Turnover or Cash?
Sharecropping in the US South.*

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Abstract

Sector-level reasons dominate the share contracts' literature - arrangements where labor is paid with a share of the output. Conversely, this paper inquires whether economy-wide conditions predominantly explain the use of those contracts. Sharecropping, a share contract in farming, was extensively used in the US South between 1880 and 1940. Labor turnover during the farming season was a central, sector-level reason behind that phenomenon. However, employees benefiting less from sharecropping could have opted out at the beginning of the season. Identification comprises the fact that more post offices implied more knowledge of economic opportunities in an industrializing US, raising both labor turnover during the season and the outside option at the beginning of the season. The evidence overwhelmingly points for low outside options as the dominant driver of sharecropping contracts. Evidence also links share contracts to endowment inequality: as land lost importance, employees ceased to accept sharecropping contracts. These conclusions enlighten recent trends in share contracts and entrepreneurship worldwide.

Keywords: Share Contracts; Turnover; Jobs; Inequality.
JEL classification: J41; J43; N30; N50.

1 Introduction

Share contracts - a contract where an employer pays an employee with a share of the output - are abundant. A vast literature studies reasons for a particular sector or firm to use such contracts. This paper goes in a different direction, and inquires whether economy-wide conditions explain the extent of share contracts used within one sector. More specifically, this paper takes the case of sharecropping contracts - farm contracts where the employer pays the employee a share of the crop for his labor input - in the US South after the American Civil War (1861-65), and finds that the well-documented expansion of sharecropping contracts was predominantly the result of a lack of job alternatives outside of the farming sector. This conclusion sheds light on possible explanations for the expansion of franchising, the persistence of sharecropping contracts as well as that of high entrepreneurial activity in developing countries.

Unsurprisingly, the economics literature devotes a lot of attention to share contracts. First, they are ubiquitous (Allen and Lueck, 1993; Burke, 2015; Dana and Spier, 2001): taxi and Über drivers work in piece-rate contracts; CEO's have their remuneration attached to several performance indicators; franchising contracts are paramount in modern economy (Dana and Spier, 2001), counting as much as 10% of Canada's GDP, and employing 11 million US workers (Pruett and Winter, 2011). Second, share contracts are the solution in principal-agent with different sources (Ackerberg and Botticini, 2002), such as risk-sharing (Cheung, 1969; Townsend and Mueller, 1998), screening (Hallagan, 1978; Ackerberg and Botticini, 2002), labor turnover (Lazear, 1996) or other transaction costs (Allen and Lueck 1992, 1993; Dana and Spier, 2001).

Sharecropping played a central role in the economy of the US South after the American Civil War, also known as the Postbellum South. Farms run with sharecropping contracts increased dramatically, from 24% to 37% of the total number of farms between 1880 and 1940, peaking at 48% in 1930. Social sciences have explained several reasons for that phenomenon, most of them also discussed in the economics literature on share contracts. Among those, costs associated to labor turnover recurrently emerge as the protagonists. Briefly, the distribution of labor needs for the production of any crop was extremely inflexible within each season. For instance, cotton, the central cash crop in the Postbellum South, had to be harvested between the months of September and December. Moreover, crops were subject to climatic shocks. In the case of cotton, precipitation during the harvesting period might have decreased the yield, depending on how fast an employer could mobilize employees. In the employer's perspective, sharecropping outperformed the use of wage labor by not only postponing a big chunk of the cash payment to the end of the season, but also making that payment dependent on a steady labor supply by the employee along the season. Thus, a sharecropper had more incentives than a wage laborer to complete the whole season, exe-

cuting all the tasks on the correct timing. In other words, sharecropping minimized labor turnover costs during the season for the employers.

Employees accepted the postponement of their income and the increased exposition to risk in sharecropping contracts because employers gave them rations, access to consumption credit, schooling, health care, and public safety. Moreover, employers did not micromanage sharecroppers, giving the latter the chance to manage their farms with a large degree of autonomy. In fact, many authors say that these non-pecuniary perks associated to sharecropping resulted from the fact that employers could not give away enough cash to wage laborers along the season to stabilize the labor supply and, consequently, to avoid labor turnover.

However, those contracts had an asymmetric impact. For instance, employees without a family had more difficulty to run a farm alone, and did not benefit so much from the provision of educational services. Therefore, sharecropping was an effective instrument to reduce turnover across the season as long as many employees on the margin did not have better options outside of the farming sector before the season started. Indeed, the Postbellum South had a separate labor market from the rest of the US, and "at the turn of the twentieth century, real income per worker in the South was less than half that in the rest of the United States" (Collins and Wanamaker, 2015). Gordon (2016) goes further and states that employees in Southern farms often lived in complete oblivion relative to the changes occurring across the country. If they were aware of the options outside of the farming sector, fewer employees would choose sharecropping contracts in the beginning of season.

Therefore, employers wanted to use more sharecropping contracts if labor turnover costs during the season were higher. If there were more outside options to farm jobs, less employees wanted to take sharecropping contracts in the beginning of the season. To know which effect dominated, this paper uses a variable affecting both labor turnover costs and job opportunities: the number of post offices in a county. US Post Offices were ubiquitous, and they distributed letters and newspapers. More post offices meant that employees would receive more easily news from potential jobs elsewhere. During the season, this increased information flow would expose employers to more labor turnover, as wage laborers were more likely to switch jobs. At the beginning of the season, employees would be aware of more job opportunities, decreasing the number of employees taking sharecropping contracts. To be sure, USPS (2007) and Acemoglu, Moscona, and Robinson (2016) provide evidence that post offices were harbingers of economic development. Therefore, their effect more likely stemmed from enhanced communication than coincidental economic development.

Figures 1 and 2 show a negative relation between the number of sharecropping farms over the total number of farms (herein, proportion of sharecropping) and post office density. In fact, there is a statistical significant, negative correlation between the proportion of share-

cropping and post office density of 0.23. This fact points for the lack of job alternatives as the key driver behind the use of sharecropping contracts. The regression in table 2 controls for population density and access to transportation to avoid endogeneity issues. The result confirms the picture brought by figures 1 and 2: one-standard-deviation increase of post office density decreases the proportion of sharecropping in 1.4 percentage points.

To distinguish the channels through which post office density affects the proportion of sharecropping, a difference-in-differences analysis with two treatments is run. The first treatment, named *Rain*, stands for the top 50% counties with most erratic rainfall during cotton harvesting. The more unpredictable rainfall is, the more sensitive an employer is to labor turnover. Therefore, employers want to use sharecropping contracts in counties with the most erratic rainfall, as suggested by figures 1 and 3. Similarly, a second treatment, named *Coal*, stands for whether a county sits on a coal deposit. Cameron (1993) mentions the established positive relation between industrial development and the location of coal mines during the Industrial Revolution. Therefore, employees should take sharecropping contracts less often in areas with more industrial jobs. This last pattern seems to be reflected on figures 1 and 4. The regressions depicted in table 4 show exactly that: not only more post offices are associated with a smaller proportion of sharecropping, but also their interactions with *Rain* and *Coal* have the predicted signs.

In conclusion, this paper uses a historical case where previous literature has identified a key sector-level reason for the use of share contracts. This fact eases comparisons *vis-à-vis* an economy-wide factor. Overall, it finds a decrease in the use of a share contract as the key, unequally-distributed input of the sector, land, loses relative weight in the realm of income-generating activities for labor. This conclusion gives a possible force behind the rise of franchising contracts (Pruett and Winter, 2011) or the persistent use of sharecropping contracts in developing economies (Townsend and Mueller, 1998): the lack of economic diversity in income generation takes employees with low managerial skills to take these sort of contracts. Furthermore, share contracts provide a path towards entrepreneurship (Pruett and Winter, 2011). Thus, the same explanation might shed some light on the following puzzle: there is a negative relation between GDP per capita and entrepreneurial activity. In the sample of countries introduced in table 8, all top 5 countries in entrepreneurial activity have significantly lower GDP per capita than the bottom 5. Although that argument cannot be easily applied to Suriname or Russia, Hong Kong, Japan and Italy clearly are diverse economies, each with a rich history of successful, world-class entrepreneurs. This is hardly the case of any of the top 5 entrepreneurial countries.

The paper proceeds as follows: section 2 presents the historical summary; section 3 frames the discussion into a theoretical model; section 4 sets an empirical strategy, and discusses the results from the regressions; section 5 summarizes the main conclusions of this paper

and sets a future research agenda.

2 Historical Summary

Sharecropping contracts were a key feature of the US South economy after the American Civil War (1861-65) and the abolition of slavery[1]. Sharecropping contracts had already existed before 1861 (Shlomowitz, 1984; Wright, 1986). However, their use exploded in the 1870s after the massive damage caused by the war and the end of slavery. These two shocks left employers and employees vulnerable to a fluid labor market in agriculture. Employers struggled to stabilize their labor force, that is, they wanted to avoid labor turnover during the season. Employees desired a decent living in a backward region of the industrializing US economy.

This section ends with a discussion about post offices, the identification variable of the empirical study developed at section 4. Essentially, the mail system in the US was already an established harbinger of economic development before the American Civil War. The Post Office Department, one of the first branches of the US federal government, had a public service mission, implying that new post offices and mail routes preceded the development of the local economy. Mail brought an essential service: communication with the rest of the country.

2.1 Employers and Turnover

The abolition of slavery caused the American Civil War, which opposed the United States of America, usually named "Union" or "North", and the Confederate States of America, normally referred as "Confederacy" or "South"[2]. Essentially, the South wanted to keep its slaves, which made up half of its wealth in 1860 (Wright 2006, p. 60). Since the election of Abraham Lincoln in 1860 threatened that goal, the South declared independence. The North reacted and won a bloody, destructive conflict, preserving the territorial integrity of the US: 2.4% of the 1860 population died in the conflict; more American soldiers died in this war than in all other conflicts involving American troops combined; the war left the South in tatters and economically destroyed.

The federal government enforced abolition throughout the Reconstruction Era (1863-77). This historical period had three distinct stages: Wartime (1863-65); Presidential (1865-66); Radical (1866-77). "Wartime" consisted of the conquest of the secessionist states, liberating

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[1]Literature used for this section: Donald and Randall (1961), Foner (1988), Keller (1977), McPherson (2013), and Roback (1984).

[2]The South was composed by the states of Alabama, Arkansas, Florida, Georgia, Mississippi, Louisiana, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

slaves in each of them. "Presidential" began with the rise of president Johnson in 1865, and promoted a quick reintegration of the South back into the US without interfering in their internal affairs. Southern states seized the chance to control the labor supplied by the former slaves, the freedmen, through a series of laws known as Black Codes[3]. However, Radical Republicans took over the US Congress in 1866, and began an interventionist agenda to guarantee the creation of a free labor economy in the South. This policy included military occupation, suspension of the Black Codes, and promotion of wage employment among freedmen through the Freedmen's Bureau. Lack of popularity, a financial crisis, and a stalemate in the presidential election of 1876 precipitated the end of the Radical Reconstruction period[4]. In conclusion, the war and abolition were essentially two external forces to the farming sector of the US South.

Therefore, employers sought a substitute for slavery in their farms between 1866-1877 (Ransom and Sutch, 1977). Labor turnover was the most pressing problem created by abolition. Put simply, labor turnover hurt agriculture because crops had strict calendars (Hanes, 1996; Wright, 1986). There were also plenty of unexpected shocks, such as sudden precipitation that might have destroyed a whole harvest in a few days. Since this was common knowledge, employers also faced the threat of labor contract renegotiation (Hanes, 1996; Roback, 1984; Shlomowitz 1979, 1984). Finally, these problems affected every Southern cash crop (Shlomowitz, 1979; Wright, 1986)[5]. Cotton had two labor peaks during the crop year: planting and harvesting (Roback, 1984; Wright 2006, p. 86). Cane Sugar had at least one labor peak and "sugarcane, once harvested, cannot be stored because of sucrose decomposition" Britannica (2015). Therefore, "the time between cutting and processing" had to be minimized (Britannica, 2015). Tobacco had at least three labor peaks: seeds preparation; transplanting, and harvesting. "The prime requisite for successful tobacco culture is a supply of well-developed healthy seedlings that is available at the proper time for transplanting" (Britannica, 2015). Before harvesting tobacco "may be left in the field from a few hours to two days to wilt" (Britannica, 2015). Still, cotton was the most widespread and produced cash crop. Ironically, it required twice as much labor as any other cash or food crop (Alston, 1981). Not surprisingly, employers tended to poach labor from each other during the critical cotton-picking season (Higgs 1977, p. 45).

After extensive experimentation, employers opted for sharecropping (Ransom and Sutch,

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[3]There were already laws of this nature before the war but by "the mid-nineteenth century criminal prosecutions for enticing a servant had become virtually nonexistent, and civil cases were rare" (Roback, 1984).

[4]"The states and the years of military withdrawal are Alabama (1874), Arkansas (1874), Florida (1876), Georgia (1874), Louisiana (1876), Mississippi (1874), North Carolina (1874), South Carolina (1876), Tennessee (1874), Texas (1874), and Virginia (1874)" (Naidu, 2010).

[5]The reader might ask about the production of rice. According to the literature reviewed, it was largely wiped out after the abolition. Further, it was circumscribed to few small regions.

1977; Shlomowitz, 1984)[6]. Employers began by postponing the payment of wages to the end of the season to stabilize the workforce (Alston, 1981;; Roback, 1984; Shlomowitz, 1979). But employers soon noticed that employees had to finance their consumption during the season, and they desired autonomy in the management of their working schedule (Roback, 1984; Shlomowitz, 1979; Wright, 1978). Further, employers struggled to pay enough cash during the season to compensate the lack of autonomy in wage labor (Shlomowitz, 1979), and they had high supervision costs to enforce effort among employees (Alston, 1981; Higgs 1977, p. 45). Sharecropping offered a satisfactory solution. It was a share contract where labor earned a share of the final output in the end of the season. The employer usually sold the crop and deducted whatever advances in consumption goods he gave in the beginning and during the season to the employee. "Since the worker had a stake in the crop on that particular farm, he was not likely to abandon his job" (Roback, 1984). Meanwhile, the employee had more freedom to manage his own farm.

Collusion in labor contracting failed during the Reconstruction Era (Higgs, 1977), especially in the cotton sector: employers were too many and too heterogeneous, while employees could easily move to explore deviations (Collins and Wanamaker, 2015; Higgs, 1977; Ransom and Sutch, 1977; Wright, 1986; Shlomowitz, 1984). "There was indeed a labor market in the South between 1870 and 1930, and it operated to reduce wage differentials and some form of wage discrimination" [Wright 1986, p. 12] and "intercounty mobility rates were high" [Wright, 1986, p. 65].

Those not acquainted with this historical period might find odd equating wage labor with forms of tenancy. In fact, Wright (1986, p. 70) states that "sharecroppers, renters and small farmers were not wage laborers; they were not involved, directly at least, in the market we have been describing." However, Shlomowitz (1984) establishes a relation between wage levels and the capability of employers to pay a premium for the lack of autonomy compared to sharecropping or tenancy can offer. In the end, the choice between "wage labor, sharecropping, and rental...depended on relative wage levels and rental rates" [Wright 1986, p. 90]. "After all ... sharecroppers are legally wage workers paid with a share of the crop" (Alston and Ferrie 1993).

A final point relates to the form of the different labor contracts. The main parameters were standardized before 1880 (Ransom and Sutch, 1977). The division of the output depended on the quality of the land and in the amount of inputs supplied by each party[7].

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[6]Shlomowitz (1979) witnesses a "wide variety of payment schemes" during these early postbellum years (1865-1880): Standing Wages; Share of the Crop or Sharecropping; Sharing of Time; Standing Rent; Wages in Kind; Other various explicit incentive schemes.

[7]"For example, in 1876, the U.S. Department of Agriculture reported: 'Contracts vary widely in details, but are most generally based upon the following equivalents. Bare labor, one-fourth of cotton in rich land, one-third in poor soils; labor and rations, one-half as a general rule, four-tenths in some very productive lands; labor, rations, stock and supplies, two-thirds to three-fourths of the product'" Shlomowitz (1979).

Higgs (1977) and Ransom and Sutch (1977) report that often contract terms suffered small adjustments in the terms besides the share of the output, such as food rations provided during the season by the employer.

2.2 Employees and Jobs

Overall, sharecropping "offered the potential of a higher income than could be obtained working for the fixed standard wage. This was particularly attractive to the man who possessed skills or who had gained experience beyond that of the average worker" [Ransom and Sutch 1977, p. 95]. Thus, many employees eagerly accepted sharecropping contracts because they were more qualified to manage a farm. Again, sharecropping labor system allowed employees to manage their own schedule and labor at the family level (Du Bois, 1935; Ransom and Sutch, 1977; Wright 1978, 2006). So, employees who had families and some inputs, like a mule, would seize the chance (Du Bois, 1935; Ransom and Sutch, 1977; Wright 1978, 2006). In general, wage labor was tightly supervised, and the extreme mobility demanded to wage laborers mostly attracted young men (Ransom and Sutch 1977, p. 95; Wright 1986, p.103).

Employees also had part of their consumption guaranteed by the employers. Sometimes they would receive cash advancements during the season, but most of the benefits came in the form of food rations, access to credit, medical care or education (Alston and Ferrie, 1993; Naidu, 2010; Ransom and Sutch, 1977), and the chance to cultivate food crops on the side (Wright, 1978). Alston and Ferrie (1993) also add that employers provided protection from violence, an especially valuable good for black employees. In a nutshell, employers provided enough non-pecuniary goods and perks to keep employees working (Alston and Ferrie, 1993).

The aforementioned benefits of sharecropping compensated employees to the exposition to risk (Alston, 1981), and to an expensive credit market (Wright, 1986). "Wage workers received money and rations at regular intervals during the course of the crop year. Tenants and owners, on the other hand, needed to spend both for personal consumption and for farm operations throughout the year, but not until they had produced and sold a crop would they receive any income" [Higgs 1977, p. 55]. That is, an employee accepted a postponement of liquidity when he became a sharecropper, because he earned most of his cash income at the end of the season. The underlying transfer of liquidity costs was so good for employers that they often preferred to write-off debt created by the advancements than losing the employee (Wright, 1986), or they would accept to just rollover it to the next season (Ager, 2012; Naidu, 2010). Equally important, often employers would not directly provide current consumption: merchants and local shopkeepers financed it in exchange of a portion of the final production (Du Bois, 2007; Wright, 1986).

Furthermore, many of the non-pecuniary perks given by the employers only worked be-

cause cash wages were low in the first place (Wright, 1986), and local elites controlled the access to those goods (Alston and Ferrie, 1993). Additionally, blacks were often humiliated and cheated (Higgs, 1977; Alston and Ferrie, 1993). Thus, consumption decisions were frequently distorted by employers. This is revealed by the increase of cash wage jobs after World War 2: a black employee "went forth to buy where he thought he was getting the best values for his money, and where he was treated with the most consideration" (Alston and Ferrie, 1993).

Above all, most employees did not have cash themselves to explore different alternatives. There was no land redistribution after the war, meaning that millions of freedmen and poor whites had no access to land, the key input in farming (Foner, 1988; Higgs, 1977). Rural bankers did not provide short-term credit at all (Ransom and Sutch, 1977), and banks were forbidden to accept land as collateral (Wright, 1986). Thus, a "wealthy farmer might choose to operate as a tenant or sharecropper, but a poor man could not simply choose to become a cash tenant" (Wright 1978, p. 177) because tenancy required the employee to supply many more inputs than in sharecropping. Thus, most rural employees were stuck between being wage laborers or sharecroppers.

In conclusion, sharecropping had an asymmetric impact across employees. Many employees were ready to take the chance to be their own managers, and to access goods that were valuable for farm operations and for their family life. But for many other employees, the benefits of sharecropping were not enough to make it more than a labor contract with uncertain payment (Du Bois, 2007) or even a piece-rate wage labor regime (Wright, 1978). So, unsurprisingly, a witness saw that people had been "moving cityward, entering other occupations, migrating west or north-where more money is to be made" [Higgs 1977, p. 62].

2.3   No Human Capital

Training was irrelevant in agriculture at that time. Human capital during slavery times consisted of slaves health and reproductive capacity (Ruef, 2012), two factors absent in the Postbellum South (Du Bois, 2007; Ruef, 2012). Moreover, most skill acquisition for slaves occurred in domestic service (Ruef, 2012) whereas by "1850, nearly 80 percent all slaves were engaged directly in agriculture" (Wright 2006, p. 84). Further, Rueff (2012) presents records of 57977 slaves sold in the market: about 95% had no skills.

Ransom and Sutch (1977) classify farmers of the Postbellum South as "inexperienced and illiterate." In fact, Collins and Wanamaker (2015) also suggest that southern employees after the war were less skilled than in the rest of the US. Figures 5, 6, and 7 point to the same direction: with the exception of the black population in 1900, the South has worse

literacy rates than the rest of the US[8].

Alston and Ferrie (1993) classifies the agriculture of the time as "pre-mechanized and non-science-based." As a labor force, employees had some farming-specific knowledge. This motivated employers to keep that labor force in the South using, for instance, paternalistic institutions (Alston and Ferrie, 1993). Furthermore, the high number of employees changing of employers between seasons supports the perception of low relation-specific investments (Wright, 1986). In fact, among the black labor force, Wright (1986), Ransom and Sutch (1977), and Higgs (1997) present trust, and deference as the crucial characteristics to access sharecropping.

In conclusion, the loss of relation-specific or general human capital played a marginal role. Seasonal labor needs almost exclusively drove turnover costs between 1880 and 1940.

2.4   Post Offices as Communication Centers

Post Offices were a well-established communication system well before the American Civil War[9]. "The 19th century saw the growth of the United States. The Post Office Department, the communications system that helped bind the nation together, developed new services that have lasted into the 21st century and subsidized the development of every major form of transportation" [USPS 2007, p. 10]. Even before 1861, populations already perceived the benefits brought by the existence of a mail service: the "new territories and states, as well as established communities, pressed the Post Office Department for more routes and faster delivery" [USPS 2007, p. 10]. Furthermore, community debates about postal delivery always reflected their importance for business development. For instance, "business logic" was behind the adoption of free rural delivery at the end of the 19th century: "Rural people needed the important information provided by newspapers ... Young people might stay on the farm if correspondence and magazines eased their isolation" [USPS 2007, p. 22]. Finally, Alston and Ferrie (1993) recognize that "out-migration of labor or in-migration of capital would have raised reservation wages". Mail facilitated both.

According to anecdotal evidence, new post offices preceded economic development (Acemoglu, Moscona, and Robinson, 2016). In fact, the Post Office Department "ultimately made decisions in the 19th century that reflected public service as its highest aim. It funded post routes that supported national development and instituted services to benefit all residents of the country" [USPS 2007, p. 11]. The opening of a new post office was a function of the number of new customers and distance to a transportation route (POD, 1980). Typically,

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[8]According to the US Census, in 1870 about 20% (7.4%) of the whites in the south (the rest of the country) could not write, about 74.3% (49.3%) of the blacks in the south (the rest of the country) could not write, about 40.4% (8.5%) of the total population in the south (the rest of the country) could not write, and about 44% (6.7%) of the total population in the south (the rest of the country) could not read.

[9]The main reference of this subsection is USPS (2007).

the Post Department would require a report from the nearest postmaster of an existing post office. That report would also include suggestions for the postmaster position at the new post office, who had to be a local inhabitant. Naturally, the local community or the local congressmen had a saying in the matter. For the largest post offices, the postmasters were directly nominated by the US President, while the Postmaster General filled the remaining positions. Frequently, postmasters were storekeepers who kept their normal jobs while on duty.

Railways were the central piece of mail distribution after 1864, while the use of steamboats peaked in 1853. Universal service to customers in all the US was established by the Act of March 3, 1863 (12 Stat. 704). The act also formalized the three types of goods delivered by mail: letters; newspapers; other heavier items, such as syrup cans or soap. These items were delivered along mailing routes.

Therefore, more post offices were a crucial communication device for any local community in a time when job positions traveled mouth to mouth (Alston, 1981; Du Bois, 2007; Higgs, 1977; Wright, 1986). The public service mission of the Post Office Department implied a service that preceded local development. The opening of a new post office essentially depended on local population size and accessibility.

3   Model

"In a sense, the adoption of sharecropping was the result of a compromise between the laborers' pursuit of independence and higher incomes and the landlords' desire to retain control and minimize risk" [Ransom and Sutch, 1977 p. 94]. The model in this section discusses how different economic conditions outside agriculture upset this compromise.

Post offices improved the knowledge about possible jobs. Thus, post offices affected the labor market in the farming sector at two different moments of the season. First, less employees chose sharecropping contracts at the beginning of the season. That is, improved awareness of outside options increased employees' reservation value before they chose to become sharecroppers. Second, more job alternatives increased labor turnover during the season. Consequently, employers would like to use sharecropping contracts more often to avoid the increase in risk associated to labor turnover.

This is a static model because it only discusses what happens during one season. This approach reflects the fact that employer-employee pairs changed frequently (Wright, 1986). In fact, inter-seasonal turnover and annual contracting were used as disciplining devices by employers (Higgs 1977, p. 73; Ransom and Sutch 1977, p. 101).

The following model consists of a principal-agent model in order to clarify which effect dominated the proportion of sharecropping farms relative to all farms: the will of employees

to avoid turnover or the will of employers to get a better income.

3.1   Setting

There are 2 populations: employers (the principals) and employees (the agents). Employers (employees) are distributed along a continuum $\delta \in [0,1]$ ($\alpha \in [0,1]$), where δ (α) is the cost of managing a farm. That is, there are economic agents better at management than others. The employer (employee) can not observe the employee's (employer's) type, but he is aware of the whole distribution. The differences in management costs among employees reflect the discussion in section 2. Alston (1981) presents the size of the farm as a source of supervision costs.

Both populations are risk averse. The literature supports this view. Ransom and Sutch (1977, p. 97) states that "the poor black was probably less averse to assuming risk than the comparatively wealthy landlord." At the same time, Alston (1981) defends that "agricultural workers are relatively more absolute risk averse than landowners because they are less wealthy and have less access to credit markets". This model assumes that all agents have the same risk preferences: the object is the role of risk, not of risk preferences, in the composition of farm contracts.

Employees have three employment options: wage labor in a farm; manage a sharecropping farm; an outside option to jobs in the farming sector. The first option, wage labor in a farm, implies that the employer controls the employee's effort level a and pays him a fixed wage w along the season. Alternatively, sharecropping means that the employee manages his own effort, and to earn a share s of end of season's production. However, management brings a cost α. The outside option pays $\bar{u}$.

An employee has the following expected welfare as a wage laborer:

$$E\left[-e^{-\left(w-\frac{a^2}{2}\right)}\right] \tag{3.1}$$

$\frac{a^2}{2}$ stands for the cost of exerting effort level a. Likewise, if he opts for a sharecropping contract:

$$E\left[-e^{-\left(sy-\frac{a^2}{2}-\alpha\right)}\right] \tag{3.2}$$

Where y stands for the farm's output. Finally, the outside option yields the employee:

$$E\left[-e^{-(\bar{u})}\right] \tag{3.3}$$

The last three expressions can be rewritten into certainty equivalents. The payoff wage

labor has no random variable:

$$\Pi_{wage} = w - \frac{a^2}{2} \tag{3.4}$$

y is a random variable. $y = a + \beta\epsilon$, where $\epsilon \sim N(0, \sigma^2)$. β measures the effect of labor turnover. $\beta = 1$ if the farm is operated by a sharecropper, and $\beta > 1$ if run with wage labor. That is, the danger of turnover or renegotiation by wage laborers amplifies the effect of production's risk. Therefore, the payoff from sharecropping can be rewritten the following way[10]:

$$\Pi_{share} = sa - \frac{a^2}{2} - \alpha - s^2\frac{\sigma^2}{2} \tag{3.5}$$

Analogous to wage labor, the outside option pay-off has no random variable:

$$\Pi_{outside} = \bar{u} \tag{3.6}$$

In an analogous fashion, each employer chooses to run his farm using wage labor or to let it be operated by sharecroppers. The advantage of using sharecropping contracts consists of minimizing the increase in risk created by labor turnover, β, and save the cost of management, δ. In turn, wage labor lets employers to directly control the effort level exerted by their wage laborers. Thus, wage labor brings the employer:

$$E\left[-e^{-(y-\delta-w)}\right] \tag{3.7}$$

Sharecropping yields the following pay-off:

$$E\left[-e^{-((1-s)y)}\right] \tag{3.8}$$

Analogous to employees, it is possible to use the certainty equivalents for wage labor:

$$\Pi_{wage}^{E} = a - w - \delta - \beta^2\frac{\sigma^2}{2} \tag{3.9}$$

And for sharecropping:

$$\Pi_{share}^{E} = (1-s)\left(a - (1-s)\frac{\sigma^2}{2}\right) \tag{3.10}$$

The employer faces a participation constraint when choosing either w or s: the fact that employees have a reservation value of $\bar{u}$. Otherwise, the latter chooses to work outside the farm sector. In addition, employers must satisfy an incentive constraint from employees when using sharecropping contracts.

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[10]I use the fact that $E\left[-e^{\delta\epsilon}\right] = -e^{\delta^2\frac{\sigma^2}{2}}$ where $\epsilon \sim N(0, \sigma^2)$.

3.2 Propositions

Appendix A presents this model's solution. An increase in the number of post offices leads to an increase in $\bar{u}$, the reservation value of employee's at the beginning of the season, and β, the increase in risk generated by turnover costs during the season. The two propositions below summarize the effects of an increase in the number of post offices:

> **Proposition 1**: If the outside option to the farming sector, $\bar{u}$, is low enough, i.e. $\bar{u} \leq \bar{u}_l$, then the proportion of sharecropping increases with the number of post offices. If $\bar{u} \in (\bar{u}_l, \bar{u}_h)$, then the proportion of sharecropping decreases with the number of post offices. If $\bar{u} \geq \bar{u}_h$, then the proportion of sharecropping decreases (increases) with the number of post offices if turnover costs are low (high) enough, i.e. $\beta < (>)\bar{\beta}$.

> **Proposition 2**: If the outside option to the farming sector, $\bar{u}$, is low enough, i.e. $\bar{u} \leq \bar{u}_h$, then the number of active employers does not change with the number of post offices. Otherwise, it decreases with the number of post offices.

The effect of post offices deserves further clarification. The increase of $\bar{u}$ and β is a reduced-form approach to the role of communication in decision-making at the beginning and during the season. The intricacies of such a problem is not relevant due to the historical circumstances under scrutiny. The industrialization of the US economy was at full speed after the war (Gordon, 2016). Thus, thinking that more news about job opportunities outside the agriculture labor market necessarily increased employees' outside option and turnover is a realistic assumption:

> *Life in the south in the late nineteenth and early twentieth centuries, particularly for the black sharecroppers, was striking in its isolation and its lack of connection to the modern world. Many members of farm families never traveled outside the county in which they were born. Roads were poor to nonexistent, and the only means of travel available were by foot, horseback, or wagon. Striking was the absence of medium to large-sized cities that were typical in the northeast and Midwest. Most towns were merely crossroads* [Gordon 2016, p. 266].

4 Empirics

The current section presents empirical evidence of the lack of job alternatives dominating turnover costs as the driver of the proportion of sharecropping farms relative to the total number of farms. To test the predictions mentioned in subsection 3.2, subsection 4.1 details

the identification strategy. The database and the variables are introduced in subsection 4.2, giving a way to translate each proposition into a set of empirically-testable predictions in subsection 4.3. At last, a discussion about the results and their pitfalls takes place in subsection 4.4.

4.1 Identification

Subsection 2.4 explains the role of post offices as heralds of job opportunities. Subsection 3.2 details the impact of an increase in the number of post offices in this paper's framework. On the one hand, more post offices meant a higher reservation utility of employees in farming labor markets at the beginning of the season. On the other hand, more of those facilities improved the chances of employees to have jobs during the season, increasing the risk associated to the use of wage labor by the employers. Therefore, the first effect makes employees less inclined to take a sharecropping contract for the whole season, whereas the second effect increases the advantages of using sharecropping contracts for the employers during the season. Consequently, the overall effect of an increase in the number of post offices over the proportion of sharecropping farms relative to the total number of farms used is ambiguous: a negative (positive) coefficient suggests a dominance of the first (second) effect over the second (first).

The first question about this mechanism comes to whether more post offices are just a sign of overall development of one region. In other words, more post offices in a certain area just signals that area has more jobs in different economics sectors. So more post offices might affect the composition of farms not because they facilitate communication but because there are simply more jobs out there. The analysis of subsection 2.4 puts the latter hypothesis aside. Post offices preceded economic development, as it was part of the public service mission of the Post Office Department at least since 1863. Even in the case of established counties, USPS (2007) presents evidence of postal service giving subsidies to the development of railroads and other means of transportation through allowances for the delivery to transportation companies.

There is also the possibility that news brought by mail affected the relative prices of inputs that, in turn, influenced the costs of managing a farm. If that was the case, employees could find better places to use their family labor force or other inputs such as mule. But, it is not clear why that effect would only impact sharecroppers, or affect sharecropping farms more than other farms. Second, that same effect can be easily described by a change in the reservation utility of employees instead of an adjustment in the costs of managing a farm. Elaborating, the employee could simply make more cash somewhere else with those inputs, while the yield of those inputs in a sharecropping farm stayed the same.

Acemoglu et al. (2016) analysis raises the concern that post office presence equated to

a stronger presence of the federal state. In turn, federal policies could have interfered with local labor markets. That seems unlikely. King and Lieberman (2009) and Novak (2008) argue for recent findings that point for a stronger federal state before World War 2 than previously thought, but that does not imply that the federal state was indeed a powerful entity in every realm of the US economy. Even if it was a strong entity, Alston and Ferrie (1993) and Higgs (1977) present concrete evidence of how the federal state, at best, did not interfere in the southern labor market. Equally important, the persistence of separate labor markets between the US south and the rest of the US (Wright, 1986) is a sign of the limited role that any federal intervention might have had.

Another point of contention arises with the mobility of people, especially before World War 1. This is essential to assume that employees could actually seize job opportunities elsewhere. First, there is plenty of evidence of inter-county mobility of wage laborers and of occasional labor in non-farming sectors for this period (Wright, 1986). Second, Alston (1981) and Higgs (1977) present contemporary testimonials of recruitment in urban areas for agricultural jobs, and of several black employees moving to the cities for better jobs in industry. Finally, several US markets were already integrated. The cotton market is a good example of that. Any farmer could easily ship their cotton production from anywhere in the South (Higgs, 1977). Atack (2013) confirms that the price of cotton was the same nationwide before the 1880s.

Finally, knowing whether the number of post offices in fact interacts with both channels: the reservation utility of the employees at the beginning of the season; and the augmented risk due to turnover in wage labor for the employers during the season. The empirical analysis below gives compelling evidence in favor of that hypothesis. Two treatments are used, one identified with each effect. The first, called *Rain*, stands for whether a county belongs to the top 50% counties with the most erratic rain during the cotton harvesting season. This treatment essentially distinguishes counties in terms of turnover costs: the more erratic the rain is, the more costly it is to have uncertainties in labor supply. The second treatment, known as *Coal*, classified whether a county sits on a coal deposit. Cameron (1993) explains the stylized fact that the first industrial areas were located nearby coal mines. Atack (2013) correlates railway access with the location of inanimately-powered, larger manufacturing establishments, which had higher productivity than smaller establishments. Therefore, more industry certainly meant higher reservation values for employees in the farming sector.

4.2 Dataset and Variables

4.2.1 Sample

This empirical study consists of a set of panel-data regressions. The sample consists of 1119 counties across the southern states[11]. Note that the sample size was reduced to only include counties where there is data for the post offices.

The US census data on land tenure spans from 1880 to 1940 with a decennial frequency. The only year after abolition left is 1870, when the South still tested post-slavery institutions (Roback, 1984; Ransom and Sutch 1977; Shlomowitz 1979, 1984). 1940 is taken as the last data point, before the mechanization of cotton and sugar production (Britannica, 2015; Holley, 2000) and the effects of the New Deal and of the Second World War in the southern labor markets (Wright, 1986).

This paper follows Naidu (2010) and considers the eleven Confederate states plus Kentucky and West Virginia. Kentucky had slavery and passed legislation restricting labor mobility after the war, just like the Confederate states[12]. West Virginia resulted from a strategic breakaway from Virginia in the beginning of the war.

4.2.2 Key Variable and Treatments

The dependent variable is the proportion of farms that run with a sharecropping contract relative to the total number of farms in each county (*Sharecropping* herein). NHGIS (2011) provides the US Census data concerning the farming sector. Studying the proportion instead of the absolute number of sharecropping farms distinguishes changes common to all farms from those only affecting sharecropping farms. For instance, an increase in the local labor force makes labor cheaper, which equally affects all farms. Note that the proportion of sharecropping farms is a continuous variable, while the total number of farms is a count variable, which brings extra complications for hypothesis testing (Cameron and Trivedi, 2005).

Subsection 4.1 extensively discusses the intuition behind the key independent variable of this study: the density of post offices in each county (*Post Office* henceforth). The number of post offices is divided by the county area to take into account the chance that a larger county has more post offices simply due to geographic reasons. Figures 1 and 2 present a negative relation between the average *Sharecropping* and average *Post Office* between 1880 and 1940. As a matter of fact, they have a statistically significant, negative correlation of 0.23.

The two treatments used, *Rain* and *Coal*, are exogenous. *Rain* is constructed from

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[11]I use 1880 borders, as defined by the maps available in the NHGIS (2011).
[12]See table **??**.

contemporary data on precipitation. *Coal* is based on existent coal deposits, not mines, so it is not influenced by human behavior. Comparing figure 1 with figure 3, clusters of *Sharecropping* emerge around areas with erratic rain, such as the Mississippi river basin. A more mixed scenario emerges in figure 4, although there is a negative relation between *Sharecropping* and *Coal* in Texas and in the Appalachians.

4.2.3 Extra Control Variables

The US census also provides rural and urban population. I use the rural and urban population between 15 and 65 years old to proxy for labor force size. Additionally, I use population density in place of the absolute number to control for the county size. This variable is strongly correlated with the number of post offices in an area, as discussed in subsection 2.4, as well with the use of sharecropping contracts (Alston, 1981).

The wage of agricultural laborers measures the competition for the local labor force. The literature agrees on a competitive rural labor market for the entire period, even across racial lines (Alston and Kauffman, 2001; Collins and Wanamaker, 2015; Naidu, 2010; Roback, 1984; Shlomowitz, 1984; Wright, 1986). Also recall from section 2 that farm and non-farm labor markets mutually affected each other. Consequently, *Wage* directly controls for the cost of farm labor, and indirectly gauges the job opportunities in the non-farm sector, in a very similar fashion to what occurs in the model of section 3.

The regressions also include the average farm area in the county. This was a crucial decision variable in sharecropping contracts and, consequently, in the crop mix of each farm (Ransom and Sutch, 1977; Wright, 1978). Alston (1981) argues that it affected farm supervision costs, too. Finally, farm size might also relate to how powerful the local elite was and, thus, the value of many of the non-pecuniary perks included in sharecropping contracts (Ager, 2013; Alston and Ferrie, 1993).

The proportion of blacks in the whole population is controlled because of the role of racial relations, as discussed in section 2. Alston and Ferrie (1993) present evidence of sharecropping contracts as a source of paternalistic protection from racial violence[13]. For instance, blacks were lynched much more often than whites (Ager, 2013). Wright (1986) also presents evidence that black population had lower skill bias relative to the white population.

The distance to key transportation lines is another control variable. It consists of the distance to rivers navigable by steamboats, and the distance to railways. As argued in section 2.4, they were one of the decision variables behind the opening a new post office. Atack (2013) provides county-level evidence of the impact of railways on the opening of new banks, on urbanization, on farm productivity, and on land value.

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[13]Nationwide, in 1900 about 37% (20%) of the colored (white) farm managers were sharecroppers. Also nationwide, in 1920, about 72% (67)% of the colored (white) tenants were sharecroppers.

After 1877, the South progressively revived the Black Codes, and approved new laws targeting black employees. This body of legislation was part of the Jim Crow Era, during which blacks were relegated to a *de facto* second-class citizen status until the 1960s. Wright (1986) states that employers used racial discrimination to drive wages to whites and blacks alike. Naidu (2010) finds that a negative impact of that legislation over different labor market outcomes, such as returns on working experience. Roback (1984) also defends the need for this sort of legislation to enforce sharecropping contracts. Figure 8 summarizes the evolution of the enactment of those laws[14]:

- Enticement and Contract Enforcement laws - The former "made it a crime for an employer to 'entice' a laborer who had a contract with another employer", whereas the later guaranteed that "a laborer who signed a contract and then abandoned his job could be arrested for a criminal offense." Basically, these laws reduced competition to the beginning of the season, when employers and employees could sign new contracts.

- Vagrancy laws - These "essentially made it a crime to be unemployed or out of the labor force", increasing the search cost for better jobs.

- Emigrant-agent laws - These laws prevented agents hiring workers across states, especially those moving workers out of the South.

- Convict-lease system - Penalty for transgressors of contract enforcement and vagrancy laws. The government would lease prisoners to private entities, relinquishing any monitoring of day-to-day use of those prisoners.

Thus, 5 dummies variables are created: each equals 1 when corresponding law exists in the state in the decade under scrutiny[15].

Finally, to distinguish risk from the augmented costs associated to labor turnover, the regressions include average monthly standard deviations of temperature and precipitation for the whole year, decade by decade.

4.3 Regressions and Empirical Predictions

The following regression is estimated to check which theory dominates:

$$Sharecropping_{c,d} = \gamma_c + \gamma_d + \beta_1 Post\ Office_{c,d} + \bar{\beta}X_{c,d} + \epsilon_{c,d} \tag{4.1}$$

Where c, d stands for county c in decade d, γ_c is the county-fixed effects term, γ_d is the decade-fixed effects term, $Post\ Office_{c,d}$ stands for the variable $Post\ Office$, $X_{c,d}$ includes all

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[14]The quotes in the following descriptions are from Roback (1984).
[15]This information is based on figure 8.

the control variables discussed in subsection 4.2.3, and $\epsilon_{c,d}$ is the idiosyncratic error. Then a difference-in-differences regression is ran using the two treatment, *Rain* and *Coal*, to have a better understanding of the interaction of *Post Office* with the aforementioned channels:

$$Sharecropping_{c,d} = \gamma_c + \gamma_d + \beta_1 Post\ Office_{c,d}$$
$$+ \beta_2 Post\ Office_{c,d} \times Rain_c + \beta_3 Post\ Office_{c,d} \times Coal_c + \bar{\beta}X_{c,d} + \epsilon_{c,d} \qquad (4.2)$$

This last regression is rerun on the dependent variable *Number of Farms*, which stands for the number of farms in county c in decade d:

$$Number\ of\ Farms_{c,d} = \gamma_c + \gamma_d + \beta_1 Post\ Office_{c,d}$$
$$+ \beta_2 Post\ Office_{c,d} \times Rain_c + \beta_3 Post\ Office_{c,d} \times Coal_c + \bar{\beta}X_{c,d} + \epsilon_{c,d} \qquad (4.3)$$

Now it is possible to translate the propositions of subsection 3.2 into empirically-testable predictions. First, relative to regression 4.1:

Prediction 1: If turnover costs (lack of job alternatives) is the dominant reason behind *Sharecropping*, then *ceteris paribus Sharecropping* increases (decreases) with *Post Office*: $\beta_1 > 0$ ($\beta_1 < 0$).

Relative to regression 4.2:

Prediction 2: If turnover costs (lack of job alternatives) is the dominant reason behind *Sharecropping*, then *ceteris paribus Sharecropping* increases (decreases) with *Post Office*: $\beta_1 > 0$ ($\beta_1 < 0$).

Prediction 3: In counties with high turnover costs, *ceteris paribus Sharecropping* increases with *Post Office*: $\beta_2 > 0$.

Prediction 4: In counties with more job alternatives, *ceteris paribus Sharecropping* decreases with *Post Office*: $\beta_3 < 0$.

Relative to regression 4.3:

Prediction 5: If there are enough job alternatives, then *ceteris paribus Number of Farms* decreases with *Post Office*: $\beta_1 > 0$. Otherwise, β_1 is insignificant. This prediction should be indifferent to both treatments, that is, β_2 and β_3 are insignificant.

4.4 Results and Discussion

Table 2 refers to regression 4.1 and answers to prediction 1: the lack of job alternatives dominates turnover costs as the driver of sharecropping contracts. A one-standard-deviation increase in *Post Office* decreases *Sharecropping* 1.4 percentage points. That would imply an average 5.8% decrease of *Sharecropping* in 1880 and 3.8% decrease of *Sharecropping* in 1940. The decrease of the effect of *Post Office* on *Sharecropping* over time stems from three sources: the relative importance of mail decreased with the appearance of new communication technologies such as the radio and the telephone (Gordon, 2016); the first wave of migration out of the South after 1914 (Collins and Wanamaker, 2015); the Jim Crow era, and hence the benefits from employer paternalism, strengthened after 1900 (Alston and Ferrie, 1993; Higgs, 1977).

Table 3 sheds light on the channels working through the variable *Post Office*. Columns (*Rain*) and (*No Rain*) stand for the top 50% and the bottom 50% counties in terms of erratic precipitation during the cotton harvesting season, one of the treatments discussed in subsection 4.1. Intuitively, the first column represents the counties with the highest turnover costs, while the second stands for those with the lowest turnover costs. Therefore, the decrease of the sign of *Post Office* from one to the other is not surprising: the role of job alternatives is relatively stronger in an environment with low turnover costs. An analogous exercise is made using the treatment *Coal* in the last two columns. The existence of coal deposits is associated to more industry, and, therefore, to more jobs outside of farming. Unsurprisingly, *Post Office* has a larger impact in the third column than in the fourth column of table 3.

To confirm the analysis of the previous paragraph, table 4 adds to table 2 three difference-in-differences regressions. In each, *Post Office* interacts with one or both the treatments of subsection 4.1. From column (1) to column (2), the coefficient of *Post Office* decreases as the interaction with *Rain* is positive and significant. Interestingly, in column (3) appears that all the effect going from *Post Office* to the interaction term with the treatment *Coal*. That might signal an especially strong role of industrialization and, consequently, of the reservation utility in the beginning of the season. Column (4) presents the results of regression 4.2. Overall, *Post Office* has a negative effect, whereas the treatments have the expected signs. Using this last regression, when a county is affected by both treatments, a one-standard-deviation increase in *Post Office* decreases *Sharecropping* in 1 percentage point. In case a county is only affected by the *Rain* treatment, then the effect of *Post Office* is not significant. Finally, if a county is affected by the *Coal* treatment, a one-standard-deviation increase in *Post Office* decreases *Sharecropping* in 1.6 percentage points. Therefore, there is some support for prediction 3, and strong support for prediction 4. The answer to prediction 2 is similar to that of prediction 1: the evidence points for a dominance of the lack of job

alternatives behind variations in *Sharecropping*.

Regression 4.3 answers prediction 5. Table 5 displays an output where only *Post Office* significantly explains *Sharecropping* with the predicted sign. Therefore, there is evidence that the reservation utility is already high across the whole sample.

There are some challenges to these results. USPS (2007, p. 25) refers an increase of the number of rural delivery routes, replacing smaller Post Offices, after 1901. That is, the overall number of post offices peaks in 1901 and decreases from then until the end of the sample. One the one hand, this policy might have actually made the current empirical analysis to downplay the role of each office. That fact would imply a downward bias on the estimations displayed from table 2 to 5. On the other hand, more worryingly, there can be a trend effect affecting the validity of the estimations. Therefore, a regression including interaction terms between *Post Office* and decade dummies is run. The gist and the significance of the results stay the same.

Another possible critique relates to the *Coal* treatment. Wright (1986) provides examples of young laborers temporarily leaving the fields during the farming season to work in mining industry. That indicates the chance that the *Coal* treatment also implies an increase in turnover costs during the season. In that case, as discussed in section 3, that would create an upward bias in the estimated coefficients. Thus, at most, there is an underestimation of the effect of a higher reservation utility.

Recall the possibility that post offices, as a branch of the federal state, may have decreased the political clout of the local elites. By consequence, that would interfere with the size of the paternalistic perks given by the local elites. Ager (2013) uses a measure of property inequality in 1860 to demonstrate that prewar elites still played a central role in local politics. Consequently, a treatment is used to split the sample according to whether a county is on the bottom or top 50% of counties in terms of slaves per slaveholder in 1860: the more slaves per slaveholder, the more powerful the local elite is. The results on table 6 demonstrate that the size, sign, and significance of the coefficient does not change across the two samples. A difference-in-differences regression gives a conforming marginal effect: *Sharecropping* decreases in 1.2 percentage points, when *Post Office* interacted with this treatment increases in one standard deviation. Furthermore, if *Post Office* stands for a measure of federal state projection that contradicts local elites, that interaction effect would be negative. This last conclusion arises because the federal state would be felt more in counties with more powerful local elites. Instead, the interaction has a positive coefficient, which conforms to the idea that local elites use sharecropping more often because their paternalistic goods are more valuable where they control the political system better.

Table 7 displays a final piece of evidence. The two regressions inspect the proportion of fixed-rent farms and the proportion of owner-managed farms, respectively, relative to the

total farms applying the same model as in regression 4.2. Comparing to column (4) of table 4, an increase in *Post Office* decreases all forms of tenancy, and increases owner-managed farms. Interestingly, the *Rain* treatment only affects owner-managed farms, whereas the *Coal* treatment only affects fixed-rent farms. Although the model does not study the whole tenancy ladder[16], these results go in the direction of the literature. The employees most suited for sharecropping eventually became fixed-rent tenants (Ransom and Sutch, 1977; Wright, 1986). Thus, as more employees on the border between sharecropping and the outside option drop as the latter improves, the remaining sharecroppers are those who have a higher managerial ability. Meanwhile, if the turnover costs were truly a reason that left employers indifferent between wage labor and sharecropping, it is natural that the treatment associated to turnover costs is only significant at the two respective regressions.

5 Concluding Remarks and Future Research

This paper inspects the impact of economy-wide conditions on the use of share contracts in a specific sector or industry. Going back to the US South between 1880 and 1940, a economy-wide condition, job alternatives, dominates a well-identified reason by the literature, labor turnover, in explaining the proportion of sharecropping farms relative to the total number of farms. The identification benefits from some unique characteristics of this setting: a strong consensus about the causes of sharecropping at the sector-level; existence and development of a communication system nationwide but with an asymmetric local prevalence; that national communication system was driven by public service, not economic development; the industrialization of a nation that generated job alternatives outside the farming sector.

As discussed in the introduction, share contracts still abound nowadays. The literature found several reasons inside of particular firms or industries to use them. However, this paper finds a situation where not all agents benefit the same when using those contracts. This paper finds the lack of alternatives for the agents to be the dominant reason of the use of those contracts. This raises the question whether a similar result is behind trends observed nowadays, such as the spread of franchising arrangements in developed economies, or the persistence of sharecropping contracts in developing countries. Finally, share contracts are a form of entrepreneurship. Thus, future research should take steps such as Paulson, Townsend and Karaivanov (2006), and find the dominant factors behind entrepreneurship in developing economies.

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[16]Steps of the tenancy ladder: wage labor, sharecropping, fixed-rent tenancy, and ownership of the land (Alston and Kauffman, 2001; Naidu, 2010; Shlomowitz, 1984).

References

Acemoglu, Daron, Jacob Moscona, and James A. Robinson. 2016. *State Capacity and American Technology: Evidence from the Nineteenth Century.* American Economic Review: Papers & Proceedings, 106(5): 6167.

Ackerberg, Daniel A., and Maristella Botticini. 2002. *Endogenous Matching and the Empirical Determinants of Contract Form.* Journal of Political Economy, 110(3): 564-591.

Ager, Philipp. 2013. *The Persistence of de Facto Power: Elites and Economic Development in the South, 1840-1960.* EHES Working Papers in Economic History No. 38.

Akerlof, George. 1976. *The Economics of Caste and of the Rat Race and Other Woeful Tales.* The Quarterly Journal of Economics, Vol. 90(4): 599-617.

Allen, Douglas, and Dean Lueck. 1992. *Contract Choice in Modern Agriculture: Cash Rent versus Cropshare.* Journal of Law and Economics, 35(2): 397-426.

Allen, Douglas, and Dean Lueck. 1993. *Transaction Costs and the Design of Cropshare Contracts.* The RAND Journal of Economics, 24(1): 78-100.

Alston, L. J.. 1981. *Contractual Mix in Southern Agriculture Since the Civil War: Facts, Hypotheses and Tests.* Journal of Economic History 18: 211-232.

Alston, L. J., and Joseph P. Ferrie. 1993. *Paternalism in Agricultural Labor Contracts in the U.S. South: Implications for the Growth of the Welfare State.* The American Economic Review, 83(4): 852-876.

Alston, Lee J., and Kyle D. Kauffman. 2001. *Competition and the Compensation of Sharecroppers by Race: A View from Plantations in the Early Twentieth Century.* Explorations in Economic History 38: 181194.

Atack, Jeremy. 2013. *On the Use of Geographic Information Systems in Economic History: The American Transportation Revolution Revisited.* The Journal of Economic History, 73(02): 313-338.

Britannica (Encyclopedia). 2015. *Encyclopedia Britannica.* http://www.britannica.com.

Burke, Mary A.. 2015. *The Distributional Effects of Contractual Norms: The Case of Cropshare Agreements.* Federal Reserve Bank of Boston Working Paper No. 15-7.

Cameron, A. Colin, and Pravin K. Trivedi. 2005. *Microeconometrics: Methods and Applications.* New York, NY: Cambridge University Press.

Cameron, Rondo. 1993. *A Concise Economic History of the World: From Paleolithic Times to the Present .* New York, NY: Oxford University Press.

Cheung, S. N. Steven. 1969. *The Theory of Share Tenancy.* Chicago, IL: University of Chicago Press.

Collin, William J., Marianne H. Wanamaker. 2015. *The Great Migration in Black and White: New Evidence on the Selection and Sorting of Southern Migrants.* NBER Working Paper Series No. 21384.

Dana Jr., James D., and Kathryn E. Spier. 2001. *Revenue Sharing and Vertical Control in the Video Rental Industry,* The Journal of Industrial Economics, 49(3): 223245.

Donald, David, and J. G. Randall. 1961. *The Civil War and Reconstruction.* Boston, MA: D.C. Heath and Company.

Du Bois, W.E.B.. 1935. *Black reconstruction.* New York, NY: Harcourt.

Du Bois, W.E.B.. 2007. *The Souls of Black Folk.* New York, NY: Oxford University Press Inc..

Egerton, Douglas. 2014. *The Wars of Reconstruction.* New York, NY: Bloomsbury Press.

Evans, Robert. 1962. "The Economics of American Negro Slavery." In *Aspects of Labor Economics.*, edited by Universities-National Bureau Committee for Economic Research, 185-256. Cambridge, MA : Princeton University Press.

Foner, Eric. 1988. *Reconstruction: America's Unfinished Revolution 1863-1877.* New York, NY: Harper & Row.

Hallagan, William. 1978. *Self-Selection by Contractual Choice and the Theory of Sharecropping.* The Bell Journal of Economics, 9(2): 344-354.

Hanes, Christopher. 1996. *Turnover Cost and the Distribution of Slave Labor in Anglo-America.* The Journal of Economic History, 56(2): 307-329.

Higgs, Robert. 1977. *Competition and Coercion: Blacks in the American economy.* Cambridge, MA: Cambridge University Press.

Holley, Donald. 2000. *The Second Great Emancipation: The Mechanical Cotton Picker, Black Migration, and How They Shaped the Modern South.* Fayetteville, AR: University of Arkansas Press.

Keller, Morton. 1977. *Affairs of State.* Cambridge, MA: Belknap Press of Harvard University Press.

King, Desmond and Robert C. Lieberman. 2009. *Ironies of State Building: A Comparative Perspective on the American State.* World Politics, 61(3): 547-588.

Lazear, Edward P.. 1996. *Performance Pay and Productivity.* NBER Working Paper 5672.

NHGIS. 2011. *Minnesota Population Center. National Historical Geographic Information System: Version 2.0.* Minneapolis, MN: University of Minnesota.

McPherson, James. 2013. *The War that Forged a Nation.* New York, NY: Oxford University Press.

Naidu, Suresh. 2010. *Recruitment Restrictions and Labor Markets: Evidence from the Postbellum U.S. South.* Journal of Labor Economics, 28(2): 413-445.

Novak, William. 2008. *The Myth of the 'Weak' American State.* American Historical Review, 113(3): 752-72.

Paulson, Anna L., Robert M. Townsend and Alexander Karaivanov. 2006. *Distinguishing Limited Liability from Moral Hazard in a Model of Entrepreneurship.* Journal of Political Economy, 114(1): 100-144.

Post Office Department (POD). 1980. *Reports of Sites Location, 1837-1950.* National Archives Microfilm Publications, Microfilm Publication M1126, Roll 88.

Pruett, Mark, and Greg Winter. 2011. *Why do Entrepreneurs Enter Franchising and Other Relationships?* Journal of Small Business & Entrepreneurship, 24(4): 567-581.

Ransom, Roger L., and Richard Sutch. 1977. *One Kind of Freedom: The economic consequences of emancipation.* Cambridge, MA: Cambridge University Press.

Roback, Jennifer. 1984. *Southern Labor Law in the Jim Crow Era: Exploitative or Competitive?* The University of Chicago Law Review, 51(4): 1161-1192.

Ruef, Martin. 2012. *Constructing Labor Markets: The Valuation of Black Labor in the U.S. South, 1831 to 1867.* American Sociological Review, XX(X): 1-29.

Shlomowitz, Ralph. 1979. *The Origins of Southern Sharecropping.* Agricultural History, 53(3): 557-575.

Shlomowitz, Ralph. 1984. *"Bound" or "Free"? Black Labor in Cotton and Sugarcane Farming, 1865-1880.* The Journal of Southern History, 50(4): 569-596.

Stiglitz, Joseph E.. 1974. *Incentives and Risk Sharing in Sharecropping.* The Review of Economic Studies, 41(2): 219-255.

Townsend, Robert M., and Rolf A. E. Mueller. 1998. *Mechanism Design and Village Economies: From Credit to Tenancy to Cropping Groups.* Review of Economic Dynamics, 1: 119172.

United States Department of Agriculture (USDA). 1942. *Crops and Markets.* Vol. 19, No. 6. Washington, D.C.: Government Printing Office.

United States Postal Service (USPS). 2007. *The history of the United States Postal Service: An American History, 1775-2006.* United States Postal Service, Publication 100.

United States Geological Survey (USGS). 1996. *Coal Fields of the Conterminous United States.* Washington, D.C.: United States Geological Survey.

Wattenberg, Ben J.. 1976. *The Statistical History of the United States.* New York, NY: Basic Books, Inc., Publishers.

Wright, Gavin. 1978. *The Political Economy of the Cotton South.* New York, NY: W.W. Norton & Company, Inc..

Wright, Gavin. 1986. *Old South, New South.* New York, NY: Basic Books, Inc., Publishers.

Wright, Gavin. 2006. *Slavery and American Economic Development.* Baton Rouge, LA: Louisiana State University Press.

Tables and Figures

Variable	Definition and Sources	Median Value (Standard Deviation)
Sharecropping:	Number of sharecropping farms relative to total population in each county. Source: NHGIS (2011).	0.2938 (0.1775)
Post Office:	Number of post offices per square kilometer in each county. Source: Postal History, https://postalhistory.com/, 1880-1940.	0.01202 (0.0115)
Rain:	1 if the county belongs to the top 50% of the counties with the highest average, monthly standard deviation of precipitation from September to December, 0 otherwise. Source: NOAA and Sok Chul Hong .	
Coal:	1 if the county sits on a coal deposit, 0 otherwise. Source: USGS.	
Rural Pop. Dens.:	Labor force per square kilometer living in locations with less than 2.500 inhabitants in each county. Source: NHGIS (2011).	11.6272 (8.5352)
Wage:	Farm labor wage rates per day without board per state. Source: USDA (1942).	1.0778 (0.4033)
Urban Population Density:	Labor force per square kilometer living in locations with more than 2.500 inhabitants in each county. Source: NHGIS (2011).	3.7386 (26.1724)
Average Farm Size:	Average size of farms in square meters in a county. Source: NHGIS (2011).	657.0156 (454.4631)
Proportion of Black Population:	Proportion of black labor force relative to white labor force in the county. Source: NHGIS (2011).	0.2745 (0.2359)

Table 1: Summary of Variables.

	Sharecropping
Post Office	-1.2608***
	(0.2350)
Extra Controls	Yes
N	7,609
R-Squared	0.4313

Table 2: Regression using only Post Office Density.

	Sharecropping			
	(Rain)	(No Rain)	(Coal)	(No Coal)
Post Office	0.1631	-1.3329***	-2.4354***	-0.17697
	(0.5088)	(0.2600)	(0.3771)	(0.3013)
Extra Controls	Yes	Yes	Yes	Yes
N	3,825	3,784	2,384	5,225
R-Squared	0.4748	0.4150	0.5757	0.3856

Table 3: Regressions depending on whether the county is in the treatment *Rain* (*Coal*).

	Sharecropping			
	(1)	(2)	(3)	(4)
Post Office	-1.2608***	-1.5718***	-0.3859	-0.6864**
	(0.2350)	(0.2554)	(0..2741)	(0.2999)
Post Office×Rain		1.3987***		1.1433***
		(0.4344)		(0.4393)
Post Office×Coal			-2.3359***	-2.2122***
			(0.4198)	(0.4324)
Extra Controls	Yes	Yes	Yes	Yes
N	7,609	7,609	7,609	7,609
R-Squared	0.4313	0.4326	0.4353	0.4362

Table 4: Regressions including "Rain" and "Coal" treatments.

	Total Number of Farms			
	(1)	(2)	(3)	(4)
Post Office	-8136.097***	-9164.605***	-8646.363***	-9919.684***
	(1438.228)	(1598.948)	(1441.978)	(1622.31)
Post Office×Rain		4626.859		4844.600
		(3034.667)		(3052.646)
Post Office×Coal			1362.446	1886.879
			(2617.234)	(2657.851)
Extra Controls	Yes	Yes	Yes	Yes
N	7,609	7,609	7,609	7,609
R-Squared	0.4924	0.4928	0.4925	0.4928

Table 5: Regressions on the total number of farms.

| | Sharecropping | | |
	(Top Slaves)	(Bottom Slaves)	(Dif-in-Dif)
Post Office	-1.5873***	-1.3907***	-1.6708***
	(0.3569)	(0.2686)	(0.3524)
Post Office×Slave			1.5795***
			(0.3625)
Extra Controls	Yes	Yes	Yes
N	4,576	3,033	7,609
R-Squared	0.4733	0.4519	0.4385

Table 6: Regressions depending on whether the county is in the treatment *Slave*.

	Fixed Rent	Owner
Post Office	-0.7824***	1.4073***
	(0.1863)	(0.3020)
Post Office×Rain	0.0094	-1.2032***
	(0.3138)	(0.3607)
Post Office×Coal	1.9841***	0.2035
	(0.3226)	(0.3592)
Extra Controls	Yes	Yes
N	7,609	7,609
R-Squared	0.1980	0.4286

Table 7: Regressions on the number of fixed-rent farms over the total number of farms, and on the number of owner-run farms over the total number of farms.

Entrepreneurial Activity in 2014	
Highest	Lowest
Nigeria (39.9%)	Suriname (2.10%)
Zambia (39.9%)	Hong Kong (3.60%)
Cameroon (37.4%)	Japan (3.83%)
Uganda (35.5%)	Italy (4.42%)
Namibia (33.3%)	Russia (4.69%)

Definition: percentage of active population who are either a nascent entrepreneur or a owner-manager of a new business.

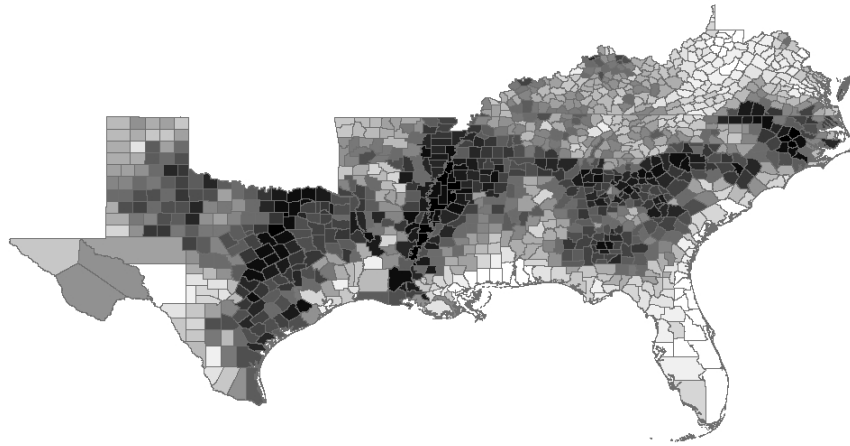Table 8: Top 5 and bottom 5 countries in terms of Entrepreneurial Activity. Source: The Economist.

Figure 1: Number of sharecropping farms over the total number of farms, 1880-1940 average. Source: US Census.
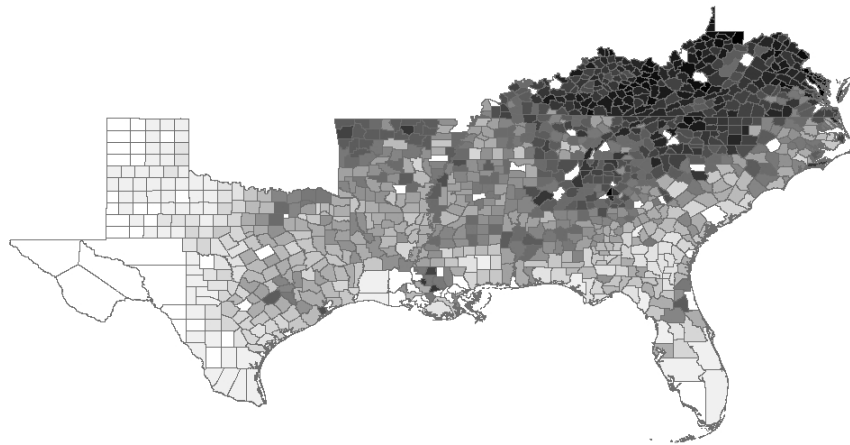

Figure 2: Post office density, 1880-1940 average. Source: Postal History.
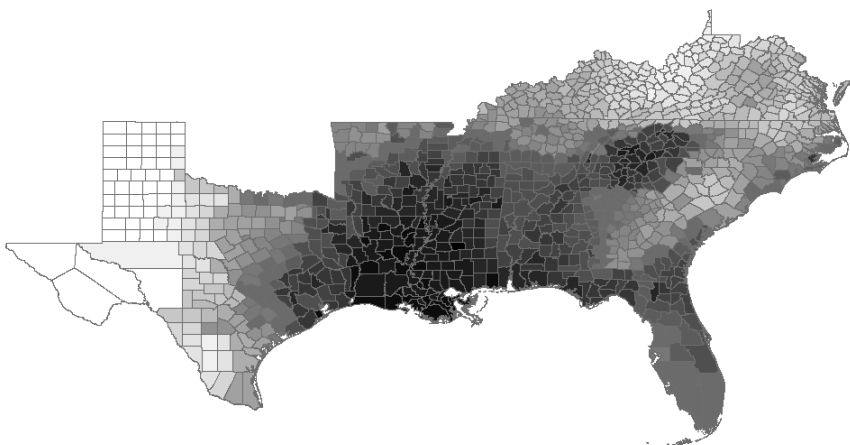

Figure 3: Standard Deviation of Precipitation during cotton harvesting, 1880-1840 average. Source: NOAA.
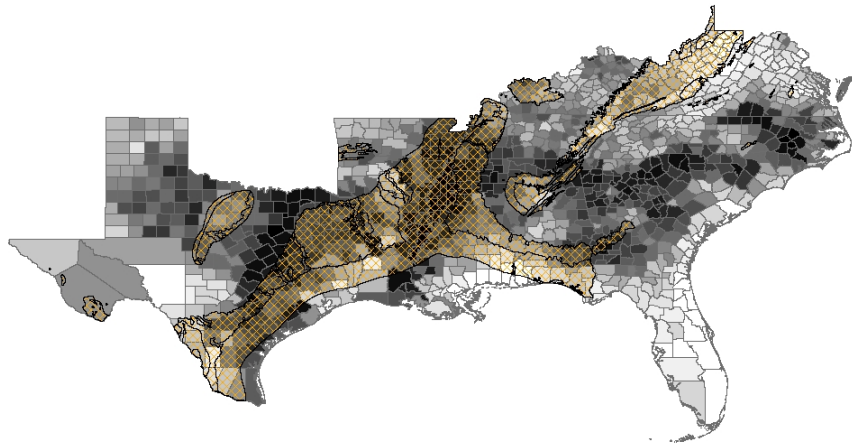
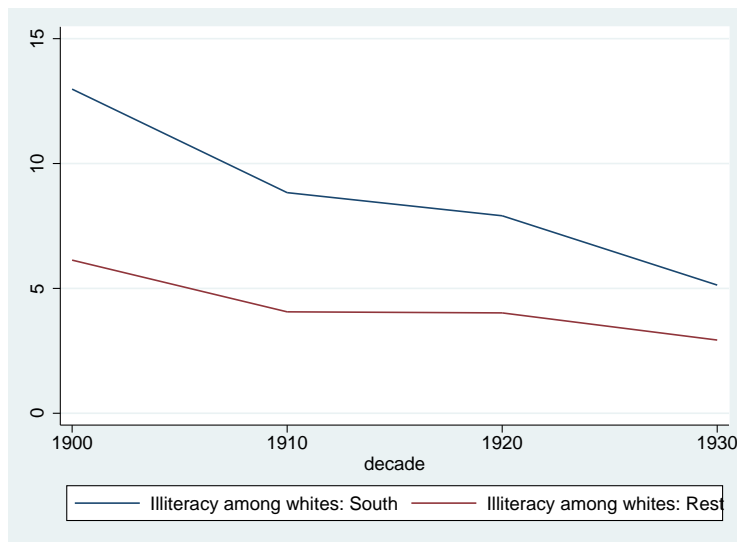Figure 4: Sharecropping Farms and Coal Deposits. Source: USGS.

Figure 5: Illiteracy rate of the white population in the South and in the rest of US. Source: NHGIS (2011).
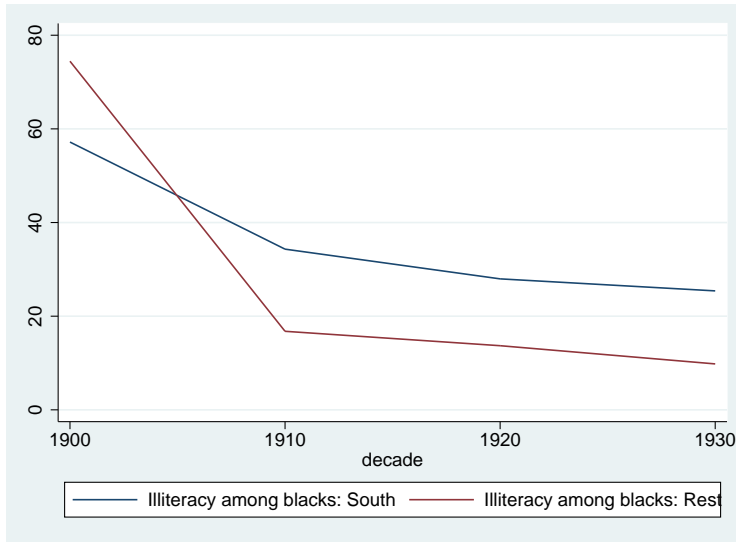
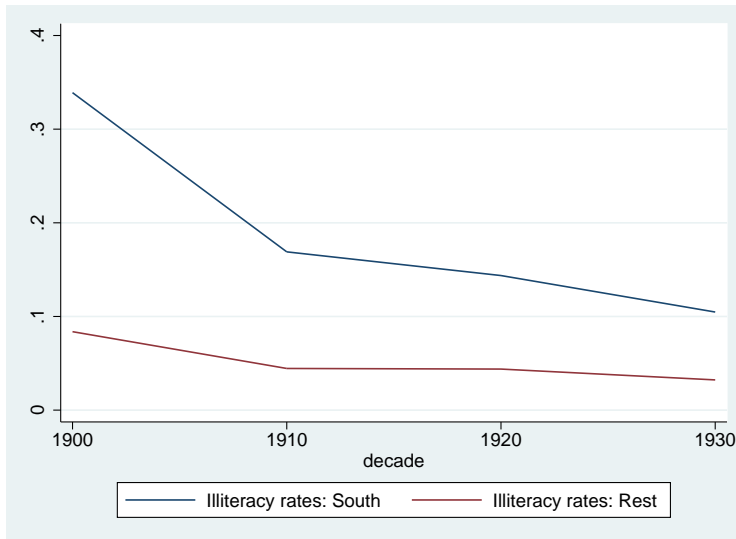Figure 6: Illiteracy rate of the black population in the South and in the rest of US. Source: NHGIS (2011).

Figure 7: Illiteracy rate of the whole population in the South and in the rest of US. Source: NHGIS (2011).
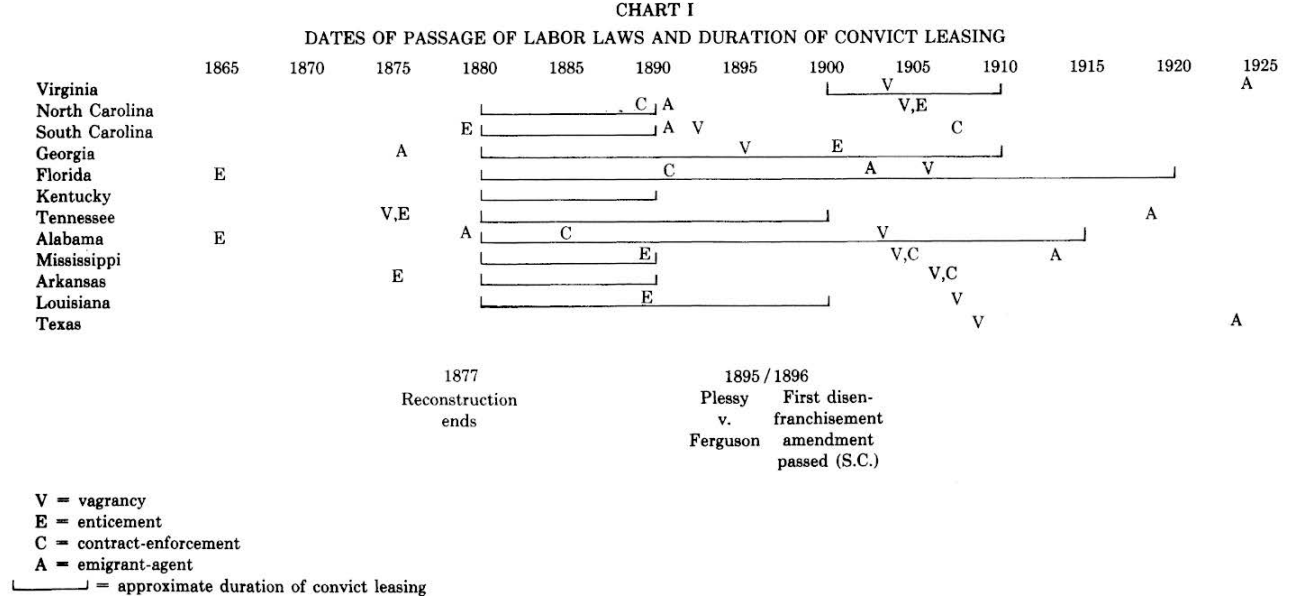
CHART I

DATES OF PASSAGE OF LABOR LAWS AND DURATION OF CONVICT LEASING

Figure 8: Laws restricting labor mobility approved across the South (1865-1925). Source: Roback (1984).

Appendix

A   Solution of the Model in Section 3

There are three thresholds that determine whether employees or employers are setting the proportion of sharecropping contracts. One of those thresholds also reveals whether all employers are active.

Wage Labor

Each employer sets a. Thus, $w = \frac{a^2}{2} + \bar{u}$ to satisfy the participation constraint of the employee. In equilibrium, $a = 1$, giving the employer:

$$\Pi^E_{wage} = \frac{1 - \beta^2 \sigma^2}{2} - \bar{u} - \delta \tag{A.1}$$

Therefore, wage labor is only profitable when employers have a δ lower or equal than δ_w:

$$\delta \leq \delta_w = \frac{1 - \beta^2 \sigma^2}{2} - \bar{u} \tag{A.2}$$

Notice that all employees working as wage laborers earn $\bar{u}$. That is, they are indifferent between the outside option and wage labor.

Sharecropping

The employee chooses effort such that $a = s$. Then, the employer chooses s to maximize his payoff facing the following participation constraint:

$$\frac{s^2}{2}\left(1 - \sigma^2\right) - \alpha \geq \bar{u} \tag{A.3}$$

The employers know the distribution of α. So, they set s so that all the employees with $\alpha \leq \alpha_s$ take the sharecropping contract:

$$s \geq s_s = \sqrt{2\frac{\bar{u} + \alpha_s}{1 - \sigma^2}} \tag{A.4}$$

The first-order condition of the problem can be used to find the optimal α_s after plugging $s = s_s$ in:

$$\alpha_s = \frac{1 - \sigma^2}{2}\left(\frac{1 + \sigma^2}{2 + \sigma^2}\right)^2 - \bar{u} \tag{A.5}$$

Thus, sharecropping gives the employer[17]:

$$\Pi^E_{share} = \frac{1}{2\left(2 + \sigma^2\right)} \tag{A.6}$$

Employees with $\alpha = \alpha_s$ working as sharecroppers earn $\bar{u}$, while all employees with $\alpha < \alpha_s$ working as sharecroppers earn more than $\bar{u}$. Thus, employees working as sharecroppers earn an information rent. That is consistent with the necessity of a premium for employers to convince employees to take sharecropping contracts in the Postbellum South (Alston and Ferrie, 1993).

Employer's choice

Employers choose sharecropping over wage labor when δ is such that $\Pi^E_{share} \geq \Pi^E_{wage}$:

$$\delta \geq \delta_s = \frac{1 - \beta^2\sigma^2}{2} - \frac{1}{2\left(2 + \sigma^2\right)} - \bar{u} \tag{A.7}$$

Thresholds and Proportion of Sharecropping Contracts

The discussion finds 2 key values on the δ continuum and 1 key value on the α continuum:

1. δ_w: employers with $\delta \leq \delta_w$ remain active.

2. δ_s: employers with $\delta \geq \delta_s$ use sharecropping contracts; employers with $\delta < \delta_s$ use wage labor contracts.

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[17]Note that $s \geq 1 \Leftrightarrow \alpha \geq \frac{1 - \sigma^2}{2} - \bar{u}$, which is always larger than the equilibrium α. That is, sharecropping never becomes unprofitable.

3. α_s: employees with $\alpha \leq \alpha_s$ choose sharecropping contracts. Otherwise, they choose to work as wage laborers or the outside option.

The δ values depend on β and $\bar{u}$, whereas the δ value is only a function of $\bar{u}$. Thus, it more convenient to study the behavior of the proportion of sharecropping contracts according to $\bar{u}$.

$1 - \delta_s$ employers want a sharecropping contracts, whereas α_s employees prefer a sharecropping contract. There is a $\bar{u}$ so that $1 - \delta_s \leq \alpha_s$:

$$\bar{u} \leq \bar{u}_l = \frac{1}{2} \left(\frac{1 - \sigma^2}{2} \left(\frac{1 + \sigma^2}{2 + \sigma^2} \right)^2 - 1 + \frac{1 - \beta^2 \sigma^2}{2} - \frac{1}{2(2 + \sigma^2)} \right) \tag{A.8}$$

That is, when $\bar{u} \leq \bar{u}_l$, $1 - \delta_s$ employers (employees) hire (work as) sharecroppers, and δ_w employers (employees) hire (work as) wage labor. Thus, the proportion of sharecropping farms to the total number of farms is given by:

$$\mathbf{p} = 1 - \delta_s \tag{A.9}$$

Only variations in β affect the proportion of sharecropping contracts. That is, turnover costs are the dominant force when $\bar{u}$ is quite low.

If $\bar{u} \geq \bar{u}_l$, employers are forced to choose wage labor where sharecropping was more desirable. Still, there is a $\bar{u}$ so that $1 - \delta_w \leq \alpha_s$:

$$\bar{u} \leq \bar{u}_h = \frac{1}{2} \left(\frac{1 - \sigma^2}{2} \left(\frac{1 + \sigma^2}{2 + \sigma^2} \right)^2 - 1 + \frac{1 - \beta^2 \sigma^2}{2} \right) \tag{A.10}$$

Basically, if $\bar{u} \leq \bar{u}_h$, there still enough employees taking sharecropping contracts to keep all employers active. So, α_s employees (employees) hire (work as) sharecroppers. $1 - \alpha_s$ employers (employees) hire (works as) wage labor. Thus, the proportion of sharecropping farms to the total number of farms is given by:

$$\mathbf{p} = \alpha_s \tag{A.11}$$

However, if $\bar{u} \geq \bar{u}_h$, some employers become inactive. Under these circumstances, α_s employers (employees) hire (work as) sharecroppers, and δ_w employers hire wage labor. Consequently, $(1 - \alpha_s)\delta_w$ employees work as wage laborers, whereas $(1 - \alpha_s)(1 - \delta_w)$ choose the outside option. Thus, the proportion of sharecropping contracts p over the total of farming contracts is below:

$$\mathbf{p} = \frac{\alpha_s}{\alpha_s + (1 - \alpha_s)\delta_w} \tag{A.12}$$

In summary, the proportion of sharecropping contracts, $\mathbf{p}$, in function of $\bar{u}$ is given by the following scheme:

1. $\mathbf{p} = 1 - \delta_s$ if $\bar{u} \leq \bar{u}_l$.

2. $\mathbf{p} = \alpha_s$ if $\bar{u} \in (\bar{u}_l, \bar{u}_h)$.

3. $\mathbf{p} = \frac{\alpha_s}{\alpha_s + (1-\alpha_s)\delta_w}$ if $\bar{u} \geq \bar{u}_h$.

Derivatives of Proportion of Sharecropping Contracts

Depending on the level of $\bar{u}$, the derivative of the proportion of sharecropping contracts is a function of the derivatives of α_s, δ_w, and or δ_0:

1. $\frac{\partial \mathbf{p}}{\partial t} = -\frac{\partial \delta_s}{\partial t}$ if $\bar{u} \leq \bar{u}_l$.

2. $\frac{\partial \mathbf{p}}{\partial t} = \frac{\partial \alpha_s}{\partial t}$ if $\bar{u} \in (\bar{u}_l, \bar{u}_h)$.

3. $\frac{\partial \mathbf{p}}{\partial t} = \frac{\delta_w \frac{\partial \alpha_s}{\partial t} - \alpha_s(1-\alpha_s)\frac{\partial \delta_w}{\partial t}}{(\alpha_s + (1-\alpha_s)\delta_w)^2}$ if $\bar{u} \geq \bar{u}_h$.

The derivatives of δ_s and δ_w relative to $\bar{u}$ and β:

1. $\frac{\partial \delta_s}{\partial \bar{u}} = \frac{\partial \delta_w}{\partial \bar{u}} = -1$.

2. $\frac{\partial \delta_s}{\partial \beta} = \frac{\partial \delta_w}{\partial \beta} = -\beta\sigma^2$.

The derivatives of α_s relative to $\bar{u}$ and β:

1. $\frac{\partial \alpha_s}{\partial \bar{u}} = -1$.

2. $\frac{\partial \alpha_s}{\partial \beta} = 0$.

Therefore, the derivative of the proportion of sharecropping contracts relative to $\bar{u}$:

1. $\frac{\partial \mathbf{p}}{\partial \bar{u}} = 1$ if $\bar{u} \leq \bar{u}_l$.

2. $\frac{\partial \mathbf{p}}{\partial \bar{u}} = -1$ if $\bar{u} \in (\bar{u}_l, \bar{u}_h)$.

3. $\frac{\partial \mathbf{p}}{\partial \bar{u}} = \frac{\alpha_s(1-\alpha_s) - \delta_w}{(\alpha_s + (1-\alpha_s)\delta_w)^2}$ if $\bar{u} \geq \bar{u}_h$.

Therefore, the derivative of the proportion of sharecropping contracts relative to β:

1. $\frac{\partial \mathbf{p}}{\partial \beta} = \beta\sigma^2$ if $\bar{u} \leq \bar{u}_l$.

2. $\frac{\partial \mathbf{p}}{\partial \beta} = 0$ if $\bar{u} \in (\bar{u}_l, \bar{u}_h)$.

3. $\frac{\partial \mathbf{p}}{\partial \beta} = \beta\sigma^2 \frac{\alpha_s(1-\alpha_s)}{(\alpha_s + (1-\alpha_s)\delta_w)^2}$ if $\bar{u} \geq \bar{u}_h$.

The total effect of post offices on sharecropping contracts, that is, $\frac{\partial \mathbf{p}}{\partial \bar{u}} + \frac{\partial \mathbf{p}}{\partial \beta}$:

1. $1 + \beta \sigma^2$ if $\bar{u} \leq \bar{u}_l$.

2. -1 if $\bar{u} \in (\bar{u}_l, \bar{u}_h)$.

3. $\frac{\left(1 + \beta \sigma^2\right) \alpha_s (1 - \alpha_s) - \delta_w}{(\alpha_s + (1 - \alpha_s) \delta_w)^2}$ if $\bar{u} \geq \bar{u}_h$.

The last case deserves further inspection. In order to $\frac{\partial \mathbf{p}}{\partial \bar{u}} + \frac{\partial \mathbf{p}}{\partial \beta} < 0$ when $\bar{u} \geq \bar{u}_h$:

$$\beta < \bar{\beta} = \frac{1}{\sigma^2} \left(\frac{\delta_w}{\alpha_s (1 - \alpha_s)} - 1 \right) \tag{A.13}$$

That is, turnover costs must be low enough so that $\bar{p}$ decreases with the number of post offices.

Notice that the total number of active employers always decreases on $\bar{u}$ and β when $\bar{u} \geq \bar{u}_h$. The derivatives of the active employers to $\bar{u}$ and β:

1. $\frac{\partial (\delta_w + \alpha_s)}{\partial \bar{u}} = -2$

2. $\frac{\partial (\delta_w + \alpha_s)}{\partial \beta} = -\beta \sigma^2$

Thus, it is clear that $\frac{\partial (\delta_w + \alpha_s)}{\partial \bar{u}} + \frac{\partial (\delta_w + \alpha_s)}{\partial \beta} < 0$.