Promoting the Useful Arts: Technological Innovation Outside the Patent System, 1790-1880

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Abstract

The paper compares the award of prizes to technological innovation in the patent system. The data set comprises a sample of exhibits and premiums at industrial fairs sponsored by the Massachusetts Charitable Mechanic Association, between 1837 and 1874. The patterns shed light on the factors that influenced whether specific inventions and inventors attempted to appropriate returns through the protection of intellectual property rights, or through alternative institutions. Prize winners tended to belong to more privileged classes than the general population of patentees, as gauged by wealth and occupation of inventors at the exhibition. Moreover, the award of prizes was less systematic than that of patents, and unrelated to such proxies for the productivity of the innovation measures as inventive capital or the commercial success of the invention.

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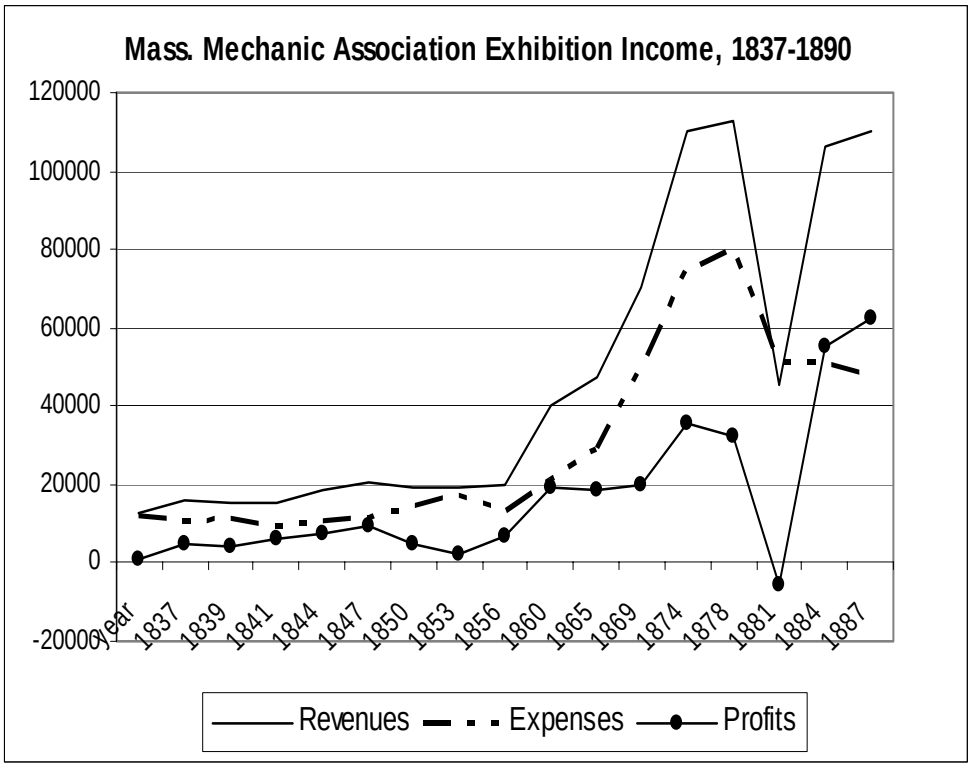
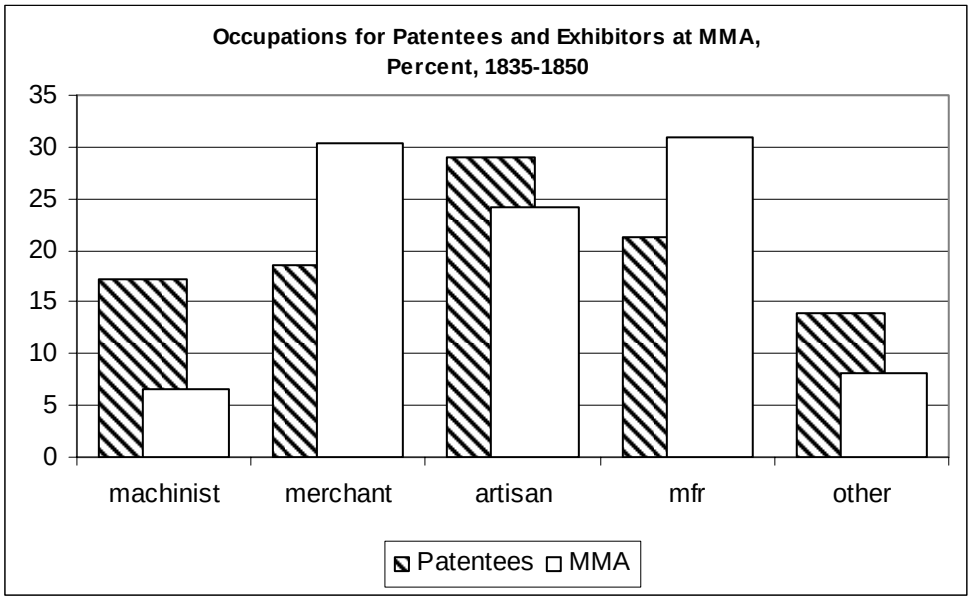
Figure 1



Massachusetts Charitable Mechanic Association, *Annals of the Massachusetts Charitable Mechanics Association, 1795-1892*, Boston: Rockwell and Churchill, 1892.

Figure 2: Occupational Distributions of Patentees and MMA Participants, 1835-1875



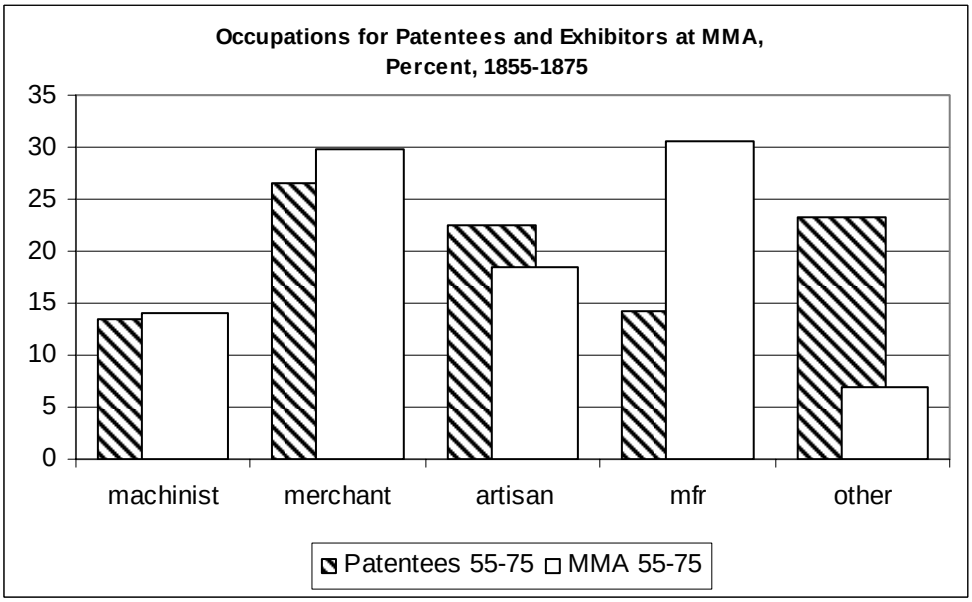
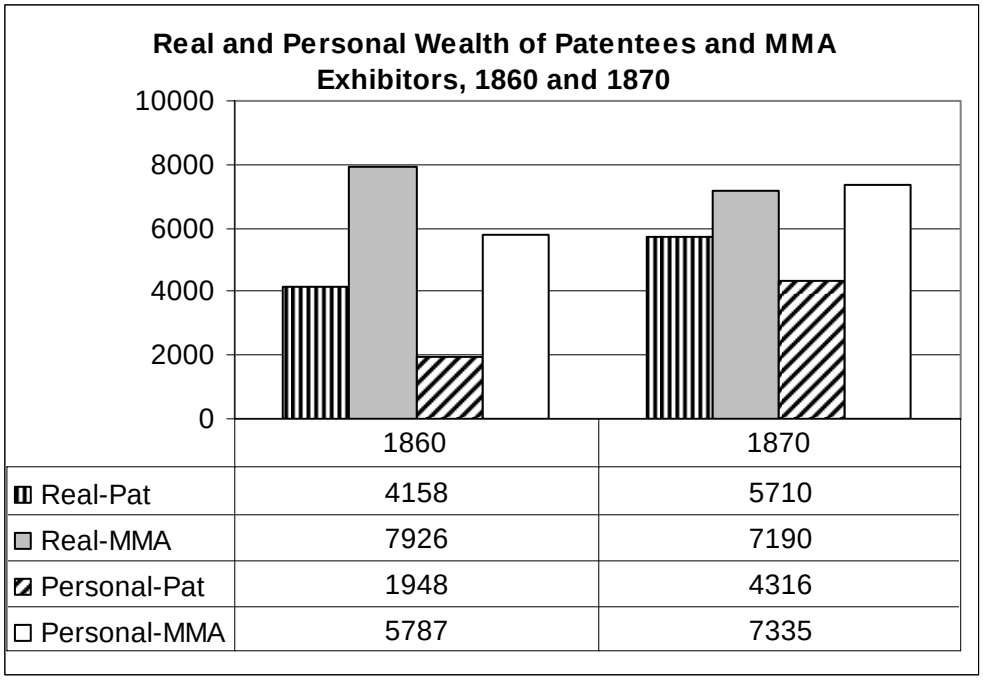


Figure 3



	1860	1870
Real-Pat	4158	5710
Real-MMA	7926	7190
Personal-Pat	1948	4316
Personal-MMA	5787	7335

Notes and Sources:

The MMA sample was matched with the manuscript census that was closest to the date of the exhibition. This resulted in 404 matches for 1860 and 329 matches for 1870, over which these averages for real estate and personal wealth were estimated. Missing values are treated as zero. Wealth is expressed in terms of real $1860 dollars. For the sample of ordinary patentees in 1860 and 1870, see Khan, "Creative Destruction" (2007).

TABLE 1: Summary Statistics for Sample of Exhibits at Massachusetts Mechanics Association Fair, 1837-1874

	BEFORE 1855		AFTER 1855		TOTAL	
	N	%	N	%	N	%
AWARDS						
Gold Medal	146	6.4	152	5.3	298	5.8
Silver Medal	940	41.4	799	27.7	1739	33.8
Bronze Medal	213	9.4	986	34.2	1200	23.3
Diplomas	973	42.8	943	32.7	1916	33.2
Total Awards	2273	100	2880	100	5153	100
LOCATION						
Massachusetts	1950	85.8	2592	89.8	4542	88.0
Other New England	157	6.9	154	5.3	311	6.0
Mid-Atlantic	150	6.6	124	4.3	274	5.3
Other	16	0.7	16	0.6	32	0.5
EXHIBITORS						
Women	281	12.4	214	7.4	495	9.6
Companies	572	25.1	1082	37.5	1654	32.1
Age, mean and (s.d.)	37.1	(10.3)	42.7	(11.3)	40.5	(11.3)
Participation in fairs, mean and (s.d.)	2.0	(2.1)	1.9	(2.2)	2.0	(2.1)
OCCUPATION of individual (nonfirm) exhibitors (1635 matches with ms. Census)						
Artisan	156	24.1	183	18.5	339	20.7
Machinist/ engineer/Inventor	42	6.5	139	14.1	181	11.1
Manufacturer	200	30.9	301	30.5	501	30.6
Merchant/professional/wh.collar	197	30.4	295	29.9	492	30.1
Other	53	8.2	69	7.0	122	7.5
PATENTING						
Patentable subject matter	801	35.3	1635	56.7	2436	47.2
Exhibitor is patentee	456	20.0	1065	36.9	1521	29.5
Patent obtained for exhibit	212	9.3	633	21.9	845	16.4
Career patents, mean and (s.d.)	1.4	(16.2)	3.1	(13.0)	2.4	(14.5)
SECTORS						
Agriculture	62	2.7	117	4.1	179	3.5
Construction	115	5.1	214	7.4	329	6.4
Manufacturing	1681	74.0	1948	67.5	3629	70.4
Transportation	187	8.2	404	14.0	591	11.5
Other	227	10.0	203	7.0	430	8.3

Notes and Sources: Reports of Exhibitions of MMA, 1837-1874; U.S. Patent Records 1790-2009; Manuscript censuses (federal), 1850-1880. Patentable subject matter: exhibits that fall into classes that could be patented, as gauged from a subject search of the patent records; it does not imply that the invention would have qualified for the grant of a patent, which would require additional scrutiny for novelty. Exhibitor is a patentee refers to those who had ever attained a patent. Career patents: total patents that the patentee obtained over his lifetime.

TABLE 2: Prizes, Patents, and Industrial Distribution of Exhibits at Massachusetts Mechanics Association Fair, 1837-1874

INDUSTRY	Total	Patentable	Patents	Gold Medal	Silver Medal	Bronze Medal
Agriculture (n)	358	200	73	20	129	81
Col %	6.9	8.2	8.6	6.7	7.4	6.8
Row %		55.6	20.4	5.6	36.1	22.7
Apparel (n)	319	33	6	18	95	66
Col %	6.2	1.4	0.7	6.0	5.5	7.3
Row %		10.3	1.9	5.7	29.9	20.8
Arts (n)	609	167	40	39	95	66
Col %	11.8	6.9	4.7	13.1	12.4	11.3
Row %		27.4	6.7	6.4	35.5	22.2
Construction (n)	329	185	79	19	113	79
Col %	6.4	7.6	9.4	6.4	6.5	6.6
Row %		56.2	23.9	5.8	34.2	23.9
Furniture (n)	305	75	38	11	95	73
Col %	5.9	3.1	4.5	3.7	5.5	6.1
Row %		24.6	12.5	3.6	31.2	23.9
Heat & Power (n)	499	464	157	33	150	143
Col %	9.7	19.1	18.6	11.1	8.6	11.9
Row %		93.0	31.5	6.6	30.1	28.7
Manf. Machines (n)	493	441	125	36	161	133
Col %	9.6	18.1	14.8	12.1	9.3	11.1
Row %		89.5	25.4	7.3	32.8	27.1
Manf. Goods (n)	898	350	144	52	307	179
Col %	17.4	14.4	17.0	17.5	17.7	14.9
Row %		39.0	16.0	5.8	34.2	19.9
Printing & Publish. (n)	295	71	22	12	100	69
Col %	5.7	2.9	2.6	4.0	5.8	5.8
Row %		24.1	7.5	4.1	33.9	23.4
Scientific (n)	132	51	17	9	41	26
Col %	2.6	2.1	2.0	3.0	2.4	2.2
Row %		38.6	12.9	6.9	31.3	19.9
Textiles (n)	620	185	71	31	226	140
Col %	12.0	7.6	8.4	10.4	13.0	11.7
Row %		29.8	11.5	5.0	36.5	22.6
Transportation (n)	300	214	73	18	106	76
Col %	5.8	8.8	8.6	6.0	6.1	6.3
Row %		71.3	24.3	6.0	35.3	25.3
Total (n)	5157	2436	1521	298	1739	1200
%	100	47.2	29.5	5.8	33.8	23.3

Notes and Sources: See Table 1. The percentages in the table include the undisplayed calculations for 1915 diplomas, given to 37 percent of the exhibits in the dataset.

Table 3
OLS Regressions: Determinants of Patenting of Exhibits at the MMA

	Pr that Exhibit is Patentable		Pr that Exhibit is Patented	
	(1)	(2)	(3)	(4)
Intercept	0.47	0.79	0.17	0.25
	(15.87)	(18.68)	(6.68)	(6.33)
TIME DUMMIES				
1850s	0.14	0.01	0.06	0.06
	(0.40)	(0.26)	(2.20)	(2.05)
1860s	0.25	0.15	0.15	0.12
	(7.99)	(5.31)	(5.77)	(4.34)
1870s	0.16	0.10	0.16	0.18
	(3.98)	(2.77)	(4.74)	(4.16)
GENDER	-0.53	-0.24	-0.23	-0.15
	(8.59)	(4.02)	(4.45)	(2.68)
BOSTON	-0.16	-0.09	-0.10	-0.07
	(6.84)	(4.08)	(5.02)	(3.64)
MULTIPLE EXHIBITOR	0.04	0.03	0.00	0.00
	(3.83)	(3.08)	(0.08)	(0.42)
REAL WEALTH	-0.00	-0.00	0.00	-0.00
	(0.09)	(0.50)	(1.55)	(0.97)
PERSONAL WEALTH	0.00	0.00	-0.002	-0.001
	(0.66)	(0.72)	(3.06)	(2.16)
CAREER PATENTS			0.03	0.02
			(16.33)	(13.77)
OCCUPATION				
Artisan		-0.01		-0.00
		(0.25)		(0.11)
Machinist		0.21		0.13
		(5.89)		(3.58)
Other		-0.03		0.01
		(0.61)		(0.23)
Merchant		-0.02		0.01
		(0.72)		(0.38)
INDUSTRY				
Agriculture		-0.21		-0.04
		(4.38)		(0.83)
Apparel		-0.60		-0.16
		(10.38)		(2.95)
Arts		-0.69		-0.00
		(14.55)		(0.11)
Construction		-0.21		-0.01
		(4.49)		(0.23)
Furniture		-0.48		-0.01
		(9.47)		(1.72)
Heat, Power		0.01		-0.03
& Communicns		(0.25)		(0.61)
Manuf. Products		-0.38		-0.11
		(9.61)		(2.87)

Table 3 (Cont'd)
OLS Regressions: Determinants of Patenting of Exhibits at the MMA

	(1)	(2)	(3)	(4)
Printing		-0.64		-0.25
		(12.34)		(5.08)
Science & Medicine		-0.45		-0.22
		(7.25)		(3.73)
Textiles		-0.44		-0.15
		(9.44)		(3.41)
Transportation		-0.12		-0.01
		(2.34)		(0.21)
Other		-0.10		-0.15
		(1.46)		(2.17)
	N=1640	N=1640	N=1640	N=1640
	R^2=0.12	R^2=0.35	R^2=0.21	R^2=0.25
	F=27.31	F=36.74	F=46.74	F=21.4

Notes and Sources:

The excluded variables are the 1840s, manufacturers, and machinery in the manufacturing sector. All exhibits are allocated to industry of final use. The dummy variable for Boston represents city of residence, multiple exhibitors submitted in more than one exhibition, and gender has a value of 1 if female. Patents and assignments refer to the patenting of the specific invention at the exhibition, and the assignment at issue of the patent for that exhibit. Occupations and wealth were determined from the federal manuscript censuses.

Table 4
OLS Regressions: Determinants of probability of a gold or silver medal

	(1)	(2)	(3)	(4)
Intercept	0.52	0.52	0.52	0.50
	(41.0)	(16.88)	(14.35)	(9.83)
TIME DUMMIES				
1850s	-0.14	-0.19	-0.20	-0.20
	(7.54)	(5.74)	(5.75)	(5.77)
1860s	-0.20	-0.22	-0.22	-0.21
	(11.68)	(6.76)	(6.68)	(6.37)
1870s	-0.16	-0.19	-0.19	-0.18
	(7.34)	(4.62)	(4.57)	(4.45)
GENDER	-0.06	-0.10	-0.10	-0.06
	(2.43)	(1.63)	(1.46)	(0.81)
PATENT FOR EXHIBIT		0.01	0.02	0.02
		(0.39)	(0.18)	(0.64)
ASSIGNED PATENT		0.04	0.05	0.04
		(0.72)	(0.75)	(0.68)
BOSTON		0.02	0.02	0.03
		(0.90)	(0.80)	(1.07)
MULTIPLE EXHIBITOR		0.00	0.00	0.00
		(0.21)	(0.18)	(0.31)
REAL WEALTH		-0.00	-0.00	-0.00
		(1.21)	(1.19)	(1.41)
PERSONAL WEALTH		0.001	0.001	0.002
		(2.36)	(2.30)	(2.64)
OCCUPATION				
Artisan			0.01	0.01
			(0.19)	(0.15)
Machinist			-0.05	-0.04
			(1.07)	(0.87)
Other			-0.01	-0.02
			(0.26)	(0.35)
Merchant			0.01	0.01
			(0.22)	(0.35)
INDUSTRY				
Agriculture				0.07
				(1.19)
Apparel				-0.07
				(1.01)
Arts				0.02
				(0.41)
Construction				0.05
				(0.93)
Furniture				0.01
				(0.22)
Heat, Power				-0.10
& Communicns				(1.93)
Manuf. Products				0.07
				(1.41)

Table 4 (Cont'd)
OLS Regressions: Determinants of probability of a gold or silver medal

		(1)	(2)	(3)
Printing				-0.02
				(0.31)
Science & Medicine				0.03
				(0.33)
Textiles				0.04
				(0.66)
Transportation				0.06
				(1.10)
Other				0.00
				(0.00)
	N=1640	N=1640	N=1640	N=1640
	R^2=0.03	R^2=0.04	R^2=0.04	R^2=0.047
	F=37.11	F=5.95	F=4.38	F=3.08

Notes and Sources:

The excluded variables are the 1840s, manufacturers, and machinery in the manufacturing sector. All exhibits are allocated to industry of final use. The dummy variable for Boston represents city of residence, multiple exhibitors submitted in more than one exhibition, and gender has a value of 1 if female. Patents and assignments refer to the specific invention at the exhibition, and the assignment at issue of that exhibit. Occupations were determined from the manuscript census.