2009

The Death of the Model T: Smooth Roads, Closed Cars, and Technological Maladaption; a translation of "La Morte del Modello T: Strade Pavimentate, Auto Coperte e Tecnologica Desueta"

Christopher Wells, *Macalester College*

Translation of Christopher W. Wells, "La Morte del Modello T: Strade Pavimentate, Auto Coperte e Tecnologica Desueta," *I Frutti di Demetra,* Bulletin no. 21 (2009): 63-75.

The Death of the Model T: Smooth Roads, Closed Cars, and Technological Maladaptation

By Christopher W. Wells

Introduction: The Ford Model T and the Built Environment

Between 1908 and 1923, the Ford Model T enjoyed a meteoric rise that firmly established it as the most important automobile in the world. Propelled by its utilitarian design, its low and constantly falling price, and Ford's innovative mass-production methods, Model T sales skyrocketed from just over 10,000 in 1909, its first full year of production, to over 735,000 in 1917, when wartime materials shortages caused Ford to scale back its operations. Ford's production quickly recovered to prewar levels after the war, surged to 1.3 million sales in 1922, and soared above 2 million in 1923. But then an unexpected series of events set in motion what Alfred A. Sloan, the head of the rival firm General Motors, later described as a "catastrophic and almost whimsical" fall.[1] The decline began innocently enough in 1924, when Ford's production fell slightly to just below 2 million, where it remained almost unchanged in 1925. But in 1926 Ford's output slackened to below 1.6 million, and in May 1927, after producing just 387,777 units, the company permanently discontinued the Model T and suspended all operations at its factories. After six frantic months of design,

[1] Alfred P. Sloan, Jr., *My Years with General Motors* (Garden City, N.Y.: Doubleday, 1964), 162.

retooling, and public-relations maneuvers, the company introduced a completely new automobile, the Ford Model A, to replace the venerable Model T.[2]

Although most scholars writing about these events have focused on the business decisions of Ford and General Motors, whose Chevrolet overtook the Model T as the nation's best-selling vehicle in 1927 and 1928, there was an important but overlooked environmental component to the Model T's demise. In particular, the rapid spread of a national network of smooth roads undercut many of the Model T's traditional advantages over its competitors, a problem that Ford exacerbated with its clumsy attempts to enter the closed-car era by grafting heavy closed-body designs onto the flexible Model T chassis. Like a species dying out in the face of massive habitat loss, the Model T's tumbling market share reflected its poor adaptation to a series of rapid changes that transformed the built environment of the United States during the 1920s.

The Origins of Business Success: Roads in Poor Condition

Upon its introduction at the end of 1908, the Model T represented a curious but exciting hybrid of design features that allowed it to bridge an American marketplace bifurcated into low- and high-priced halves. At its debut price of $850, the five-passenger Model T touring car cost somewhat more than the two vehicle types that dominated the low end of the American market: "high wheelers," which were basically motorized farm wagons, and "runabouts" or "gas buggies," which were small, underpowered vehicles with rear-mounted engines. Yet the Model T also cost significantly less than the expensive automobiles at the upper end of the market, especially the big, powerful "touring cars" that had evolved out of the engineering and design innovations

[2] Ford production numbers from Bruce W. McCalley, *Model T Ford: The Car That Changed the World* (Iola, Wisc., 1994), 462-63.

embodied in the revolutionary 1901 Mercedes, the vehicle widely regarded as the first "modern" automobile. By keeping the Model T simple, light, and strong, Ford created a utilitarian, low-cost car with sprightly performance characteristics that rivaled those of much more expensive touring cars. Those same characteristics, coupled with the Model T's high-quality materials, careful engineering, and staunch reliability, gave it a significant performance edge over lower-priced high-wheelers and runabouts at only marginally greater expense. As a result, the Model T appealed powerfully to both halves of the divided market, quickly creating a new division—this time split roughly evenly between the Model T and everything else.[3]

The nation's notoriously bad rural roads played a significant role in creating the Model T's appeal. Although well-maintained highways had enjoyed a brief heyday in the United States during the early nineteenth century, the rapid spread of railway networks in the middle decades of the century eroded interest in maintaining expensive highways for long-distance transportation. Road administration devolved into the hands of undercapitalized local authorities, who often had little more than a minimal road tax, most frequently paid in labor, to handle routine maintenance. By the 1880s, rural roads had declined to such a poor state that a full-fledged "good roads movement" emerged to try to improve them. Initially led by urban cyclists who were appalled by the roads they encountered on recreational rides through the countryside, they were later joined by rural residents themselves, who began to see an array of social and economic advantages to better roads.

---

[3] Christopher W. Wells, "The Road to the Model T: Culture, Road Conditions, and Innovation at the Dawn of the American Motor Age," *Technology and Culture* 48 (July 2007): 497-523. Between 1913 and 1919, for example, Model Ts accounted for 44.6 percent of new-car sales in the U.S. See McCalley, *Model T Ford*, 502–36 (Ford production statistics); and National Automobile Chamber of Commerce, *Facts and Figures of the Automobile Industry, 1928 Edition* (New York: NACC, 1929), 6 (total industry production statistics).

By 1908, when Ford introduced the Model T, this movement had generated substantial interest and secured a handful of significant reforms. Even so, improvements to rural roads themselves came slowly. Aside from a widely dispersed smattering of short stretches of paved roads, the nation's country roads remained in a generally sorry state through the 1910s.[4]

In the face of such poor roads, Henry Ford set out to build—as he put it in 1906—an automobile "capable of carrying its passengers anywhere that a horse-drawn vehicle will go without the driver being afraid of ruining his car."[5] Three major features allowed the Model T to achieve this ambitious goal. First, ample road clearance insured that the underside of the car would not scrape the ground—even on deeply rutted or otherwise unevenly surfaced roads. Second, the use of light, high-quality materials, combined with simple design and low weight, gave the Model T touring car an excellent weight-to-horsepower ratio, a rough measure of performance in which lower numbers indicate better performance. At 60:1, the Model T had a much better ratio than the day's average of 80:1, which meant that its drivers could extract themselves

[4] Christopher W. Wells, "The Changing Nature of Country Roads: Farmers, Reformers, and the Shifting Uses of Rural Space, 1880–1905," *Agricultural History* 80 (2006): 143–66. A substantial literature exists on this subject. See, for example, Hal S. Barron, *Mixed Harvest: The Second Great Transformation in the Rural North, 1870–1930* (Chapel Hill: University of North Carolina Press, 1997); Howard Lawrence Preston, *Dirt Roads to Dixie: Accessibility and Modernization in the South, 1885–1935* (Knoxville: University of Tennessee Press, 1991); Bruce E. Seely, *Building the American Highway System: Engineers as Policy Makers* (Philadelphia: Temple University Press, 1987); George Rogers Taylor, *The Transportation Revolution, 1815–1860* (New York: Rinehart and Company, 1951); Federal Highway Administration, *America's Highways, 1776–1976: A History of the Federal-Aid Program* (Washington, D.C.: U.S. Government Printing Office, 1976); John B. Rae, *The Road and the Car in American Life* (Cambridge: MIT Press, 1971); Philip P. Mason, "The League of American Wheelmen and the Good-Roads Movement, 1880–1905" (Ph.D. diss., University of Michigan, 1957); Ballard Campbell, "The Good Roads Movement in Wisconsin, 1890–1911," *The Wisconsin Magazine of History* 49 (Summer 1966): 273–93.

[5] Henry Ford, "Arranging to Build 20,000 Runabouts" (letter to the editor), *Automobile*, 11 January 1906, 107.

from tricky stretches of road that routinely beached other automobiles.[6] Third, the Model T's design brilliantly resolved a key conundrum facing early automakers: how to design a chassis capable of withstanding the bruising conditions of poor American roads. Unlike most of its competitors, which featured beefy, heavy chassis designed to take a pounding, the Model T combined a simple leaf spring with a light chassis designed to twist, bend, and flex with the contours of the road. Combined with its high road clearance and low weight-to-power ratio, the Model T's suspension quickly helped the Model T earn an unmatched reputation for mud-hole heroics. When a Model T won a well-publicized cross-country race between New York and Seattle in 1909, for example, the company emphasized its ability to conquer unpaved country roads as much as its victory over its pricy competitors. "The Ford won," one advertisement explained, "in a contest where the roads were just like those on which you want a car to run."[7]

Declining Fortunes: Smooth Roads and Enclosed Cars

While Model T sales soared during the later 1910s and early 1920s, a series of changes in federal and state highway policy set the stage to launch what one historian has described as "the golden age of highway building" after 1921. At the federal level, major legislation

---

[6] On weight-to-power ratio as a measure of performance, and on the early Model T's advantage in this area, see James J. Flink, *America Adopts the Automobile, 1895-1910* (Cambridge: MIT Press, 1970), 281-288; Peter J. Hugill, "Technology and Geography in the Emergence of the American Automobile Industry, 1895-1915," in Jan Jennings, ed., *Roadside America: The Automobile in Design and Culture* (Ames: Iowa State University Press, 1990), 34, 36, 38; and T. P. Newcomb and R. T. Spurr, *A Technical History of the Motor Car* (Bristol: Adam Hilger, 1989), 36, 85-86.

[7] "The New York-Seattle Race" (advertisement), *Ford Times*, 15 July 1909, p. 23. On the Model T's design, see Wells, "The Road to the Model T"; and Robert Casey, *The Model T: A Centennial History* (Baltimore: Johns Hopkins University Press, 2008), 13-31.

in 1916 and 1921 created a national network of primary roads and obligated the federal government to pay half of its costs. At the state level, the rapid rise of income from registration fees, coupled with lucrative new gasoline taxes that spread quickly after three states first introduced them in 1919, provided enormous new revenues for road construction. As a result, state road budgets soared over 200 percent between 1921 and 1930. Overall construction grew 75 percent, and the size of state road systems expanded 60 percent, during the 1920s. As a result, the total surfaced mileage of rural American highways between 1921 and 1929 rose from 387,760 to 662,435 miles, while the mileage of "high" type surfaces, defined as bituminous macadam roads or better, jumped from 35,874 to 112,454 miles. Taken together, total state and federal road expenditures during the same years reached $10.4 billion.[8]

As smoothly surfaced roads began to spread across the American landscape in the 1920s, a host of new design possibilities began to open to automobile manufacturers. More American automakers lowered their suspensions, for example, and introduced more sensitive steering systems, neither of which had been practical in an era of poor roads. In addition, smooth roads opened the possibility of greater speed, which automakers delivered by incorporating bigger engines (and better brakes) into their designs.[9] Perhaps the most important design shift

---

[8] Seely, *Building the American Highway System*, 67 (quotation), 71-86; National Automobile Chamber of Commerce, *Facts and Figures of the Automobile Industry, 1931 Edition* (New York: NACC, 1931), 44. For a detailed record of federal-aid expenditures and construction, broken down by state, see the annually published *Report of the Chief of the Bureau of Public Roads*. On gasoline taxes, see John Chynoweth Burnham, "The Gasoline Tax and the Automobile Revolution," *Mississippi Valley Historical Review* 48 (Dec. 1961): 435-59.

[9] On the major design changes of the 1920s, and the role of style as a factor in those changes, see David Gartman, *Auto Opium: A Social History of American Automobile Design* (New York: Routledge, 1994), 68-99; James J. Flink, *The Automobile Age* (Cambridge: MIT Press, 1988), 212-215; Allan Nevins and Frank Ernest Hill, *Ford*, vol. II: *Expansion and Challenge, 1915-1933* (New York: Charles Scribner's Sons, 1957), 394-401; and Thomas Martin McCarthy, "The

of the 1920s, however, was the dramatic swing toward closed-body designs—a development inextricably linked to rapid highway construction. As late as 1917, closed-body cars accounted for only 4 percent of all new-car sales in the United States.[10] Most of these were high-end makes designed to provide chauffeured transportation over the paved streets of cities, far away from rough country roads that could wrench apart their elegantly appointed enclosures and crack their expansive windows. After World War I, however, the popularity of closed-body automobiles began to rise, jumping from 10.3 percent of sales in 1919 to 56.5 percent in 1925. By 1929 closed cars dominated the new-car market, accounting for 89.4 percent of sales.[11] One clear spur to the newfound popularity of closed-body styles was the improved manufacturing methods that helped bring their price well under $1,000 by the mid-1920s.[12] Another was the increasingly utilitarian (as opposed to recreational) use of automobiles: closed cars, unlike open touring cars, operated comfortably in foul weather. But it was a landscape increasingly characterized by smooth roads that made inexpensive closed-body automobiles practical options by insuring that they would not rattle apart during normal use.[13]

Road to Respect: Americans, Automobiles, and the Environment" (Ph.D. diss., Yale University, 2001), 187-211.

[10] National Automobile Chamber of Commerce, *Facts and Figures of the Automobile Industry, 1924 Edition* (New York: NACC, 1925), 4.

[11] National Automobile Chamber of Commerce, *Facts and Figures of the Automobile Industry, 1930 Edition* (New York: NACC, 1931), 8.

[12] For a concise summary and overview of the production technology behind closed-body automobiles, including a good bibliography of sources, see William J. Abernathy, *The Productivity Dilemma: Roadblock to Innovation in the Automobile Industry* (Baltimore: Johns Hopkins University Press, 1978), 18-19, 183-185.

[13] On this point, see also Roger White, "Body by Fisher: The Closed Car Revolution," *Automobile Quarterly*, 29 (4 1991): 46-63, esp. 53-54. For a full discussion of the spread of smooth roads in the United States during the 1920s, see especially Seely, *Building the American Highway System*, 71-99.

On the surface, the shift toward closed-body vehicles did not appear to threaten Ford's market dominance, for Ford had always offered consumers both open- and closed-body options, which it mounted on identical Model T chassis.[14] In 1910, for example, interested buyers could pick from among five different body styles, including town car, coupe, roadster, and "tourabout" options, in addition to the five-person, open-car touring car body. "As all Model T bodies are interchangeable," the company noted in its 1910 catalog entry for the coupe, a two-seat, closed-body design, "a touring car or roadster body may be substituted for the coupe at the end of the winter season."[15] In 1917, available bodies included touring, runabout, and town car options that resembled those of 1910, but potential buyers could also purchase Model Ts with the body of a sedan, a "coupelet," or even an ambulance. By 1923, the available options included

[14] The popular notion that Ford sold the Model T in a single design that never changed must be qualified in two respects. First, although it is true that Ford focused its entire production on a single Model T *chassis*, the company offered that chassis with a variety of body types that changed markedly over the years. Second, even the Model T chassis was not as unchanging as popular legend holds, although the company did work hard to ensure compatibility as new parts and components replaced old ones. On this point, see especially McCalley, *Model T Ford*, iii. McCalley is the former editor of *The Vintage Ford*. His book, which is the definitive study of the Model T's mechanical evolution, also describes the Model T's changing body styles over the years in careful detail.

[15] 1910 Ford catalog as reproduced in McCalley, *Model T Ford*, 25.

updated open-car touring and runabout bodies, as well as several closed-body options in different sizes and shapes, with various numbers and arrangements of doors and seats.

Despite this range of body styles, the touring car and the runabout—both open-body designs—always accounted for the lion's share of Ford's sales. At the peak of the Model T's popularity in 1923, for example, the open-style touring car and roadster bodies outsold the company's three closed-body designs (the Tudor, Fordor, and coupe) by a 2-to-1 ratio.[16] Not surprisingly, however, with smooth roads paving the way for improved closed-body designs, the popularity of Ford's open-body options began to fall in rough proportion to the precipitous decline of *all* open-car sales in the U.S. The sales of the Model T touring car, long its most popular version, tell the story: from a peak of 897,772 units in 1923, touring-car production fell 17 percent in 1924 to 749,042, another 11 percent in 1925 to 663,047, and a disastrous 50 percent in 1926 to 332,619—slightly less than the number of Model T touring cars that the company had produced in 1916.[17]

Worse, by 1923, when Ford sliced the touring car's sales price from $348 to just $298, Ford's traditional strategy of cutting prices to stimulate sales appeared to have reached the outer limits of its effectiveness. At that price, the company earned just two dollars on each unit, making further large cuts untenable.[18] With Ford selling its cars virtually at cost and the popularity of its open-body styles plummeting, the company needed to sell more of its closed-body types—the clear growth market for the industry—to offset its losses. Unfortunately for Ford, however, sales of the company's closed-body designs never came close to counterbalancing faltering open-body sales.

---

[16] The actual numbers were 1,188,552 open body cars, 538,856 closed body cars, and 283,717 other (including chassis, trucks, and truck chassis). McCalley, *Model T Ford*, 463.

[17] The company produced 363,024 Model T touring cars in 1916. Figures are based on a breakdown of Model T Ford production by body type in McCalley, *Model T Ford*, 462-463. The 1916 numbers are as compiled from BFRC, Acc. 231; the 1926 numbers are as compiled by the Ford Motor Company on 3 Aug. 1927.

[18] Frederick, "What is Happening to the Motor Industry," 198. The company cut the touring car's price to $295 in 1924 and to $290 in 1925, where it remained until it was discontinued in 1927. For prices, see Beverly Rae Kimes and Henry Austin Clark, Jr., *Standard Catalog of American Cars, 1805-1942*, third ed. (Iola, Wisc.: Krause Publications, 1996), 582-587.

The company's four-door, five-passenger sedan initially enjoyed great success, selling 143,884 units in 1923, its first full year of production. Its sales fell off rapidly thereafter, however, and sales never again surpassed 100,000 per year. Sales of Ford's two-door, five-passenger Model T sedan also proved inconsistent, combining shrinking sales in 1923 and 1925 with expanded output in 1924 and 1926. Altogether it averaged 185,424 units per year between 1923 and 1926—only a modest increase over its 146,060 mark of 1922, and not nearly enough to compensate for lost touring-car sales.[19] The Ford Motor Company's basic failure after 1923, then, was its inability to transform the Model T, which had been the world's most popular automobile during the open-car era, into an appealing closed-body sedan.

The Final Fall: Paved Roads and Technological Maladaptation

Why did closed-body Model T's fail to catch on? Part of the explanation, as most historical accounts emphasize, can be attributed to the Model T's somewhat ungainly appearance compared to other, more dashing low-priced vehicles like General Motors' Chevrolet. Ford had introduced largely cosmetic changes to the Model T in 1917 and again in 1923 that progressively lowered the chassis and created a slightly more streamlined appearance, but even with these stylistic improvements the Model T lacked the flair of its primary competitors.[20] Yet the emphasis on style has obscured

[19] Demand for the company's two-passenger models, on the other hand—the closed-body coupe and the open-body roadster—grew quickly between 1921 and 1923, but remained relatively static thereafter. Sales of the coupe, for example, rose 5 percent in both 1924 and 1925, but then fell 17 percent in 1926. The roadster did slightly better, making up for a 10 percent drop in 1924 with 13 percent increases in each of the next two years. All production figures as compiled by the Ford Motor Company on 3 Aug. 1927, as reproduced in McCalley, *Model T Ford*, 463.

[20] On Ford's 1917 and 1923 changes, see Hounshell, *From the American System to Mass Production*, 274. The particular changes can be traced in detail in McCalley, *Model T Ford*.

another significant part of the explanation: the Model T's declining performance.

While automakers like General Motors spent the early and mid-1920s introducing completely new closed-body automobiles—lowering the chassis, lengthening and smoothing the lines, creating a more integrated appearance, and making mechanical changes to accommodate their permanent, heavy enclosures—the Ford Motor Company continued to mount its closed-body designs on the same basic Model T chassis that had been introduced in 1908, when poor roads predominated. In its early years, the Model T's flexible suspension had been an invaluable asset, enabling countless Ford owners to negotiate terrain that drivers of other makes feared to tread. On the increasingly smoothly paved roads of the 1920s, however, Ford's closed-body sedans proved remarkably top heavy and rested uneasily on their flexible suspension. As a result, the Model T in its sedan versions had a notably bouncy ride, pitching and rolling when traveling at speed on smooth roads in a way that produced more than its share of carsickness.[21]

Heavy enclosed sedan bodies also added significantly to the Model T's total weight, reducing its weight-to-power ratio and compromising the spry performance that had characterized earlier, open-bodied Model Ts. Following the advent of mass production, even the open-bodied touring car had gained weight—300 pounds in 1915 as a result of various refinements and improvements, and another 150 pounds in 1920 with the addition of an optional electric starter. At 1650 pounds, the Model T touring car's weight-to-power ratio had thus climbed to 83:1 by the 1920s—still respectable, but decidedly inferior to its 60:1 of earlier years. The Model T as an enclosed sedan, however, weighed much more: 1875 pounds for the two-door sedan (a 94:1 ratio), and 1950 pounds for the four-door model (98:1). If the combination of a bouncy ride

[21] Hugill, "Technology and Geography in the Emergence of the American Automobile Industry," 38-39; and Sloan, *My Years with General Motors*, 162.

and poor responsiveness compromised the performance of Model T sedans on smooth roads, it proved even worse for Ford owners who attempted to drive the enclosed sedans on poorly graded roads. In 1926, for example, Ford's branch engineering office in Seattle entreated Detroit engineers to "relieve some of the bobbing up and down experienced in the closed cars," especially "where roads are somewhat choppy and rough." Long-time Ford owners also began writing the company to say that their new enclosed Ford cars failed to meet the performance standards that had made them dedicated Ford owners. An owner from Tampa, Florida, for example, called his 1926 four-door sedan a "rattletrap," complaining that one door had badly warped and would not stay shut. Another owner, from Buena Vista, Arkansas, complained that his 1926 Ford—with the company's new-and-improved streamlined look—had put the chassis "too low for the class of dirt roads that we have to contend with in all parts of the country." Yet another, from Greenfield, California, reported a range of problems with his 1925 sedan, including a "left back window [that] rattles and shakes so severely that one small piece has broken out of [the] corner." In its closed-body sedan versions, then, the Model T had become a pale imitation of its agile ancestors—underpowered, overweight, and out of touch with the roads its owners used.[22] Declining performance and changing expectations among owners, not merely stylistic deficiencies or out-of-date technology, thus hastened the Model T's demise. Ford's clumsy attempts to transform the Model T into a closed automobile paled in comparison to the more fundamental design changes that Ford's competitors made to adapt their vehicles to the rapid spread of smooth roads.

Where Chevrolet saw its closed-body models grow from

[22] Memo, Seattle Branch Engineering to Branch Engineering Home Office, signed R. W. Hinea, 10 April 1926, in BFRC, Acc. 94, Box 168, Folder Complaints Branches; L. D. Morrow to Henry Ford, 19 June 1926, in ibid., Folder Complaints General; W. L. Blalock to Henry Ford, 1 April 1926, in ibid.; and A. B. Colburn to Henry Ford, 24 Oct. 1925, in ibid.

40 percent of its sales in 1924 to 82 percent in 1927, while expanding total production from 307,775 to just over 1 million, Ford's closed-body options never outsold its open-bodied options, growing from 37 percent of sales in 1924 to just 48 percent in 1927—as Ford's total Model T production fell from slightly less than 1.7 million to just over 300,000 during the same period.[23]

Along with its low price, the Model T's ability to handle poor roads with aplomb had always been central to its appeal, and as road networks improved it lost a big part of its edge over the competition. Moreover, the concomitant market shift toward closed cars that accompanied the spread of good roads further eroded the Model T's appeal by exposing major new liabilities in the performance of closed-body Model Ts. Compared to alternatives such as Chevrolet, whose closed-body models were designed specifically to perform well on smooth roads, Ford's various Model T sedans were sluggish, uncomfortable, and outmoded.

There were certainly other factors at work in the Model T's fall, but the massive changes sweeping across the built environment of the United States during the 1920s—and the specific ways that automakers did and did not adapt to them—clearly played a much more important role in the Model T's demise than is currently recognized.

[23] Sloan, *My Years with General Motors*, 266-267, 161-162; Kimes and Clark, *American Cars*, 290, 292; McCalley, *Model T Ford*, 463.