo-Bo to MSU	Mo-Bo past MSU	M&E to Dover	M&E past Dover	RV	NEC	NJCL to Long Branch	NJCL past Long Branch
Improvement in scheduled trip times	6	6	8	11	8	11	11	8	8	11
Faster travel time crossing the Hudson (less congestion, fewer trains stopping at Secaucus)			6	6	6	6	6	6	6	6
No more transfer at Secaucus (walk time, wait time)	4	4								
No more transfer at Newark (walk time, wait time)							3			
No more transfer from diesel line (walk time, wait time)				3		3				3
Crowding relief at PSNY/34th St terminal (over no-build condition)	2	2	2	2	2	2	2	2	2	2
Improvement in transfer penalty	5.3	5.3	0	2	0	2	5.3	0	0	2
Improvement in frequency penalty	varies by station									

Implications of these findings

Investing in transit pays off.

Construction costs for Midtown Direct, Montclair Connection and Secaucus Junction neared $900 million, and they added more than $11 billion to home values within two miles of stations (both values in 2009 dollars) – an exceptional bang for the buck. ARC will cost $9 billion and add nearly $18 billion in value to those homes. This ratio, while not as high, is still a substantial gain, and an increase in home values is only one of several long-term economic benefits of ARC, which also include new jobs on both sides of the Hudson, higher personal incomes, higher commercial property values, and reductions in driving, congestion and air pollution.

The past three projects were NJ TRANSIT's lowest-hanging fruit at the time; today, ARC is NJ TRANSIT and Metro-North's lowest-hanging fruit. Other improvement projects (extending service to Midtown East, providing service on discontinued lines, and other projects) cannot be pursued until ARC is implemented.

Higher property values are a reflection of a more efficient economy and improved access to jobs.

More efficient commuter travel means that employers have access to a larger workforce, and that workers have access to more jobs. Improving New Jersey and New York State residents' access to Manhattan from west of the Hudson River is particularly important since average wages in the region's economic hub are 60% higher. Reduced commuting times also mean more hours in the day that can be spent either for work or leisure.

Better train service increases local and state tax bases, and will reduce pressure to increase tax rates.

As transit increases the value of land and built properties near stations, and as new residents and new businesses move into the transit-served communities, so will municipal and state tax bases. This new property, income and sales tax revenue could help to improve municipal and state services, and reduce pressure to increase tax rates.

The economic development and quality-of-life-improving potential of improved transit can best be harnessed by building new, transit-oriented, mixed-use, economically diverse development around train stations.

That the greatest gains in value happened closest to stations is an indication that the most effective way to harness the economic benefits of transit is to build densely around stations. New districts of housing, office and retail that are tightly knit around stations would revitalize downtowns, boost local economies, increase tax revenues, and generally have a larger positive economic impact with smaller traffic and infrastructure costs.
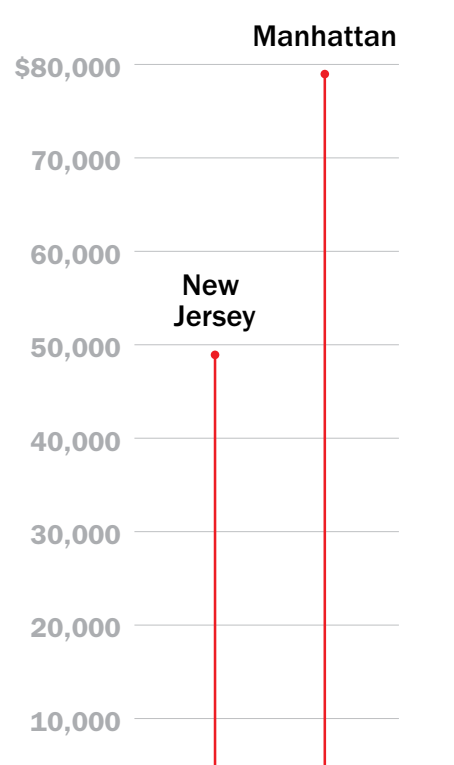
NJ TRANSIT, Metro-North and municipalities should work together to optimize ARC's benefits for the most residents possible.

The additional trans-Hudson capacity that ARC provides can be distributed throughout the rail network in an infinite number of ways, as service plans are defined in the future. Decisions about how to allocate additional service to particular lines and stations should be based on existing and future ridership and on other efficiency considerations, and not on political factors. The transit agencies should reward municipalities that attract new dense development around station with better service.

The number of New Jersey and New York residents near stations that are within a reasonable commute to Midtown by train is increasing steadily

Minute-equivalents
to Midtown Manhattan
- 71-90
- 51-70
- < 50

25% more residents under 70 min

100% more residents under 50 min

'95 2010 post-ARC

The median wage earned in Manhattan is 60% higher than in New Jersey
(Source: Bureau of Labor Statistics, 2009)

Manhattan

New Jersey

$80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000