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Abstract. Capping the number of licenses giving exclusive right to street hailing passengers, the New York City medallion system manipulated the demand and supply of taxicab market and made the Yellow Cab medallion not only a commodity of scarcity and but also an investment product hotly pursued. Since 1937, the medallion market evolved and experienced four phases of birth, formation, booming, and collapse and is fighting a losing battle against the newly emerged app-based, ride-sharing service providers like Uber and Lyft. This article presented the findings from mining the data made available by the New York City Taxi and Limousine Commission, conducted analysis, and argued the deregulation of the New York City taxicab industry has started and that should not and will not be turned back.

Keywords: New York City Taxicab, Yellow Cab Taxis, Medallion, Uber, Lyft, TLC, Taxi & Limousine Commission, Green Cab Taxis, For-Hire Vehicle, SHV, App-based, Ride-sharing

New York City Taxicab

The New York City (NYC) taxicab market is one of about one million passengers per day and annual revenue of two billion US dollars. Thanks to government regulations, there are two sectors of taxicab services in New York City— street hailing and pre-arranged pick-up and three major classes of taxi cabs - Yellow Taxi Cab (Yellow Cab), For-Hire Vehicles (FHVs), and Street Hail Livery (SHL)

Street hailer service providers can pick up passengers in response to a street hail. Pre-arranged service providers, or FHVs, can pick up only passengers who have requested a car by calling a service dispatching base.

As street service provider, Yellow Cab Taxis, identified by the color of canary yellow, are legally permitted to pick up passengers anywhere in the five boroughs and have exclusive right to pick up street hailers in Manhattan and at LaGuardia Airport and John F. Kennedy International Airport. Customers access this mode of transportation by standing in the street and hailing an available taxi with their hands. The pickups are not pre-arranged but hailed while a car is patrolling on streets. A medallion, the metal plate attached to a car's hood, is the proof of legal license, i.e.

The right for a car to provide a street hailing service. The formation and evolution of the NYC medallion market is the subject of this article. Uses of Medallion Taxi Cab, Yellow Taxi Cab, and Yellow Cab are used as exchangeable.

FHVs are community car services, including “black cars”, commuter vans, ambulate, and newly emerged app-based services. Those taxicabs can pick up only passengers on appointment – called by phone or requested via mobile apps or websites prior to the pick. It is important to note that newly emerged, app-based, ride-sharing service providers like Uber and Lyft are classified as FHVs. They did not enter NYC taxicab market until May of 2011.

SHL, painted apple green, commonly known as “boro taxis” or “Green Cabs”, is a hybrid between Yellow Taxi Cabs and FHVs. They are permitted to accept pre-arranged rides in all the five New York City boroughs and additionally to accept street-hails above 110th Street in Manhattan and in the outer-boroughs of New York City, the areas historically underserved by Yellow Taxi Cabs. This law had been in discussion for a long time and finally approved in June of 2013.

The NYC taxicab industry is highly regulated. Licenses for both drivers and vehicles are required to operate taxi cabs in New York City. However, regulations on Yellow Cabs, Green Cabs, and FHVs vary and the Yellow Cab sector is the one regulated most. There are three most important regulations separating Yellow Cab Taxis apart from the others. The first one is to differentiate street hailing from pre-arrangement taxicab services treating them as two different types of consumer demand or products; The second one is to assign the exclusive right to serving street hailers to Yellow Cab Taxis; The third one is to restrict the number of Yellow Cab Taxis permitted on streets via medallion licenses-Any issuance of additional medallions is subject to approval of the New York state’s legislative body. As such, creation and persistence of the medallion system is the product of a political debate and decision process.

Though not obvious in its early years, the medallion system created a Yellow Cab monopoly by capping the supply of taxi cabs accessible to people on New York streets. In its eighty years’ history, very limited number of new medallions were added through very few times of legislative approvals and auctions administrated by TLC. As today, there are 13,587 medallion licenses active, even 8 fewer than the 13,595 at its birth in 1937. Between 1937 and 1947, the medallions were reduced to 11,787, and then stood no change for five decades until 1996 when additional 400 were approved. Between 2004 and 2013, 1,400 were added through three legislations. A sharp contrast, the number of licensed FHVs has grown to more than eighty thousand, from zero when the Medallion system was first legislated.

“Unlike other licenses issued by the TLC, taxicab licenses are transferable, and may be pledged as security for loans. Since this license provides the holder with the exclusive right to accept street hails in the City of New York, the license has a considerable value.” (TLC, 2002)

Its exclusive pick-up right to street hailers, limited number and history of rare approval for additions, and rising market demand for taxi cab services transformed the New York City Yellow Cab medallion into a commodity of scarcity. Not only a medallion was required and used to make a living in NYC taxi cab industry but also it was increasingly taken as an investment vehicle. For over six decades from 1947 through 2013, except the temporary setbacks from the economic recession in 1990

and the terrorist attack on September 11 of 2001, the price for the NYC medallion had only one way to go – up, up, and up!

Innovations and advancement in telecommunications gave births to app-based companies like Uber and Lyft. Their platforms enable taxi riders to call taxi cabs anywhere and anytime using their mobile phones. Their entry and expansion changed taxicab supply and demand, broke the Yellow Cab monopoly, and disrupted the taxi cab industry – taking passengers and market share away from Yellow Cab Taxi and caused the fall and collapse of the Medallion market. The market peaked in late 2013 and early 2014 and the meltdown started in late 2014.

This project mined the data from TLC’s websites made available by New York City’s open data program, and other publications to help describe and understand the rise and collapse of the New York City Medallion market and draw regulation implications. Data about the medallion transaction history were collected, cleansed, and integrated for analysis and can be provided free upon request.

The Four Phases of NYC Medallion Market

There are four major phases in NYC medallion market’s creation and evolution,

- Phase I – Birth of medallion with no market and value (1937 – 1947)
- Phase II – Market Formation and Firming (1947 – 1986)
- Phase III – Booming and Investment Tool (1987 – 2013)
- Phase IV – Collapse and Falling (2014 – Present)

The first phase of the NYC medallion system was from 1937 through 1947. The initial phase of ten years after the medallion birth carried no market values. After the great depressions in early 1930s, the New York City was flooded with 30,000 drivers, sometimes even more than passengers on the streets. Out of concerns about congestion, pollution, and crimes, the Haas Act was legislated and official taxis with medallions attached were introduced according to the law. The law limited the total number of cab licenses to 16,900, but the actual number was only 13,595 and dwindled to 11,787 in 1947, then stood for 50 years until 1996 (Wikipedia, 2017)

The number-capped medallion system had little impact on the taxi industry. Due to the World War II disruptions and lack of demand for taxi services, many medallion owners even believed in “the annual \$10 renewal fee was not “worth” the benefits” and failed to renew their licenses. “There is no evidence that in capping the number of taxis the Haas Act’s drafters intended to create a valuable property right in the right to drive a cab on the City’s streets” and “the establishment of medallions was aligned with other Depression-era legislative efforts to stabilize economic sectors thought to be suffering from too much competition.” [Wyman, 2013]

The Second Phase of the NYC medallion system was 1947 through 1986, almost four decades during which a medallion market was formed and firmed. It was commonly accepted that, not until 1947 there was enough demand for medallions from individuals seeking to make a living by driving a taxi to meet the public’s need of taxi riding. That year the *New York Times* reported that taxicab owners received bonuses averaging \$1,500 or \$2,500 for their medallions when they sold them with used cabs (Wyman, 2013) When a used taxi cabs was sold with the bonus, a price tag

was put on a medallion, independent of the cab it was attached to. As such, a standalone market for the medallions was born.

In early 1960s, the *New York Times* was reporting there was a "brisk, if limited" market in medallions (TLC, 2002)

In 1971, The New York City Taxi and Limousine Commission (TLC) was created pursuant to Local Law 12 of 1971 to

- License vehicles, drivers and businesses authorized to transport passengers for hire.
- Establish licensing criteria and standards for conduct.
- Establish and enforce standards for vehicle and public safety and business accountability.
- Develop a comprehensive transportation policy applicable to vehicles for hire.
- Set taxicab rates of fare.

The creation and functioning of TLC brought more transparency and stability, much needed to support a healthy medallion market.

With number of medallions capped at 11,787, more and more medallions routinely changed hands each year at higher prices. In 1984, the trading volumes went as high as 1,591 or 13.5% of the medallions available as the historical record never surpassed since. In 1987, 1,438 medallions or 12.2% of existing medallions changed hands and marked the end of the formation phase of the NYC medallion market. The year also marked with the price tag of over \$100,000 dollars for a medallion, forty times that at the beginning of the period with a nominal value appreciation of \$97,500. With no medallions added, this phase of the NYC medallion market was majorly characteristic of formation, rise in both trading volume and price, and establishment of government regulations and TLC as the administration agency of authority.

In Figure 1 New York City Yellow Cab Taxi Medallion Sales Transfer (1947-2017), the segment from year 1947 through 1986 of charted the medallion price movement in Phase 1. Numeric numbers for sales transfer volumes and prices are presented in Table 1 New York City Yellow Cab Taxi Medallion License and Sales Transfer.

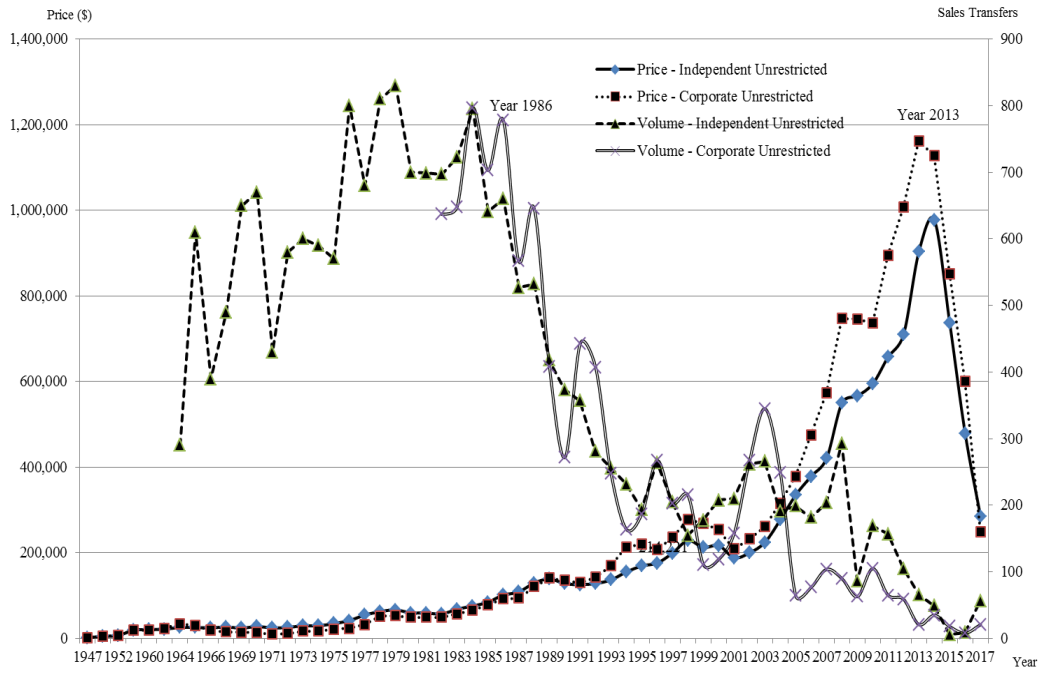


Figure 1 New York City Yellow Cab Taxi Medallion Sales Transfer (1947 - 2017)

Table 1 New York City Yellow Cab Taxi Medallion Licenses and Sales Transfer

Year	Market Price		Sales Transfers			Medallion Licenses	
	Independent Unrestricted	Corporate Unrestricted	Independent Unrestricted	Corporate Unrestricted	Total	Total	New Issuance
1947	2,500	2,500				11,787	
1950	5,000	5,000				11,787	
1952	7,500	7,500				11,787	
1959	19,500	20,000				11,787	
1960	20,825	19,450				11,787	
1962	22,000	23,400				11,787	
1964	26,000	34,145	290			11,787	
1965	26,000	30,000	610			11,787	
1966	25,000	19,000	390			11,787	
1968	27,000	16,000	490			11,787	
1969	24,500	15,000	650			11,787	
1970	28,000	14,000	670			11,787	
1971	25,000	10,000	430			11,787	
1972	26,000	12,000	580			11,787	
1973	30,000	17,000	600			11,787	
1974	30,000	17,000	590			11,787	
1975	35,000	22,000	570			11,787	
1976	42,000	24,000	800			11,787	
1977	55,000	33,000	680			11,787	
1978	63,000	52,000	810			11,787	
1979	67,000	53,000	830			11,787	
1980	60,000	50,000	700			11,787	
1981	60,000	50,000	699			11,787	
1982	57,500	49,300	697	637	1,334	11,787	
1983	68,600	57,900	723	648	1,371	11,787	
1984	75,900	66,200	795	796	1,591	11,787	
1985	84,900	79,000	641	703	1,344	11,787	
1986	101,600	92,900	660	778	1,438	11,787	
1987	108,700	94,600	527	567	1,094	11,787	
1988	129,700	121,500	532	646	1,178	11,787	
1989	139,100	141,400	418	408	826	11,787	
1990	128,400	135,700	374	272	646	11,787	
1991	126,067	130,360	357	443	800	11,787	
1992	128,577	143,199	281	407	688	11,787	
1993	137,196	170,200	256	248	504	11,787	
1994	155,633	214,221	232	164	396	11,787	
1995	169,750	219,958	194	187	381	11,787	
1996	176,333	207,292	264	267	531	12,053	266
1997	199,875	236,500	205	203	408	12,187	134
1998	229,000	277,318	155	215	370	12,187	
1999	212,917	269,500	178	111	289	12,187	
2000	217,125	253,864	208	119	327	12,187	
2001	188,958	209,458	210	158	368	12,187	
2002	200,333	232,250	262	267	529	12,187	
2003	224,958	260,917	266	345	611	12,187	
2004	277,583	315,636	191	249	440	12,741	554
2005	335,583	378,556	199	64	263	12,779	38
2006	379,000	476,000	182	77	259	13,028	249
2007	420,964	573,489	204	104	308	13,148	120
2008	550,000	747,000	293	90	383	13,237	89
2009	566,732	746,746	87	63	150	13,237	
2010	595,118	736,200	169	105	274	13,237	
2011	657,665	895,462	157	65	222	13,237	
2012	709,643	1,007,203	105	59	164	13,237	
2013	904,008	1,162,381	66	21	87	13,437	200
2014	977,729	1,127,371	49	35	84	13,587	150
2015	736,667	852,500	6	18	24	13,587	
2016	479,191	600,266	9	8	17	13,587	
2017	285,168	249,891	57	21	78	13,587	

The Third Phase of NYC medallion system was from 1987 through 2013, during which the price was skyrocketing but trading volume was thin and dwindling, even 1,800 or 15% more licenses were issued. Medallions were auctioned off at high prices

and but less and less were traded on the market, a clear indicator that the medallion became an investor tool to be bought and held in anticipation for value appreciation ahead by owners.

The annually averaged prices peaked at \$1.16 million for a corporate medallion in 2013 and \$0.98 million for an independent license in 2014. Year 2013 also set the highest price record for a corporate medallion at \$1.32 million and for an independent medallion at \$1.1 million. That year only 90 medallions were transacted, 21 corporate ones and 69 independent ones, less than 0.67% of the medallions available. Except the temporary setbacks from the economic recession in 1990 and the terrorist attack on September 11 of 2001, the price for the NYC medallions had only one way to go – up, up, and up! The low interest rate of post the 2008 financial crisis also contributed to the medallion hype by making medallion loan more accessible and affordable.

Rising price and anticipated entry control made the NYC medallion a safe bet and gave it many attributes of the bundle a commercial property. It has been routinely bought and sold, leased, used as collateral for loans, and counted as assets in estate, bankruptcy, divorce, and inheritance settlements during this phase. Purchases of medallions were largely financed through banks and other financial institutes. In 1995, Medallion Financial was founded as a firm specialized in originating, acquiring, and servicing loans that finance taxicab medallions and various types of commercial businesses. One year later, and it was listed on NASDAQ stock exchange and is actively traded. It is estimated that overall, 80% of the taxis on New York streets are owned by investors but operated by drivers using leased medallions. With the assumption that 15% of a medallion's total revenues went to its owners, the annual return was between 3% and 9% during this period, better than investment in gold and oil (Schaller Consulting, 2006). Calculated per TLC Promulgation of Rules issued in 2012, a medallion owner can earn \$30,000 to \$80,000 annually by leasing out one medallion (TLC, 2012). It was widely believed that buying, holding, and leasing out a medallion was the wise business judgement and decision, not selling.

In Figure 1 New York City Yellow Cab Taxi Medallion Sales Transfer (1947-2017), the segment from year 1987 through 2013 charted the medallion's annual trading volumes and price movements in Phase III. Numeric numbers for annual sales transfer volumes and prices are presented in Table 1 New York City Yellow Cab Taxi Medallion License and Sales Transfer.

The medallion market entered its fourth phase in the fourth quarter of 2014, beginning of its booming ending. It simply collapsed and continued its fall with depressed prices and extremely light transaction volumes. The annually averaged prices dropped to \$285,168 per piece in 2017 for independent licenses and \$249,891 per piece for corporate licenses, loss of 71% and 78.5% from their annual peaks in 2014 and 2013 respectively. On quarterly basis, the average sales price for corporate medallion peaked at \$1.26 million in Q2 of 2014 and then fell straight to \$208,411 in quarter 4 of 2017, lost 83.45% of its value; The average price for independent license peaked at \$1.0 million in quarter 3 of 2014 and then fell straight to \$191,749 in Quarter 3 of 2017, lost 81% of its value.

Not only price is low, transaction volume is light. Unlike that during the third phase when few owners would like to sell - they did not sell because anticipated more value appreciation ahead, this time they did not sell because no one would like to buy out of the fear the bottom is hardly predicted, even questionable whether there will be

a supportable floor. Corporate and independent medallion licenses combined, only 41 and 17 medallions were transacted at depressed market prices for sales amounts of only \$21 million and \$9.1 million respectively in year 2015 and 2016. For a market of 13,587 medallions valued over \$14 billion prior to the fourth quarter of 2014, it is a clear declaration of illiquidity, collapse, or dooming for the medallion market.

Figure 2 New York City Yellow Cab Taxi Quarterly Sales Transfer (2009-2017) charted the sharp fall in price during Phase 4 and the numeric numbers are presented in Table 2 New York Yellow Cab Taxi Medallion Quarterly Sales.

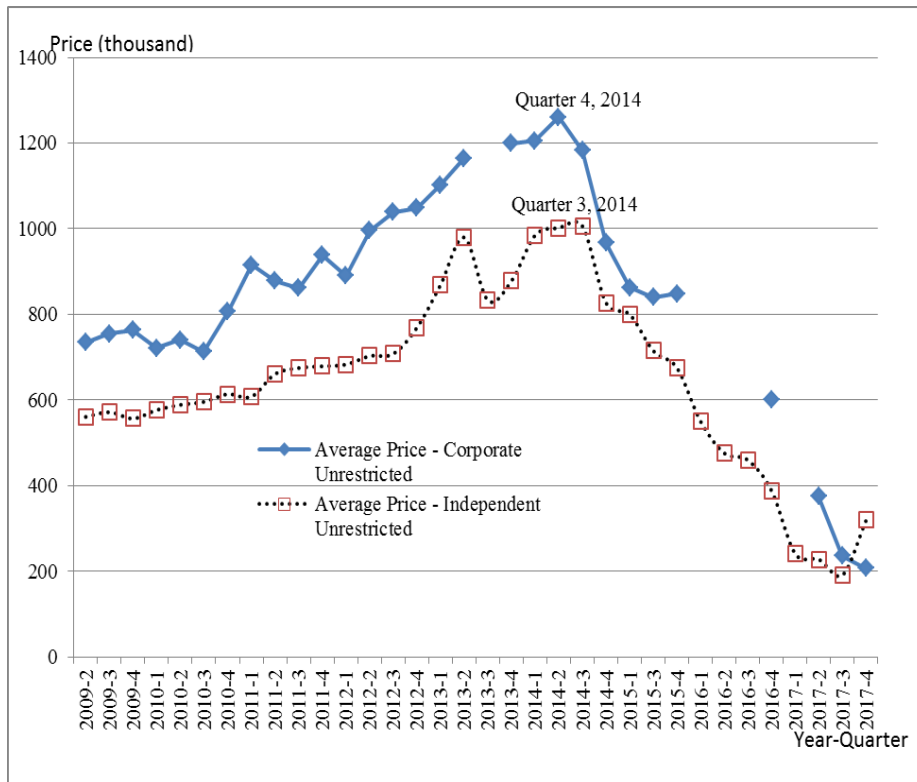


Figure 2 New York City Yellow Cab Taxi Quarterly Sales Transfer (2009-2017)

Without buyers, many owners were unable to pay their medallion loans and just simply filed for bankruptcy. From quarter 4 of 2014 through quarter 4 of 2017, 15 corporate medallions were foreclosed, default of loan values over \$16.3 million, averaged 1.09 million per piece; 62 independent medallions were foreclosed, default if loan values of 36.4 million, averaged \$587,961 per piece (Table 3 New York City Yellow Cab Taxi Medallion Foreclosure) No foreclosures were reported or recorded in the TLC data prior to 2015.

Many medallions are now in possession of banks and credit unions because their clients could no longer keep up with their loan repayment schedules. Medallion Financial providing loans backed by medallions is now in heavy debt fighting for its existence (Hickman, 2018). In the middle September of 2017, for a total of \$8.56 million, or \$186,000 per medallion, a hedge fund company named MGPE Inc. won the auction sale of the 45 medallions foreclosed from Evgeny "Gene" Freidman's (Hernandez, 2017), known as York City's Taxi King whose companies once owned 800 medallions. It is predictable that more foreclosures may occur. When or whether TLC will auction the remaining 1,650 medallion licenses already authorized is now anyone's guess.

Table 2 New York City Yellow Cab Taxi Medallion Quarterly Sales (2009-2017)

Year	Quarter	Corporate Restricted							Independent Restricted						
		Transactions	Medallions Transacted	Medallions Transferred	Sales Amount (,000)	Highest Price (,000)	Lowest Price (,000)	Average Price (,000)	Transactions	Medallions Transacted	Medallions Transferred	Sales Amount (,000)	Highest Price (,000)	Lowest Price (,000)	Average Price (,000)
2009	2	13	27	27	19,845	763	600	735	28	28	27	14,863	578	300	561
2009	3	16	32	32	24,150	775	700	755	52	52	49	28,086	594	520	572
2009	4	2	4	4	3,050	775	750	763	11	11	11	6,131	600	293	557
2010	1	14	29	29	20,895	800	500	721	45	45	39	22,247	620	293	577
2010	2	18	36	36	26,672	800	685	741	43	43	39	22,957	610	242	589
2010	3	13	27	27	19,243	825	685	713	51	51	44	26,064	615	165	596
2010	4	6	13	13	10,491	850	775	807	53	53	48	29,189	700	305	614
2011	1	5	10	10	9,150	950	775	915	37	37	31	18,573	660	173	608
2011	2	9	18	18	15,810	975	685	878	74	74	58	38,082	695	438	661
2011	3	9	19	19	16,370	950	650	862	43	43	35	23,483	705	227	675
2011	4	8	18	18	16,875	1,000	725	938	37	37	35	23,421	710	167	679
2012	1	5	10	10	8,900	1,000	500	890	25	25	24	16,393	715	447	683
2012	2	6	12	12	11,950	1,050	950	996	38	38	35	24,312	712	600	703
2012	3	11	22	22	22,850	1,125	1,000	1,039	35	35	31	21,672	750	592	708
2012	4	7	15	15	15,725	1,125	1,000	1,048	16	16	16	11,922	850	650	769
2013	1	3	6	6	6,620	1,210	1,000	1,103	18	18	15	13,124	950	717	869
2013	2	3	6	6	6,990	1,320	1,075	1,165	24	24	24	23,510	1,100	515	980
2013	3								13	13	13	10,827	1,050	305	833
2013	4	4	9	9	10,800	1,200	1,200	1,200	14	14	14	12,294	1,000	499	878
2014	1	6	12	12	14,458	1,254	1,175	1,205	25	25	25	24,625	1,050	920	985
2014	2	2	5	5	6,300	1,300	1,200	1,260	17	17	15	15,237	1,050	808	1,002
2014	3	3	6	6	7,100	1,200	1,150	1,183	4	4	4	4,025	1,025	1,000	1,006
2014	4	6	12	12	11,600	1,000	950	967	5	5	4	3,680	866	800	827
2015	1	4	8	8	6,900	950	700	863	2	2	2	1,600	800	800	800
2015	3	2	4	4	3,360	875	805	840	3	3	3	2,145	715	715	715
2015	4	3	6	6	5,085	875	793	848	1	1	1	675	675	675	675
2016	1								2	2	2	1,100	580	520	550
2016	2								4	4	4	1,905	600	325	476
2016	3								2	2	2	920	570	350	460
2016	4	4	8	8	4,802	675	475	600	1	1	1	388	388	388	388
2017	1								1	1	1	241	241	241	241
2017	2	1	2	2	750	750	750	375	7	8	8	1,820	300	150	228
2017	3	10	19	19	4,376	697	140	236	8	9	9	1,726	256	130	192
2017	4	1	1	0	2	208	208	208	26	39	39	12,325	628	150	320

Table 3 New York City Yellow Cab Taxi Medallion Foreclosures
(Quarter 2, 2009 - Quarter 4, 2017)

Year	Quarter	Corporate Unrestricted						Independent Unrestricted					
		Foreclosures	Medallions Transferred	Sales Amount (,000)	Highest Price (,000)	Lowest Price (,000)	Average Price (,000)	Foreclosures	Medallions Transferred	Sales Amount (,000)	Highest Price (,000)	Lowest Price (,000)	Average Price (,000)
2011	3							1	1	635	635	635	635
2014	3							1	1	900	900	900	900
2014	4	1	1	1,925	1,925	1,925	1,925	3	3	2,620	905	840	873
2015	1							1	1	800	800	800	800
2015	2							3	3	2,235	777	700	745
2015	3							3	3	2,043	725	603	681
2015	4							3	3	1,756	725	326	585
2016	2							7	7	4,018	615	540	574
2016	3	10	10	13,250	1,500	1,250	1,325	5	5	3,008	620	550	602
2016	4							3	3	1,750	600	550	583
2017	1							1	1	550	550	550	550
2017	2	1	2	738	738	738	369	7	9	3,135	500	220	348
2017	3	1	2	403	202	202	202	17	20	8,406	581	185	420
2017	4							8	13	4,600	450	200	354

The Uber Disruption

Blames have been quickly played against Uber for NYC Yellow Cab Market's meltdown – less regulated than Yellow Cab Taxis, which gives unjustified advantages to Uber and other app-based service providers. It is debatable whether Uber has competed fairly and what regulation policies need to be in place to level the market field, but it is factually indisputable that Uber's entry into New York City in 2011 and its expansions in the years followed have been aggressive, implosive, and disruptive. App-based Uber and Lyft are primarily responsible for Yellow Cab Taxis' loss and the collapse of the NYC medallion market.

While Yellow Cab is losing out, Uber is winning over for both market share and revenues. Beginning for year 2015, TLC published trip data for all the NYC taxi service providers - Yellow Cab, Green Cab, and FHV's whose major players are Uber, Lyft, and Black Cars. Based on the data, table 4 and 5 were prepared indicating Yellow Cab Taxi has retreated to the secondary place in the New York City's taxicab market. While the quarterly market size rose to 52.8 million trips in the first quarter of 2017 with a growth of 43% from the same quarter of 2015, Yellow Cab Taxis' trips dropped to 29.2 million, a loss of 9.4 million, or 24%; and its market share dropped to 38.6% from 73% during the same period. Not only failed Yellow Taxicab to catch a share from the market growth but also it failed to keep the old customer base – many riders who used to hail a Yellow Cab Taxi on the streets now turned to FHV's like Uber and Lyft. In the first quarter of 2017, FHV's as a group served 57.1% of all the taxicab trips and became NYC taxi riders' first choice. Uber alone captured 31.6%, up from 12.5% of two years ago (Figure 3 Market Share of NYC Taxicab Trips by Provider).

Between 2013 and 2016, Yellow Cab Taxi's annual trips per medallion dropped 25% and its annual revenues per medallion dropped to \$140,138, a decrease of 19% (Table 5 New York City Yellow Cab Trips and Revenues per Medallion).

As the battle goes on and the trend continues, no one should be surprised if Uber alone surpasses Yellow Cab Taxis by 2017 or sooner. It is arguable whether Uber's platform connecting drivers and riders directly is qualified as disruptive innovation, but Uber's strategy and growth is certainly disruptive.

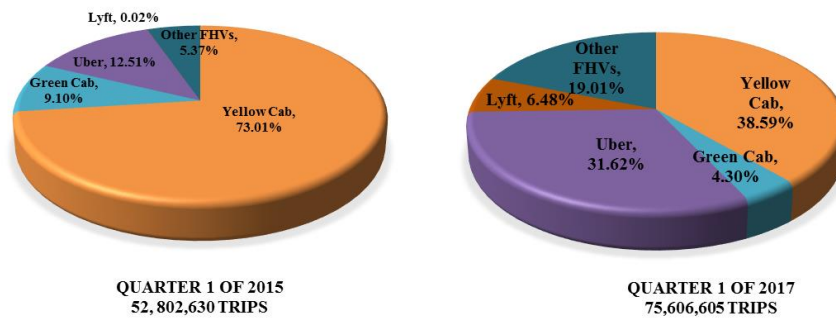


Figure 3 Market Share of NYC Taxicab Trips by Provider

Table 4 Market Share of New York City Taxicab Ridership (Quarter 1 of 2015 - Quarter 2 of 2017)

Year-Quarter	Total Market Trips	Share of Market Trips (%)					
		Yellow Cab	Green Cab	FHV Total	Uber	Lyft	Other FHVs
2015-1	52,802,630	73.01	9.10	17.89	12.51	0.02	5.37
2015-2	55,085,513	69.99	9.24	20.77	12.69	0.54	7.54
2015-3	55,249,626	61.39	8.27	30.34	18.65	1.75	9.95
2015-4	64,661,447	54.26	7.38	38.36	19.16	2.09	17.11
Year total	227,799,216	64.14	8.44	27.42	15.93	1.15	10.34
2016-1	67,066,752	50.85	6.68	42.47	21.57	2.96	17.94
2016-2	71,182,119	49.04	6.30	44.66	22.23	4.05	18.37
2016-3	67,904,830	44.71	5.51	49.78	26.77	4.55	18.46
2016-4	73,656,179	42.65	4.92	52.43	29.33	4.69	18.41
Year total	279,809,880	46.74	5.84	47.42	25.04	4.08	18.30
2017-1	75,606,605	38.59	4.30	57.12	31.62	6.48	19.01
2017-2	53,525,778	37.64	4.00	58.36	32.94	7.18	18.24
Year total	129,132,383	38.19	4.17	57.63	32.17	6.77	18.69

Table 5 New York City Yellow Cab Trips and Revenues per Medallion

Year	Medallions	Trips			Revenue		
		Total	Per Medallion	Year over Year Change %	Total	Per Medallion	Year over Year Change %
2010	13,237	168,983,489	12,766		1,789,049,841	135,155	
2011	13,237	176,866,900	13,362	4.67	1,992,549,043	150,529	11.37
2012	13,237	177,996,949	13,447	0.64	2,134,910,742	161,284	7.14
2013	13,437	173,136,240	12,885	-4.18	2,322,802,868	172,866	7.18
2014	13,587	165,104,282	12,152	-5.69	2,268,307,017	166,947	-3.42
2015	13,587	146,107,068	10,753	-11.51	2,097,292,315	154,360	-7.54
2016	13,587	130,789,390	9,626	-10.48	1,906,905,626	140,348	-9.08

Economic and Regulation Implications

It is true that the downfall of NYC Yellow Cab business and the associated medallion market is largely due to ride sharing services - their entry and expansion brought down the Yellow Cab monopoly imposed upon by the medallion system. A critical question to ask is: can Yellow Cab and the medallion market recover like a stock market or an economic cycle, or can it be reinstated by a potentially politics-driving decision like the way it was created - putting the Uber genie back into the box?

The answer is more likely to be NO. The market and the value of the NYC medallion primarily rely on one policy on the supply side and one assumption on the demand side. The policy on the supply side is the cap of medallions and thus the number of taxis on streets. The assumption on the demand side is that street hailing and prearrangement are two differentiable products and can be best provided by different, government-designated service providers. It was also assumed there would be growing number of street hailers from population and economic growth and people prefer the regulated Yellow Cab over non-street hailing taxicabs due to consumer benefits of reduced traffic congestion, cleaner air, convenience, and safety. As such, holding the supply down but letting the demand grow, the value of medallion will never go down but up.

Those assumptions have been disrupted by advancement in technologies and technology-enabled ride-sharing service providers.

In New York City, the ownership of smart phone has reached over 80% and the ownership of mobile phone has reached over 95% percent (NYC, 2015), it can be fairly and safely assumed any taxicab riders can tap mobile apps or dial up from his or her handset devices to prearrange a cab anytime and anywhere, on streets or off streets. When there are enough number of taxicabs nearby waiting for the calls, callers can get the same benefit of immediacy and convenience from those FHV's as that from a Yellow Taxicab. Even more, people would prefer to prearrange their cabs prior to getting off their flights, leaving restaurants and coffee shops and from places of comfort instead of hailing in cold weather or in the rains. As such, app-based on-demand prearrangement offers both the benefit of immediacy and the benefit of planned predictability; demand for street hailing or prearrangement of a taxicab has become hardly differentiable, or at least the attributes used to differentiate the two for people to prefer Yellow taxicabs have diminished or become blurring in riders' mind.

In Wyman's words, the two have become one unit of product and should be regulated as one unit (Wyman, 2017). This has fundamentally uprooted the primary assumption for the NYC Medallion regulation system to function – the demand for street hailing can no longer be easily segmented and exclusively assigned to Yellow Taxicabs. The regulations to enforce the segmentation and exclusiveness can no longer be easily enforced.

When app-based on-demand prearrangement rises and the number of Yellow Taxicabs was restricted, FHV's responded by adding more vehicles and drivers rises to meet the demand. When the NYC Medallion system was initially introduced, there were no FHV's legally permitted on NYC streets. Between 2011 the year Uber entered New York City and 2016, FHV's was more than doubled to 80,881 and the FHV drivers increased by 120%, to 122,997. For the same period, only 300 Yellow taxicabs were added to make the total 13,587 but 19,463 people chose not to drive Yellow taxicab anymore. The end results are that FHV's outnumbered Yellow taxicabs by 6:1 and FHV drivers outnumbered Yellow taxicab drivers by 4:1. The law excluded FHV's from the right to street pick-up but granted it the right to add vehicles and drivers unlimited subject to administrative procedures only. When demand changed, the law gave FHV's foreseen advantages over Yellow Taxicabs, or the existing law is simply invalidated by technology advancement or outsmarted by app-based service providers' innovations.

As far as cost effectiveness and economic competitiveness is concerned, Uber's advantages are obvious and one does not have to try hard to find successes of similar business models in the digital economy– eBay, Amazon, Facebook, and even Googles. Leveraging Internet and smart phones, they built platforms to connect and assemble buyers and sellers directly to create economic gravity, economy of scale, and increasing monopolies via “Size begets size” (Economist, 2018). Different for Uber, it is a kind of pioneer in sharing economy by utilizing resources idle prior to the Internet economy – private cars at the times not being driven and personnel at the times outside regular jobs, which makes it possible for almost everyone to become an Uber driver and thus provides options and flexibilities in offering, scheduling, and pricing. As they evolve and respond to market demand and catch-up regulations, new features can be expected to address public concerns the medallion systems initially intended to address – traffic congestion, air pollution, and safety. For example, dynamic pricing with surcharges can be explored to contain traffic through crowded areas; Access to driver and passenger information and their mutual rating can be explored to improve safety. That is a big competitive advantage over Yellow taxicab drivers who must pay medallion fees up front and passively respond to TLC regulations.

Globalization and size matter too. While an estimated online advertising market of \$1,000 billion has created the legendary successes of Google and Facebook, “the global market for personal mobility is worth as much as \$10 trillion.” (Economist, 2016)

Thanks to its potentials of being another Google or Facebook in personal mobility, Uber has attracted \$18 billion in funding since its setup in 2010 and now carries a valuation closed to \$70 billion, the largest startup in history who has raised the most money from private investors before going public (Economist, 2016) The deep pocket enabled Uber to grow out of its birthplace San Francisco and to have extended

its platform and business model to more than 450 cities in 78 countries (<https://expandedramblings.com/index.php/uber-statistics/>). In contrast, the medallion systems in New York City or other cities confine their taxicab markets to geographic locale, not only depriving their residents of benefits of scale economy and sharing economy but also killing the prospects for Uber or any of its existing or potential competitors to chase their dreams of being another Facebook, Google, Amazon, or Alibaba.

The benefits of ride-sharing economy are obvious and the consumers are those primary beneficiaries. In the era of mass intelligence and digital economy, the new service mode of taxicab has made taxi riding more accessible and affordable and helped grow the market. Total market taxicab trips in New York City got only bigger, up 23% to 280 million trips in 2016 from one year ago. Meanwhile Yellow Cab lost big – a deficit of 15.3 million trips and 17.4% market share. If it is not losing to Uber, it will be losing to someone else who can materialize the benefit of the technology. Technology is there, demand is there, and consumers are ready to make their moves when Uber and the likes are in right places at right times. Uber is the leader for now, but that can be changed quickly because of competition, changes in technology including autonomous driving on the horizon, and obstacles in regulations.

Though the perpetuation of the medallion system is the result of political process subject to the heavier influence by the medallion interest groups – owners, drivers, and creditors rather than the consideration of consumer benefits, political winds will be trending toward deregulation in favor of Uber and the likes who run their business on national and global scale beyond localized monopolies.

Wyman (2013) argued the financial resources, easily identified common interest, financial power, and easiness of organizational the medallion interest groups over lack of funding and difficulty in organizing consumers whose individual interest in taxicab market are scattered and ambiguous are among the main reasons why the medallion system was perpetuated and lasting and she called the medallion a problematic property. Now Uber, with its deep pocket, concentrated investor interest, and organization power in lobbying law makers and influencing public opinion, is finally a good match-up against the interested group of the medallion system. When its operation is not permitted, Uber mobilizes public support for its service and launches political campaigns to change regulations, including its "principled confrontation" program started in 2015 searching for compromises with local municipalities on new regulations. Ordinances favoring Uber, Lyft, and other ride-sharing services have been passed in more than 23 states in the US. In summer of 2015, Uber won against New York City and foiled the city's efforts to cap the number of Uber vehicles on the ground of traffic congestion. In early September, the New York City won a legal victory against three lawsuits brought by Melrose Credit Union, the largest lender to taxi medallion owners, who had made almost \$2.5 billion in loans for 5,331 city-issued medallions going back to 2006 and claimed it was illegal for Uber and other app companies to operate in New York City; In May of 2016, NY Senate committee passed bill to legalize Uber.

The deregulation process of the taxicab industry has started and will be hardly turned back by any political winds. The government has never promised the medallion monopoly will exist forever and creating monopoly was not the genuine intent of the 1937/s Haas Act either. After all, Wyman (2013) convincingly argued the New York medallion is a problematic private property “burdensome in the present but also potentially burdensome in the future.”

Instead of fixing and reviving the medallion system, local and federal regulations should catch up with technological innovations and changes in consumer demand - let the free market play freely and let the once protected medallion monopolies adapt or die. Instead of holding Uber and the likes back, regulations should foster their growth but monitor and intervene timely before their propelling into monopoly powers like Google, Facebook, and Amazon.

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