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Wages in California during the Gold Rush

This chapter examines the labor market implications of a specific event—the California Gold Rush of the late 1840s and early 1850s. From the standpoint of studying labor market integration, the Gold Rush is an interesting natural experiment—an unexpected, highly localized demand shock of tremendous size that required the significant and costly reallocation of labor (and other mobile factors) from distant locations to a very sparsely populated region. Although it is abundantly obvious from the historical record that labor migrated to California in response to the discovery of gold, the time path of wages and labor supply has remained unclear.

Following a recounting of the history of the California Gold Rush, the chapter develops a simple model of wage determination in a gold rush economy. I argue that the most likely path was an initial rise in wages, followed by a steep decline.

Similar to that in chapter 3, the analysis here uses a sample of California forts drawn from the *Reports of Persons and Articles Hired* to estimate nominal wage series for common laborers–teamsters, artisans, and clerks. A price deflator is constructed from Berry's (1984) compilation of wholesale prices.

The time path of real wages revealed by the *Reports* is consistent with the stylized model of wage determination. Real wages rose very sharply during the initial phase of the rush, fell abruptly in 1852, and then remained roughly constant for the remainder of the decade. Although it was, by definition, a purely transitory shock, the Gold Rush appears to have left a permanent imprint on California wage levels. I argue that the permanent effect occurred because, as a result of the Gold Rush, California became integrated into the economy of the Northern United States, where wages were relatively high.

The chapter concludes by examining the wage elasticity of labor supply into Gold Rush California over various periods of years (e.g., 1848–52), using labor quantities computed from the federal censuses and the state census of 1852. The estimates range between 2 and 3, suggesting a relatively elastic response. However, labor supply into Gold Rush California was less elastic than it was into Alaska during the Pipeline era (1973–76).

6.1 The California Gold Rush

Other than the Civil War, few events in nineteenth-century American history capture the imagination like the California Gold Rush.[1] The initial discovery of gold in 1848 and the subsequent rush of people into the state were the subject of innumerable newspaper articles, diaries, and related contemporary accounts. The Gold Rush was an epic adventure for the "argonauts" and "forty-niners" who took part in it. It has also been a lightning rod for historians seeking metaphors for the grand issues of frontier development—the callous exploitation of native peoples and natural resources, the slow and uncertain development of orderly government from chaos, the haphazard taming of the American West (Goodman 1994).

Although the coastal regions of California had been explored in the sixteenth century, the true origins of California settlement lie in Spain's acquisition of French claims to the vast Louisiana territory following the end of the Seven Years' War in Europe in 1763. Charles III of Spain subsequently sent the adventurer Jose de Galvez to push Spanish settlement north of Mexico, in the hope of preventing English encroachment into Mexico and its rich mining region. Galvez invented the mission—in reality, a colonizing institution whose purpose was to Christianize native populations, settle them into agriculture, and ultimately create an interlinked set of local economies (Coman 1912, vol. 1; Lavender 1976, 18).

The mission approach was largely successful in Baja California and southern Arizona, but rebellious Indians blocked its extension into Alta (Upper) California. Galvez appointed Fray Junipero Serra to head an expedition to Alta California, along with the governor of Baja, Gaspar de Portola. After great hardship, they established a *presidio* (fort) at San Diego and later one at Monterey (Lavender 1976, 19–22). By 1772, there were five missions and two *presidios.* The number of missions grew slowly but steadily. San Francisco was added in 1776, Santa Barbara in 1782 (Coman 1912, vol. 1; Lotchin 1974).

Life at the missions was hard. Mortality was extremely high, agricultural productivity was frequently low, and there were periodic skirmishes with Indians. Nonetheless, by the early nineteenth century, missions were taking root, particularly in the south, where ranching and some wheat farming flourished (Coman 1912, 1:145–55; Lavender 1976, 24–27).

The missions began to fall somewhat out of favor in the early nineteenth century. Conflict arose over access to land in California, and anticlerical sentiment erupted in Mexico. By the mid-1830s, mission land was placed under secular control, and a series of private land grants was initiated. Fueled by cheap labor, primarily Native American, southern California ranches had become highly profitable through cattle production, yet the standard of living of the "working class" was miserable (Coman 1912, 1: 172–89; Lavender 1976, 29–31).

Throughout its colonization of California, Mexico faced serious difficulties keeping out interlopers. American trappers and fur traders appeared in Alta California as early as 1800 (Coman 1912, 1:160). Furs were traded for manufactured goods brought by Boston shippers who stopped in Monterey and San Francisco on the way to China (Coman 1912, 1:163–64). Russia established Fort Ross in Alta California in 1812 (illegally, but with the full knowledge of the Mexican government) and kept it in operation until 1841. By 1832, there was a well-traveled trade route between Sante Fe and Mission San Gabriel (Coman 1912, 2:214). In addition, there was a steady stream of Americans who became Mexican citizens and practiced (or promised to practice) Catholicism in exchange for land grants. By the early 1840s, they were joined by small bands of settlers (Coman 1912, 2:228–41; Lavender 1976, 34, 37–40).

Slowly, but inexorably, disputes occurred between the settlers and the Mexican government. In June 1846, a group of settlers staged the so-called Bear Flag Revolt (near present-day Sonoma) with the aid of Charles Fremont of the U.S. Corps of Topographical Engineers and sixty troops under his command (Coman 1912, 2:246; Caughey 1948, 4–5). Word soon came that the United States was at war with Mexico. The mission at Monterey was seized by Commodore John D. Sloat. Additional troops and naval units were despatched from the Army of the West, the Mormon Battalion, and a contingent of poor artisan volunteers from New York who had been promised free passage for themselves (and their tools) if they stayed in California at the end of their tour of duty (Caughey 1948, 4–5; Lavender 1976, 49). By mid-1846, the United States Navy had occupied all usable ports in California (Lavender 1976, 46).

The Mexican War came to a formal end with the signing of the Treaty of Guadalupe Hidalgo on 2 February 1848. In exchange for $15 million and the forgiveness of $3.3 million in American claims against the Mexican government, Mexico ceded California, New Mexico, Utah, Nevada, Arizona, and disputed parts of Texas to the United States (Lavender 1976, 4).

Ironically, the treaty was signed two weeks after—and, apparently, without knowledge of—the discovery of gold that marked the formal beginning of the Gold Rush.[2] James Marshall, a carpenter working for John Sutter (a recipient of a land grant from Mexico), happened on a pea-sized pellet of gold near the American River. At first, Marshall and Sutter attempted to keep knowledge of the discovery a secret, but they were unable to prevent the information from leaking. Teamsters and other travelers delivered the news to various settlements on the way to San Francisco (Coman 1912, 2:256; Lavender 1976, 50–51).

The local response was rapid and extreme. According to an eyewitness, when the news reached Monterey in early May, "The blacksmith dropped his hammer, the carpenter his plane, the mason his trowel, the farmer his sickle, the baker his loaf, and the tapster his bottle. All were off for the mines. . . . [there is] only a community of women left, and a gang of prisoners" (quoted in Lavender 1976, 51). According to a 1 June report, half San Francisco's population (at that time, between eight hundred and one thousand) had left for the mines, and fully three-quarters were gone by the middle of the month (Coman 1912, 2:257; Caughey 1948, 21).

The local labor supply was supplemented by in-migration. The schooner *Lauisa* relayed the news to Honolulu, and other ships, bound for points north and south, did the same (Caughey 1948, 23). Migrants poured in from Oregon (according to some reports, *half* the male population) and from Hawaii, Mexico, Chile, Peru, China, and Australia (Lavender 1976, 53; Caughey 1948, 23–24; Marks 1994, 24).

The news took somewhat longer to reach the East. The first report, a letter in the *New York Times*, appeared in mid-August, and the *New Orleans Daily Picayune* reported the discovery in mid-September (Caughey 1948, 34–35). The early newspaper reports prompted disbelief, but official army accounts led President Polk to make a formal announcement in December (Lavender 1976, 55). Transportation companies quickly formed; handbooks for argonauts, such as George G. Foster's *The Gold Regions of California* (1848), were hastily written; and an avalanche of migrants followed (Caughey 1948, 51–55).

Although the specific routes varied enormously, there were three general ways to get to California. One way was by ship around Cape Horn, the chief disadvantages being the time cost (from three to eight months) and the hazards of shipwreck and onboard disease. A theoretically quicker route (six to eight weeks) was to take a ship to the Isthmus of Panama, travel overland to the Pacific, and then board another ship for San Francisco. Until Cornelius Vanderbilt built a railroad across the Isthmus (for which the fare was $25.00), the trip through Panama was extremely arduous (Coman 1912, 2:261).

Another popular route was overland (Caughey 1948, 95). Migrants banded together in groups leaving from various points in the Midwest, such as St. Louis. Because travel during winter was next to impossible, most tried to leave in April or May at the latest, the goal being to arrive in the gold fields by September. Overland migrants battled impassable terrain, bad weather, wagon damage, hunger, thirst, disease (cholera epidemics were frequent), and the occasional Indian attack (Caughey 1948, 58–60; Parke 1989).

Aside from the time costs, the money costs of migration were very high by the standards of the time. Depending on the port, fares on the Panama Route ranged from $100 to $300, for example, and the money costs of equipping an overland trip were in a similar range (Caughey 1948, 66; Parke 1989, 137). Despite the high time and money costs of transport, the numbers of migrants are impressive—an estimated eighty to ninety thousand annually in 1849 and 1850 (Wright 1940, 341–42; Lavender 1976).[3]

Although all surely had gold on their minds, not everyone became a miner (or remained one for long). Many migrants realized that profits could be made transporting consumer goods to the mines and set up makeshift stores under tents at mining camps (Coman 1912, 2:274–76; Lavender 1976, 75). Others sought to make their fortune in commerce, real estate, banking, or other services in rapidly growing San Francisco (see below). By 1860, there were 217 miners for every 1,000 people in the state, compared with 624 per 1,000 in 1850 (DeBow 1853, 976; Kennedy 1864, 35).[4]

The immediate consequence of the in-migration was rapid population growth. Estimates of the population on the eve of the Gold Rush, excluding non-Christianized Indians, range from three to eight thousand (Coman 1912, 2:217; Caughey 1948, 2; Lavender 1976, 15). The 1850 federal census put the population at ninety-three thousand, 77 percent of whom were males between the ages of fifteen and forty (DeBow 1853, 966–68; Kennedy 1862, 130).[5] By 1852, the population had grown to approximately 264,000 (DeBow 1853, 982).

Although most scholars date the end of the rush sometime in the early 1850s (some as late as 1857 [see Marks 1994, 31]), population growth fueled by in-migration continued through the rest of the decade, albeit at a slower pace. By 1860, the population had risen to 380,000, but the adult male (ages fifteen to forty) share had fallen to 49 percent, indicating a substantial shift in the demographic composition of the in-migrants toward more permanent settlers (Kennedy 1862, 131; Kennedy 1864, 26–27).

Some of the most spectacular growth occurred in San Francisco. In 1844, the population of Yeuba Buena (the Mexican name for San Francisco) was about fifty. A town census in 1847 showed that the hamlet had grown to 459 souls over the preceding three years, and the population doubled again the next year, presumably because of the establishment of the quartermaster's depot and the military presence left over from the Mexican War (Lotchin 1974, 8). Then, as a consequence of the Gold Rush the population exploded. By 1852, San Francisco housed thirty-four thousand inhabitants and, by 1860, fifty-six thousand (Lotchin 1974, 102). External trade expanded swiftly, being surpassed during the decade only by that in New York, Boston, and New Orleans (Lotchin 1974, 45).

San Francisco's extraordinary growth can be attributed to two factors—direct access to the Pacific (i.e., its port facilities) and proximity to the gold fields (Coman 1912, 2:277; Lotchin 1974, 5–6). Prospective forty-niners who took the sea route arrived at San Francisco, where they sought to buy supplies for the final leg of their journey and equipment for the mines, thereby creating a booming market in pans, shovels, and Indian baskets (Coman 1912, 2:279; Caughey 1948, 32). Miners journeyed back to the city with their treasure, where they attempted to purchase goods and services. During the early years, most goods, including food, were imported into San Francisco—including, evidently, turtle meat from the Galapagos Islands. Eventually, the imports gave way to locally produced agricultural and manufactured goods, most of which were marketed in San Francisco (Lotchin 1974, 10, 47; Caughey 1948, 210–13).

In the case of certain locally produced services, the shock to demand was sometimes so great that the line between traded and nontraded goods blurred. The cost of washing, it is said, rose so rapidly after 1848 that clothes and restaurant linens were sent by clipper ship to Hawaii or even China for cleaning (Marks 1994, 197–99).[6]

After the initial deposits near Sutter's Mill were exhausted, miners spread out over a thirty-five-thousand-square-mile area looking for more gold (Coman 1912, 2:266–68; Caughey 1948, 52–54). Some of the gold—so-called placer deposits—was so easy to find that it could be literally scooped out of streams, but other deposits were harder to locate and retrieve.

By the second half of 1849, the easy gold nearby the mother lode was gone, and more complex methods—using cradles, "long toms," and sluice boxes—had to be employed. Miners discovered that mercury ("quicksilver") bonded with gold in an amalgam, which could then be cleaned. Quicksilver was readily available owing to the discovery of rich deposits near San Jose (Lavender 1976, 62).

Although placer mining remained the most significant method of mining until late in the 1850s, alternatives soon appeared. Quartz mining grew after extensive deposits were discovered near Mariposa in 1849. Stamp mills, the use of hydraulics, and tunneling were other important innovations. By comparison with placer mining, however, the required capital investments (and associated risks) of these alternative methods were substantial, beyond the means of ordinary miners. Mining companies formed, and entrepreneurs competed with placer mining to hire laborers (Caughey 1948, 249–66).

Wherever significant deposits were found, mining camps soon followed. By the standards of the day—and certainly by those of the twentieth century—living conditions in the camps were extraordinarily bad. Aside from mining, there was little to do, and alcoholism was rampant. So, too, was disease and malnutrition, as sanitary conditions were horrible, in part owing to the environmental damage caused by the mining operations and the close (and crude) living quarters. Nonetheless, the camps thrived as miners fashioned crude local government and rudimentary procedures for enforcing their stakes (Caughey 1948; Lavender 1976, 65–66; Marks 1994).

Once the gold ran out, the camps were abandoned as quickly as they had been established (Caughey 1948, 267). Those still bitten by the gold bug moved on to the next strike or, sometimes, gold rushes elsewhere (e.g., Australia [see Caughey 1948, 293]). The less successful sought to return home but, hampered by high migration costs, frequently settled for employment in agriculture or in the burgeoning nonfarm sector in and around San Francisco (Caughey 1948; Lotchin 1974; Lavender 1976).

The Gold Rush had important political consequences. By far the most important was California's early admittance into the Union in 1850, thereby bypassing territorial status. A constitutional convention was called in 1849, and the constitution was overwhelmingly ratified by popular vote on 13 November. From the standpoint of statehood, the critical issue was slavery: Californians desired admittance as a free state, which upset the delicate political balance in Washington. The furor was abated by the Compromise of 1850, by which California was admitted as a free state while New Mexico and Utah were organized as territories that could then decide for themselves whether to be slave or free (Lavender 1976, 69–71).

6.2 Wage Determination in a Gold Rush Economy

This section presents a simple model of wage determination in a gold rush economy. The model is not novel—it is a standard Dutch disease framework, and a similar version of it has been used to analyze another historical gold rush, that of Australia in the early 1850s (Maddock and McLean 1984).[7] The prediction for nominal wages in the model economy is straightforward: nominal wages rise after the discovery of gold, then decline once labor supply fully adjusts to the spatial shock to labor demand. The comparative static path followed by real wages may be more complex, but it is likely, too, that real wages rise initially and then fall.

As a point of departure, imagine a pre–gold rush economy, by definition one in which population is small and perhaps highly scattered. There are N individuals, each of whom is endowed with equal shares ($1/N$) of the economy's known stocks of gold. N is fixed in the short run but may vary in the long run. Initially, I assume that known stocks of gold are very small; however, as the number of individuals changes, I maintain the assumption that each is endowed with $1/N$ of the stock of gold.[8] The total capital stock, K, is fixed in the short run, and each individual has an equal share ($1/N$) of it.

Individuals maximize utility, which is defined over the consumption of a locally produced good, X, whose price is p_x, and an imported good, Z. The traded good is supplied from a settled economy removed by distance from the gold rush economy. The supply of the traded good is assumed to be perfectly elastic at price p_z.

Individuals allocate their available labor supply (L) between the production of the local good and gold production. The production function of the local good is $X = F(L_X, K)$, where K is capital. Once produced, the local good can be either consumed or sold at the price p_x. Gold, as well, can be used to purchase either X or Z, but it cannot be consumed. Gold is the numeraire commodity.[9]

The function g is a *harvesting* function, which converts the stock of ore (O) into a flow (g) available for export or for purchase of X. I assume that both F and g are concave; $g(0)S = 0$ (if no labor is allocated toward gold harvesting, gold output is zero); and $g \leq 1$ for any value of $L_g = L - L_x$.

The first-order conditions are straightforward.[10] Consumption of X and Z should be efficient, as should the allocation of labor between the production of the local good and the harvesting of gold: that is, labor is allocated to equalize the value of the marginal product in both production activities.

I model a gold rush as an increase in the economy's known stock of ore (S). An increase in S shifts the harvesting function outward, but, because $g(0)S = 0$, the shift is not a parallel one. At a fixed level of p_xF_L (= w, the nominal wage), individuals will want to allocate more labor to gold harvesting than in the initial equilibrium. In the aggregate, the increase in L_g produces an inward shift in the supply of labor to the production of the local good, causing w to rise.

Gold has value in exchange, however, so the aggregate demands for X and Z may change. As long as X is a normal good, the demand for X will increase, leading to an increase in the demand for labor in the local goods sector. The increase in the demand for labor in the local sector further drives up w and also p_x. Define the real wage to be $w/h(p_x, p_z)$, where h is a cost-of-living function.[11] Because p_z is exogenous (the supply of Z is perfectly elastic), whether the real wage rises or falls depends on w/p_x. However, $w/p_x = F_L$. If, in the new (short-run) equilibrium, the quantity of labor demanded in the local sector declines, F_L will increase, and so will the real wage.[12]

In the long run, mobile factors (labor and capital) may flow in (or out) of the gold rush economy, provided that, in the new equilibrium, factor returns are sufficiently high to justify costs of adjustment (see below). Labor may be attracted into the gold rush economy because real income is higher after the discovery of gold. Capital may be attracted, especially because in-migration of labor will increase the aggregate demand for X.[13] For modeling purposes, I assume that any new labor shares in the endowment of gold equally with the initial residents. Consequently, from the standpoint of individuals, S falls, and the harvesting function shifts inward. The inward shift reduces the incentive to mine gold, thereby increasing the incentive to supply labor to the local goods sector. If the labor supply effect dominates relative to any shift in product demand, w will fall, as will w/p_x (and, thus, so will the real wage).

The model captures certain essential features of wage determination in a gold rush economy, but there is no question that it is highly stylized in several respects. For example, the model presumes that a representative individual allocates time to gold production and to production of the local good. While miners often did just that over the course of the year (because mining was seasonal [see below; and Lotchin 1974]), others clearly specialized their labor supply. Specialization does not alter the basic thrust of the model as long as some individuals were at the margin of shifting into gold production just prior to the gold discovery.[14]

Second, it was necessary to prospect for gold and establish a claim before harvesting it. Both activities had uncertain returns. Uncertainty can be incorporated in the model in the following manner. Assume that time spent harvesting gold is divided into two activities: prospecting (which includes establishing claims) and harvesting. By allocating L_p to prospecting, each individual can increase the probability $p(L_p)$ that he will find gold (I assume that $p'' < 0$). Expected income from gold harvesting is now

$$p(L_p)g(L - L_x - L_p)S.$$

There are now two ways to model a gold rush—either an increase in S or an upward shift in p for any given level of L_p. Either way, the gold rush increases the expected marginal product of labor in gold harvesting, and the remainder of the static analysis is unchanged.

6.2.1 Wage Dynamics

The model developed above does not directly address the dynamics of wage adjustment in the gold rush economy. To describe the dynamics of wage adjustment, it is necessary to specify expectations about the occurrence and duration of the shock and about adjustment costs. In what follows, I assume that the gold rush is a transitory shock—that is, the probability that its duration will continue indefinitely is known, in advance, to be zero.[15] For the moment, I assume that labor is the mobile factor and, therefore, ignore capital in- (or out-) migration.

Suppose that individuals had perfect foresight that the gold rush would begin at date t and last until date t' and that adjustment costs were convex.[16] By *adjustment costs*, I mean all costs associated with changing the allocation of labor from its initial pre–gold rush equilibrium and changing it back again once the gold rush has ended.

With perfect foresight and convex adjustment costs, it would be rational for labor to begin migrating into the economy *before* the gold rush, in order to avoid incurring high marginal adjustment costs at date t. Similarly, it would make sense for labor supply to decline just before the end of the rush, again to avoid high marginal adjustment costs. Therefore, w falls somewhat before date t, but the influx of labor before t will generally not be sufficient to prevent w from rising above its long-run equilibrium value for a while after t (Carrington 1996).[17] Analogously, some excess labor will remain after t', causing a temporary slump in wages.

What if dates t and t' are uncertain but adjustment costs are zero? By *uncertain,* I mean that no individual knows exactly when (or even if) a gold rush will occur. Once the shock occurs, however, information that a rush has begun is instantaneously available to all individuals. Similarly, the end of the rush is uncertain, but, once it has occurred, this information is immediately transmitted.

If adjustment costs were zero, then uncertainty over t and t' has no economic consequence. Labor simply adjusts once the shock occurs, and wages move immediately to their new equilibrium value, returning to their original level when the rush is over.

Of course, individuals did not have perfect foresight about the discovery of gold or the duration of the rush, and, on the basis of the discussion in section 6.1, adjustment costs were obviously nonzero. Further, as section 6.1 argued, the discovery of gold took place in stages—that is, the shock was spread through time.

If the gold discoveries were unanticipated but sequential and adjustment costs were convex, then wages would rise steeply during the period of discovery, followed by an abrupt decline when the rush ended (because all the labor would be surplus at that point). If, as assumed above, the rush were a transitory phenomenon, wages would then eventually return to their prerush level after the rush's end. The precise pattern followed by wages during the period of discovery would depend on the size of the shocks to labor demand, their precise timing, and how quickly labor responds.

Up to this point, I have ignored capital mobility. Allowing for capital mobility (with adjustment costs) might alter dramatically the wage adjustment path (Taylor 1996). For example, if adjustment costs for capital were uniformly lower than for labor, the initial jumps in wages would be greater. If the capital were of the "putty-clay" variety—capital costs are mostly sunk once the capital is in place—relatively high wages might be sustained a while after the rush is over. However, wages would still eventually return to their initial equilibrium, unless it was profitable for some other reason to continue to invest in the gold rush economy after the rush was over.

More complex dynamic models could also be fashioned by considering exactly how factor supply, particularly labor, would change in the short as opposed to the long run and by incorporating inflationary feedback. For example, individuals in the gold rush economy have strong incentives to substitute leisure intertemporally. They expand effort in the short run following the discovery of gold, believing that the additional work will be temporary, and, having accumulated gold (a store of value), they will enjoy more leisure and possibly consumption in the future. However, given that daily and weekly hours of work in the late 1840s and early 1850s were already quite high—for example, a ten-hour day and sixty-hour workweek were not uncommon—it is unclear that increases in hours at either intensive margin offered much scope for substitution (Lotchin 1974, 86). But the same may not have been true of annual hours, in the light of the widespread seasonality of labor demand during the antebellum period (Engerman and Goldin 1993).

The particular timing of migration could also be analyzed in a more complex model. Because gold harvesting was uncertain, individuals in the settled economy might prefer to wait rather than migrate immediately because the majority of the costs of migration were sunk once incurred.[18] However, the very concept of a *rush* suggests that prospective migrants believed that the easy gold would be gone unless they got there first.[19] Given high migration costs, if the first effect dominates, labor supply will be inelastic in the short run but might become abruptly elastic. If the second effect dominates, however, labor will rush in, but migration will eventually tail off.

By *inflationary feedback,* I mean a nonneutral effect of changes in the stock of gold on wages and prices. Because the country was on a metal standard, there is little doubt that the California Gold Rush raised the general price level. But the issue here is not the general price level; it is whether increases in the stock of gold affected local prices more quickly than wages—that is, whether nominal wages in California were sticky in the short run (for an analysis of nominal wage rigidity, see chap. 8). Certainly, the anecdotal evidence on prices during the Gold Rush is suggestive of the possibility of inflationary feedback (Caughey 1948, 203; Marks 1994, 177).[20] Unfortunately, the wage and price data at hand are not sufficient to determine whether inflationary feedback occurred, and I ignore the possibility in my empirical analysis.[21]

6.3 Data and Estimation of Wage Indices

Traditional accounts of the California Gold Rush provide anecdotal evidence on wages and prices but not the sort of quantitative basis to construct a continuous nominal or real wage index comparable in quality to those presented in chapter 3.[22] To construct wage indices, I make use of a sample of wages paid to civilians hired at United States Army installations in California drawn from the *Reports of Persons and Articles Hired,* the same source used in chapter 3. As indicated in the discussion in section 6.1, the army was present in California before the Gold Rush, and its installations continued to operate during and after the discovery of gold. California forts appear to have functioned like their counterparts elsewhere in the country, civilians being hired to perform various tasks. The occupations of civilians at California forts were also similar to those at forts elsewhere in the country (e.g., laborer, teamster, artisan, clerk).

Table 6.1 shows the distribution of wage observations in the sample of California forts, by occupation, fort location, and time period. The sample covers the period 1847–60 and, as in chapter 3, is restricted to common laborers (including teamsters), skilled artisans, and white-collar workers. Approximately 45 percent of the wage observations for common laborers and artisans pertain to forts located in modern-day northern or central California (i.e., in direct proximity to the gold), the remainder to forts in southern California or scattered field locations. About 90 percent of the observations pertain to common laborers–teamsters or to artisans. Overall, there are 5,753 wage observations.

Chapter 2 demonstrated that quartermasters appear to have paid the going wage in the local labor market. Can the same be said for forts in

Table 6.1 Distribution of Wage Observations: California Forts, 1847–60

	Unskilled	Artisan	White Collar
By year:			
1847–50	.202	.109	.103
1851–55	.649	.613	.654
1856–60	.149	.278	.243
By occupation:			
Laborer	.409		
Teamster	.591		
Mason		.134	
Painter		.021	
Blacksmith		.240	
Carpenter		.605	
By location in California:			
San Francisco	.167	.197	.496
Northern	.067	.131	.096
Central	.176	.121	.132
Southern	.568	.542	.269
"Field"	.022	.004	.007
Number of observations	3,879	1,261	613

Source: Sample of California forts from *Reports of Persons and Articles Hired,* Record Group 92, National Archives (see the text).

California? Unfortunately, the paucity of wage data for the state makes comparisons difficult. However, it is clear from inspection of the original data that the wages paid at California forts were far in excess of those paid elsewhere in the United States—and, as will be demonstrated shortly, the army data imply that wages rose very sharply in the aftermath of the discovery of gold.[23]

6.3.1 Hedonic Wage Regressions

Like the sample analyzed in chapter 3, the California sample is not large enough to construct occupation-specific wage series for each fort. Few forts hired the same type of labor every year, and the numbers of observations across forts varies over time. As pointed out in chapter 3, analysis of the data that ignored such composition effects would be misleading. Thus, following chapter 3, I estimate hedonic wage regressions of the form

$$\ln w = X\beta + \varepsilon,$$

where ln w is the log of the nominal daily wage, X is a vector of independent variables, the β's are the hedonic coefficients, and ε is the error term. Monthly wages are converted to daily wages by dividing by twenty-six days per month. As in chapter 3, the independent variables are dummy variables for fort location, characteristics of the worker or job associated with especially high or low wages, whether the worker was hired on a monthly basis, season of year, and time period. Separate regressions are estimated for the three occupation groups (common laborers–teamsters, artisans, and white-collar workers). The regressions are reported in appendix table 6C.1.

The cross-sectional patterns revealed by the regression coefficients are informative about the antebellum labor market in California. Seasonal variation in wages, for example, is broadly consistent with what is known about seasonal fluctuations in labor demand. Summer was the slack season in gold production, and miners flocked to San Francisco to find alternative employment (Lotchin 1974, 49), while "every spring [the miners] drifted back to the diffings, leaving a shortage of labor" (Coman 1912, 2:316). The seasonal lull in gold production may explain why the wages of common laborers were relatively low in the summer. Artisanal wages were temporarily higher during the summer, a prime season for construction activity. Rapid growth in population placed enormous strains on the construction sector, which needed to bid skilled labor away from the mines (Lotchin 1974, 50). This may also explain why carpenters were highly paid in California relative to other artisans, at least compared with elsewhere in the United States (see chap. 3 above; and Coman 1912, 2:317). The choice to enter the white-collar market was not a seasonal one, and, therefore, it is not surprising to find an absence of seasonality in clerical wages.

Despite generally high labor demand during the period, there is still evidence of a premium for unemployment risk, as artisans hired on a monthly basis generally earned a lower average daily wage than those hired daily. There is no evidence of a daily wage premium for clerks—indeed, the positive coefficient of the "monthly" dummy suggests that the few clerks hired on a daily basis were of a lower level of skill than indicated by their occupation designation in the payrolls.

Regional patterns in money wages in California bear resemblance to those occurring elsewhere. Skill differentials were generally lower in northern California than in southern California. However, the negative effect of a southern California location may also be proxying for unobserved ethnic or racial (Native American) background. Hispanics, who were concentrated in southern California, earned much less than other workers, and Hispanic status may very well be underreported in the data.[24]

6.3.2 Time-Series Patterns

As in chapter 3, I use the hedonic coefficients to estimate annual series of nominal daily wages for the three occupation categories. The procedure used to calculate the series is discussed in appendix 6A. In brief, the procedure is similar to that used in chapter 3 in that the wage series are derived from hedonic indices applied to benchmark wage estimates. However, additional adjustments were deemed necessary to produce estimates for the initial rush years of 1847–49 (for further details, see app. 6A). The nominal wage estimates are shown in appendix table 6C.2.

Consistent with the theoretical model, nominal wages rose sharply for all three groups from 1847 to 1850 (or 1851 in the case of artisans). Wages then declined sharply for all three occupation groups, fluctuating for the remainder of the 1850s.

The annual movements are broadly consistent with qualitative accounts of the rush. Scattered estimates of wages in newspaper articles suggest that wages rose after the gold discoveries and remained roughly stable until 1853 (Lotchin 1974, 86; Gerber 1997). My series clearly capture the steep initial rise and subsequent decline.[25] A business-cycle downturn is known to have occurred in 1855 following a local banking panic, and this, too, apparently left its imprint in wage levels (Coman 1912, 2:285–87; Lotchin 1974, 51, 59).

To convert the nominal wage series into real wage indices, it is necessary to deflate by a price index, as in chapter 3. Data to construct a price deflator for antebellum California are extremely scanty, but it is possible to use Berry's (1984) compilation of prices from newspapers to construct a rough price deflator.[26]

The price deflator is given in appendix table 6C.3. Although there are severe fluctuations at annual frequencies, the general pattern is of a rise in prices during the early years of the rush, followed by an abrupt (and apparently persistent) decline. The short-run increase in prices is consistent with anecdotal evidence of goods shortages during the initial phase of the rush, while the subsequent decline in prices presumably reflects the dramatic growth of the commercial sector in and around San Francisco (Caughey 1948; Lotchin 1974).[27]

The real wage series, formed by dividing the nominal wage estimates (indexed at 100 in 1860) by the price deflator, are shown in appendix table 6C.3. The series should be viewed with caution for three reasons. The price data refer solely to wholesale prices, and no provision is made for housing prices. It is entirely possible that including housing prices would dampen the short- and long-run increases in real wages evident in the indices. The range of goods included in the price deflator is limited, even compared with the price deflators used in chapter 3. Berry's price data refer exclusively to non–southern California locations.[28] However, it can be shown that the substantive findings are similar if the wage sample is restricted to non–southern California forts.

Despite these problems, the real wage indices essentially mimic the patterns evinced in the nominal wage series. Real wages of common laborers increased by approximately 615 percent from late 1847 and early 1848 to their peak in 1849. Because of the timing of the observations, the overall rate of increase over the same period cannot be determined for artisans and clerks, but it is clear that their real wages also grew rapidly. For example, the real wages of artisans rose by nearly 259 percent from the spring of 1848 (March–May 1848) to 1849; those of clerks rose by 189 percent over the same period.

Following the very steep rise, real wages fell, except for a spike in 1851 caused by a sudden drop in prices that was reversed in 1852. The real wages of common laborers fell sharply in 1855 but recovered by the end of the decade to the level reached in 1852 and 1853. Similarly, the real wages of artisans and clerks in the remainder of the 1850s hovered close to the 1860 index value of 100.

The real wage series suggest several findings. Real (and, for that matter, nominal) wages were clearly flexible during the Gold Rush; accepting the indices at face value, there can be no question that the discovery of gold markedly affected wages.

However, what is *not* consistent with the model is the finding for all three occupations that real wages were far higher in 1860 than in 1847. The Gold Rush was a transitory shock, yet the rush appears to have left wages permanently higher in California.

Implicit in the model was an assumption that real wages in the settled economy were constant over the period of the Gold Rush. The real wage indices in chapter 3 indicate that, elsewhere in the United States, real wages were higher in 1860 than in 1847. Thus, real wages could have trended upward in California simply because they were trending upward elsewhere.

However, while rates of growth of real wages elsewhere were positive over the period 1847–60, they were far lower than in California.[29] In addition, wage data from the 1860 Census of Social Statistics suggest that real wages in California on the eve of the Civil War were similar to average levels elsewhere in the country.[30] If so, the clear implication is that real wages in California just before the rush were well below real wages elsewhere in the United States.

That real wages in California circa 1847 may have been low by Northern standards is less paradoxical than it seems. To the extent that pre–Gold Rush California was part of any regional economy at all, it was part of the Mexican economy, the economy of coastal points north, and, to a much lesser extent, that of Central and South America (Wright 1940, 323).[31] As pointed out in section 6.1, initial in-migrants came from these locations, and, for them, the returns to migration, on average, were surely positive. By the time labor flows had begun to arrive from the Eastern and Midwestern United States (1849), real wages in California substantially exceeded those elsewhere in the United States.[32]

But the Gold Rush could not have left a permanent imprint on real wages unless there had been a substantial inflow of factors complementary to labor *and* continued incentive to invest capital. The Yukon Gold Rush of the late 1890s did not transform southern Alaska into the equivalent of California. What became clear to the migrants (and to many miners who struck gold early in the rush) was that California was rich in many ways, specifically in agricultural resources. As noted in section 6.1, California bypassed territorial status, and statehood presumably reduced the risk of permanent settlement. The rapid, sustained growth of San Francisco is prima facie evidence of agglomeration effects and a widening of the market for locally produced agricultural (and manufacturing) goods (Coman 1912, 2:291–314; Caughey 1948; Lotchin 1974).

Evidence of an inflow of complementary factors is both indirect and direct. Indirect evidence of an inflow of complementary factors can be gleaned from Berry (1984), who, in addition to wholesale prices, collected a series of monthly interest rates in San Francisco. The wage-rental ratio in 1850 was less than half its value in 1860, suggesting extreme initial scarcity of capital (Coman 1912, 2:307). Translating the trend in the ratio during the 1850s into equivalent movements along a factor price frontier, the implication is that the capital-labor ratio must have been rising.

While the extraordinarily high relative price of capital that prevailed in San Francisco in the early 1850s may have been partly due to unusually high risk, direct evidence of capital accumulation can be found in the city's (and state's) active participation in issuing bonds in the New York and London financial markets (Lotchin 1974, 60–61, 77). Additional direct evidence comes from the 1850 and 1860 censuses. In 1850, per capita investment in manufacturing capital was negligible but, by 1860, had grown in real terms over the decade by 1,204 percent. Investments in land clearing and complementary factors raised wheat output per acre by 463 percent over the decade.[33] Capital inflows sustained the transitory wage effects of the Gold Rush, initializing the long process by which California became an integral part of the American economy.

6.4 The Elasticity of Labor Supply into Gold Rush California

In this section, I present estimates of the elasticity of labor supply into Gold Rush California. I compare my elasticity estimates to Carrington's (1996) estimates for labor supply into Alaska during the building of the Alaska Pipeline in the mid-1970s.

The elasticity of labor supply is

$$\varepsilon_{Lw} = d(\ln L)/d(\ln w),$$

where d indicates the difference operator. I identify $d(\ln L)$ with estimates of the logarithm of the change in the ratio of the number of adult men between the ages of fifteen and forty in California relative to the aggregate population in this age (and sex) group. For the purposes of the calculation, I use the real wage series for common labor in California, expressed relative to the national aggregate series for common labor constructed in chapter 5. The calculation of the elasticity estimates is described in appendix 6B, and the estimates are shown in table 6.2.

The estimates suggest that, in the immediate short run of the discovery of gold, labor supply into California was highly inelastic ($\varepsilon = 0.24$). However, as labor made its way to the state, supply became much more elastic. By the early 1850s, the supply elasticity fell between 1.7 and 2.6, where it remained on the eve of the Civil War.[34]

Measured against the experience of the Alaska Pipeline, labor supply into Gold Rush California was considerably less elastic. For various reasons,

Table 6.2 The Elasticity of Labor Supply

	Elasticity		Elasticity
Gold Rush California:		Gold Rush California:	
From 1847–February 1848 to:		From 1847–February 1848 to:	
March 1848–December		1850–52 average	2.03
1848	.24	1860	2.24
1849	1.01	Alaska Pipeline (March	
1850	1.65	1973–June 1976):	
1851	1.75	Construction, hourly earnings	
1852	2.61	versus employment	5.88

Source: California, see app. 6B. Alaska Pipeline, computed from Carrington (1996, 196, 206, 208).

Note: Elasticity = $\Delta \ln L / \Delta \ln w$; Δ = change between successive dates.

direct comparisons between the Gold Rush and the Pipeline labor supply are difficult to make, but, on the assumption that daily hours were not the primary intensive margin during the rush, the relevant comparison is Carrington's (1996) estimate for Pipeline construction workers, as computed from changes in total employment and hourly wages, $\varepsilon_{Lw} = 5.88$ (see table 6.2).[35] In the case of the Pipeline, the period covered is March 1973–June 1976, or three and a half years. By this standard, labor supply into Alaska during the Pipeline era was roughly three times as elastic as labor supply into California during the Gold Rush.

That labor was more elastically supplied during the Pipeline era is not too difficult to rationalize. The Alaska Pipeline was a project of known duration, in which the shock to local labor demand was fully anticipated and the returns to migration were essentially known ex ante. By contrast, the discovery of gold was unanticipated, the duration of the Gold Rush was unknown ex ante, and the returns to migration were highly uncertain.[36] More fundamentally, vast improvements in internal transportation and in access to economic information across regions in the 125 years between the Gold Rush and the Pipeline era dramatically reduced migration costs for the prospective worker on the Alaska Pipeline, compared with the costs faced by the prospective argonaut.[37]

6.5 Conclusion

This chapter has examined how the antebellum economy coped with a very large, highly localized shock to the demand for labor—the California Gold Rush. A simple model of wage determination, in which real wages rose sharply during the initial stages of the rush and subsequently declined, fit the data reasonably well. However, the rush was far more than a transitory phenomenon for it left California wage levels permanently higher. Americans became convinced that the Golden State held riches far beyond the nuggets found at Sutter's Mill. Capital poured into California, sustaining wages after the rush ended. Newly minted as a state, California left behind its Hispanic economic heritage to become part of the high-wage American economy.

Appendix 6A

Construction of Nominal Wage Estimates

Estimates for 1847–60

This appendix describes the construction of the nominal wage estimates for California from 1847 to 1860.

Common Laborers

The 1860 estimate ($2.62) is the value reported for California in the 1860 Census of Social Statistics. I use 1860 rather than 1850 as the benchmark date (recall that 1850 was used as the benchmark in chap. 3) because the incompleteness of the 1850 manuscripts for California suggests that 1860 would be preferable.[38] For 1847 and 1849–60 annually, I use the coefficients to generate a nominal wage index (1860 = 100) in the same manner as in chapter 3. The nominal wage estimates for each year are $[I(t)/100] \times \$2.62$, where $I(t)$ is the index number for year t.

Artisans

I benchmark the daily wage of carpenters at the 1860 census estimate ($4.43), which is then adjusted to reflect the distribution of masons, painters, and blacksmiths in the state. The adjustment multiplies the coefficients of the dummy variables for these occupations from the hedonic regressions by an assumed set of weights (masons, 0.056; blacksmiths, 0.371; painters, 0.102; the occupation weights are based on averages of counts reported in the 1850 and 1860 censuses). The adjustment in log terms to the 1860 benchmark for carpenters is −0.081, which produces an adjusted benchmark wage of $4.08. For 1848 and 1849–60, the procedure to compute the artisanal series is the same as that for common laborers (see above).

White-Collar Workers

It is not possible to benchmark the wage series for white-collar workers. To derive an 1860 benchmark for white-collar workers, I follow the same procedure as in chapter 3 by multiplying the regression coefficients by an assumed set of weights. The seasonal weights are 0.25 each for fall, winter, and spring; and the high-low dummies are set equal to zero. Because the vast majority of white-collar workers were hired on a monthly basis, I set the monthly dummy = 1. The fort location weights are as follows: San Francisco, 0.215; southern California, 0.058; central California, 0.639; and field, 0.

The fort weights are averages of population counts in the 1852 state census (DeBow 1853) and 1860 federal census (Kennedy 1864). For the purpose of calculating the fort weights, it was necessary to allocate county populations to the forts. The allocation of counties is as follows: San Francisco: San Francisco, Marin, San Mateo, Alameda, Sulano, Napa, and Sonoma; southern California: San Luis Obispo, San Bernardino, Santa Barbara, Los Angeles, and San Diego; and northern California: Del Norte, Siskiyou, Humboldt, Trinity, Shasta, Mendocino, Colusi, Butte, and Plumas. All other counties are allocated to central California.

To construct the estimates for white-collar labor, multiply each regression coefficient by its relevant weight, sum, and add the coefficient of the appropriate year dummy; call the result β. The nominal wage estimate, therefore, is $w = \exp(\beta)$. Also, as in chapter 3, I linearly interpolate when the year dummies refer to two or more years grouped together.

Adjustment of 1847–48 Estimates

I divide this period into three subperiods: 1847–February 1848; March–May 1848; and June–December 1848.

Common Laborers

The 1847 estimate for common laborers described above is assigned to 1847–February 1848. For 1848, I use a direct observation on a common laborer hired at the San Francisco fort, who experienced a 400 percent increase in his nominal wage between early 1848 and fall 1848; applying this ratio to the 1847 estimate yields a daily wage of $4.00, which I assign to the June–December 1848 group.

Artisans

The 1848 estimate is assigned to the period March–May 1848 on the basis of the dating of the payrolls.

White-Collar Workers

The 1848 estimate computed from the coefficients of the 1848 year dummy, in the manner described above, is $113.62. However, on the basis of direct inspection of the payrolls, it is clear that this estimate overstates white-collar wages during the first half of 1848 and understates them during the second half. To compute new estimates, I used, as in the case of common laborers above, wage data for specific workers employed in San Francisco. These yielded monthly wage estimates, respectively, of $83.33 for the period up to May 1848 and $125.00 for the period June–December 1848.

Appendix 6B

Construction of Labor Supply Elasticities

This appendix describes the construction of the labor supply elasticities reported in table 6.2. As noted in the text, I identify $\Delta(\ln w)$ with the change in the real wage of common labor in California relative to the national average real wage of common labor, from chapter 5. I identify $\Delta(\ln L)$ from estimates of the number of adult men between the ages of fifteen and forty in California relative to the nation as a whole. I first estimate total population in the state in various time periods, then multiply the total population by assumed ratios of adult men to population.

For the first time period (1847–February 1848), I assume that the population equaled 15,000, which is Wright's (1940, 323) estimate. I also assume that the population totals in 1850 and 1860 were as given by the federal census (93,000 and 380,000, respectively) and that the population in 1852 was as given by the state census of 1852 (264,000). For the intervening years, I interpolate on the basis of Wright's (1940, 341–42) estimates of arrivals overland and by ship at San Francisco.[39] The assumed ratios of adult men aged fifteen to forty to total population are 0.77 for 1847–52 and 0.49 for 1860. Estimates of national population are linearly interpolated from aggregate census figures; I assume that the ratio of adult men aged fifteen to forty in the nation was 0.213, the value prevailing in both 1850 and 1860.

The estimates of $\Delta(\ln w)$ and $\Delta(\ln L)$ are, respectively, as follows: from 1847–February 1848 to March–December 1848, 1.123 and 0.264; to 1849, 1.506 and 1.524; to 1850, 1.060 and 1.747; to 1851, 1.380 and 2.413; to 1852, 1.043 and 2.719; to 1850–52 average, 1.173 and 2.383; and to 1860, 1.070 and 2.393. Caution should be exercised in interpreting the elasticity estimates because of various biases inherent in the estimation procedure.[40]

Appendix 6C

Table 6C.1 Hedonic Wage Regressions: California Forts, 1847–60

	Common Laborer–Teamster	Artisan	White-Collar Worker
Variable	β	β	β
Constant	.864	1.564	1.017
	(8.165)	(12.545)	(3.993)
Monthly	−.028	−.299	.446
	(.831)	(11.942)	(2.648)
High	N.A.	.294	0.305
		(5.287)	(5.088)
Low	−.707	−.722	−.418
	(9.556)	(7.484)	(4.437)
Mexican	−.837	N.A.	N.A.
	(8.491)		
Spring	.095	−.064	−.005
	(2.733)	(1.345)	(.047)
Summer	−.311	.080	.036
	(7.572)	(1.525)	(.337)
Fall	−.019	.031	−.047
	(.549)	(.725)	(.480)

(continued)

Table 6C.1 (continued)

	Common Laborer–Teamster	Artisan	White-Collar Worker
Teamster	.111		
	(6.560)		
Mason		−.047	
		(1.480)	
Painter		−.214	
		(3.309)	
Blacksmith		−.159	
		(6.352)	
San Francisco	.078	.062	.138
	(2.065)	(1.461)	(2.102)
Central California	.076	.155	.084
	(1.894)	(3.319)	(1.004)
Southern California	−.240	.148	−.065
	(7.186)	(3.898)	(.919)
"Field"	−.031	−.449	−.086
	(.478)	(3.103)	(.355)
1847	−.980		
	(6.748)		
1847–48			−.512
			(2.410)
1848	−.583	−.160	
	(4.995)	(1.078)	
1849	1.007	1.080	.552
	(9.891)	(5.300)	(1.686)
1850	.472	.454	.473
	(5.016)	(3.736)	(2.416)
1851	.284	.415	.357
	(3.018)	(3.332)	(1.667)
1852	.238	.216	.169
	(2.513)	(1.725)	(.897)
1853	.134	.201	.131
	(1.433)	(1.646)	(.710)
1854	−.010	.174	.084
	(.110)	(1.453)	(.460)
1855	−.088	.142	.122
	(.943)	(1.200)	(.671)
1856	−.120	.156	.143
	(1.267)	(1.303)	(.783)
1857	−.018	−.037	.175
	(.178)	(.274)	(.831)
1858	−.030	−.088	N.A.
	(.275)	(.665)	
1858–59			.163
			(.782)
1859	−.101	−.061	N.A.
	(.802)	(.412)	
R^2	.605	.488	.450

Source: See table 6.1.

Note: Left-out seasonal dummy is winter. Left-out location dummy is northern California. Left-out occupation dummies are laborers (common laborers–teamsters), carpenters (artisans). Left-out year dummy is 1860. N.A. = not applicable.

Table 6C.2 Nominal Wage Estimates: California, 1847–60 ($)

	Common Laborer	Artisan	White-Collar Worker
1847–February 1848	1.00	N.A.	N.A.
March 1848–May 1848	N.A.	3.83	83.33
June 1848–December 1848	4.00	N.A.	125.00
1849	7.17	12.01	210.33
1850	4.20	6.42	194.35
1851	3.48	6.18	173.07
1852	3.32	5.06	143.41
1853	3.00	4.99	138.11
1854	2.59	4.85	131.68
1855	2.40	4.70	136.79
1856	2.32	4.77	139.65
1857	2.57	3.93	143.24
1858	2.54	3.74	143.10
1859	2.37	3.83	135.01
1860	2.62	4.08	121.11

Source: See the text and app. 6A. N.A. = not applicable.

Table 6C.3 Price Deflator and Real Wage Indices (1860 = 100)

	Prices	Common Laborer	Artisan	White-Collar Worker
1847	142.6			
1847–February 1848		26.8	N.A.	N.A.
March 1848–May 1848		N.A.	68.3	55.3
June 1848–December 1848		122.3	N.A.	82.9
1848	124.8			
1849	166.1	164.8	177.2	104.6
1850	166.5	96.3	94.5	96.4
1851	99.6	133.4	152.1	143.5
1852	130.8	96.9	94.8	90.5
1853	107.4	106.6	113.9	106.2
1854	100.6	98.3	118.1	108.1
1855	117.2	78.2	98.3	96.4
1856	105.9	83.6	110.4	108.9
1857	108.4	90.5	88.9	109.1
1858	113.6	85.3	80.6	104.0
1859	104.2	86.8	90.1	107.0
1860	100.0	100.0	100.0	100.0

Note: N.A. = not applicable.