

The effect of serfdom on labor markets[†]

Peter Sandholt Jensen Cristina Victoria Radu Battista Severgnini Paul Richard Sharp

Department of Business and Economics, University of Southern Denmark

Campusvej 55, DK-5230 Odense M, Denmark

Abstract

This research contributes to the debate on whether restrictions on labor mobility, such as serfdom and other types of labor coercion, matter for labor market outcomes. To do so, we estimate the impact of a large shock to labor mobility in the form of the reintroduction of serfdom in Denmark in 1733 which was targeted at limiting the mobility of farmhands. While many economists, historians and others have argued that serfdom mattered, revisionist historians have countered that workers found ways to circumvent the restrictions imposed by serfdom. Using a unique data source based on 18th century estates, we test whether serfdom affected the wages of farmhands more strongly than other groups in the labor market using a differences-in-differences approach, and find evidence consistent with a strong negative effect on serfdom following its introduction. We also investigate whether one mechanism was that boys with rural backgrounds were prevented from taking up apprenticeships in towns, and find suggestive evidence that this was indeed the case. Thus, our results suggest that serfdom did matter.

Keywords: Serfdom, labor mobility, coercion

JEL Classification:

[†] We thank Philipp Ager, Casper Worm Hansen, Christian Skovsgaard, Nico Voigtländer and seminar participants at University of Copenhagen and University of Southern Denmark for useful comments and suggestions. All errors are ours. The research in this paper was supported by a grant from the *Danish Agency for Science, Technology and Innovation*.

Jensen is corresponding author (phone: +45-65504472). E-mail addresses: Jensen (psi@sam.sdu.dk), Radu (cvr@sam.sdu.dk) and Sharp (pauls@sam.sdu.dk).

The Effect of Serfdom on Labor Markets

1. Introduction

A key transformation in the history of Europe was the move from feudal labor markets to modern labor markets in which people can choose where to work and live as pointed out by Acemoglu, Johnson and Robinson (2005:p.440). According to these authors, feudal institutions such as serfdom undermined incentives and led to underdevelopment “by restricting labor mobility and by removing the role of the labor market in allocating jobs.” (p. 441). Many historical accounts are largely in line with this view,¹ but as pointed out by e.g. Dennison (2006, p.77), revisionist historians have suggested that farmhands found ways of getting around the restrictions associated with serfdom for which reason the effects would be negligible.²

To inform this debate, the present paper provides new quantitative evidence on the effects of serfdom on the labor market by exploiting the reintroduction of serfdom in Denmark in 1733 which were targeted at tying male farmhands to the estate in the area in which they were born. Agricultural workers were largely unskilled, and as they were bound to a given estate this is likely to decrease their outside option, and thus their wages. This means that their wages are likely to decrease compared to other groups in the labor market as e.g. the mobility of craftsmen would be much less affected by serfdom.³ Serfdom could also serve to prevent young men from the countryside from moving out of the rural sector via an apprenticeship in a town.

We exploit a unique micro-level dataset, which contains information on the wages, occupation and geographical location as well as other characteristics of individuals selling their labor to an estate. This allows us to evaluate whether there was a differential impact on the farmhands as compared to other

¹ Recent examples include Ogilvie (2007) and Ogilvie and Carus (2014).

² See e.g. Hagen’s (2002) study of Prussia, which emphasizes that serfdom and growth were compatible or the discussion in Clark (2007:pp.220-223)

³ Bobonis and Morrow (2010) show that when unskilled labor is coerced to work for e.g. landowners, then the relative wage of skilled workers increase. We return to potential mechanisms in Section 6.

groups in the labor market in a differences-in-differences approach. Given that the micro-level nature of the data it allows us to control for common year effects, fixed effects for occupation, region, gender, and we can control for many confounding factors. We can also investigate the presence of pre-existing trends by e.g. controlling for year fixed effects which vary by geographical area. We complement this analysis with suggestive evidence on reduced opportunities for apprenticeship for young men from rural areas after serfdom was introduced using micro data for apprentices.

Apart from the unique data source and the possibility to implement differences-in-differences estimation, studying the case of serfdom in Denmark also has a number of other advantages. First, while there are many historiographical analyses of serfdom (e.g. Domar, 1970; North and Thomas, 1971; Brenner, 1976), there is relatively little quantitative evidence on the effects of serfdom on labor market outcomes for Western Europe. The reason is that serfdom ended in the early sixteenth century in most of Western Europe which means that data are largely unavailable. Some evidence exists for Eastern Europe (as discussed below) where the emancipation of the peasantry came much later, see e.g. Persson and Sharp (2015, p.90-97). Denmark is an exception to the common Western European pattern as the data described above pertain to the period in which serfdom was re-introduced, as also pointed out by Rudé (1972, p. 31), who refers to Denmark as the “only major exception to the sharp east-west antithesis”. Thus studying the re-introduction of serfdom in Denmark offers a unique possibility to study the impact of serfdom on a western European country. Second, the rules regarding serfdom were gradually changed to pertain to bigger age groups. In 1733, serfdom implied that a farmhand in the age group 14-36 years could not leave the estate which he belonged to from birth. The age group was extended to 9-40 years in 1742; and to 4-40 in 1764. The reform of 1788 meant that the age group was yet again 14-36 years. This allows us not only to investigate the immediate effect of serfdom under the 1733 rules, but we can also dig into whether tightening the rules was effective.

Our paper contributes to the quantitative literature on the effects of serfdom, as well as to the broader literature on institutions and policies that restrict labor mobility. Quantitative studies of serfdom include Domar and Machina (1983), Nafziger (2012) and Klein and Ogilvie (2013). Domar and

Machina (1983) study the correlates of the prices of serfs in the context of Russia; Nafziger (2012) studies the impact of abolishing serfdom in Russia for the non-farm activity of serfs as compared to non-serfs; Klein and Ogilvie (2013) study the non-farm activity of peasants using cross-sectional data from Bohemia in the present day Czech Republic. None of these studies focus on wage effects due to mobility restrictions, none of them evaluate the impact of the introduction of serfdom, and finally all of them focus on Eastern European serfdom.⁴

Our paper is also strongly related to evidence on the effects of other historical institutions that limited labor market mobility. Naidu (2010) presents an analysis of anti-enticement fines and demonstrates that these reduced the mobility of share croppers using data for Arkansas. He also provides suggestive evidence that these laws reduced state level agricultural wages in the American south. Naidu and Yuchtman (2012) study the impact of the master and servant law, which made breach of contract a criminal offence in Great Britain. They study how the number of prosecutions responds to demand shocks as well how county level wages responded to the abolition of the law with the effect being larger in areas with more prosecutions. Two features of our study sets it apart from these studies. First, we focus on serfdom which is the prime example of an institution reducing labor mobility in historical Europe. Second, we can use individual level data in our differences-in-differences estimation as well as individual level data on whether apprentices were recruited from the countryside.

Our paper also speaks to the literature on restrictions on labor mobility in developing countries today as pointed out by many authors. One example is Genicot (2002, p. 102), who notes that: “The incidence of bonded labor and serfdom has been amply documented throughout history and in all parts of the world. [...] Perhaps less well-known is the extent to which these institutions persist in more recent times.” Acemoglu and Wolitzky (2011) concur with this observation and argue that labor transactions throughout most of history and a significant fraction of such transactions in developing countries today are coercive.⁵ Yet another example is the Chinese Hukou system, which serves to

⁴ Ogilvie and Edwards (2000) analyze data for Bohemian villages, but do not consider the effects on wages.

⁵ Coerced labor has been a persistent feature in developing countries such as Brazil, India and Pakistan throughout the twentieth century, see the contributions in Andrees and Belser (2009).

restrict rural-urban migration, see Whalley and Zhang (2007) who provide model simulations of the impacts of this system. Our empirical analysis provides evidence from plausibly exogenous variation so as to cast light on the quantitative impact of mobility restrictions, which is arguably difficult in a modern context.

We finally speak to the historiographical literature on serfdom. This is relevant for the eastern European and Russian contexts. It is clearly also relevant for the Danish historical context. Mirroring the international literature, the traditional view has been that serfdom was effective in restricting mobility and wage growth for farmhands. The Danish economic historian Hansen (1984, p. 43), for example, suggested that serfdom was effective in securing the estates a cheap, dependent labor force. In a similar vein, Andersen et al. (2004, p.46) argue that ‘access to unfree labor supplied by the adscripted men on the estate must have guaranteed an upper ceiling for the wages of others.’⁶ By contrast, Løgstrup (1987, 1988) takes a view closer to that of revisionist historians, and emphasizes the existence of some geographical mobility.

None of these authors offer econometric analyses for these assertions and, with unique data at hand, this paper will begin to fill this gap in our understanding of serfdom.

The rest of the paper is organized as follows. Section 2 gives a brief history of serfdom in Denmark. Section 3 describes the empirical strategy. Section 4 describes the data. Section 5 presents the analysis. Section 6 offers interpretation and discusses mechanisms, whereas Section 7 concludes.

2. Historical background

This section briefly details the history of serfdom in Denmark so as to inform our investigation of its labor market implications. We first discuss the early serfdom which applied to only part of the country

⁶ The traditional view can be traced back at least to Falbe-Hansen (1888). The Danish literature often uses adscription rather than serfdom to refer to the fact that people living in the countryside were bound to the land.

(the eastern islands of Zealand, Lolland and Falster). Next, we discuss the introduction of serfdom in 1733. Finally, we discuss the changes made to serfdom during the 18th century.

Early serfdom – vornedskab

At the end of the 15th century, serfdom known as vornedskab was established on the eastern islands of Denmark. As is also true for the re-introduced serfdom it was directed at male farmhands. Christensen, Milthers and Hansen (1934, p.40) note that the sons of farmhands were tied to the same estates as their fathers. Thus, they were not at liberty to move. Farmhands would not be the property of a landlord, but they were tied to a particular estate. If the farmhand could pay a fee, he could be allowed to work elsewhere. While the farmhands were not slaves, Christensen et al. (1934) does mention that the buying and selling of farmhands by landlords did take place. While there were earlier attempts at abolishing the “vornedskab”, it was not until 1702 that it was finally abolished, and then only for children born after 25th August 1699. This leads Munch (1974, p.308) to conclude that it would not start to have any effect until 1717, when the first free workers would start to enter the labor market.

Reintroduction of serfdom

As mentioned in the introduction, serfdom was reintroduced in 1733 for all males in the age group 14 to 36 years old, and this time for the whole of the country. It was mainly aimed at ensuring farmhands for the estates, but in principle every male in the age group 14 to 36 years was now tied to the estate. According to Olsen (1933, p. 63), the main motivation was to ensure low wages in the agricultural sector as run by the estates. Prior to 1733, farmhands had become freer at least de jure (Olsen, 1933: p.64) due to the abolition of the early serfdom on the eastern islands. Yet, in the western part of the country, they had not been limited in their mobility prior to 1733 to the same extent. Following the great Nordic war from 1709-1720 (Christensen et al., p. 71), agricultural prices had been in decline which turned into an agricultural crisis, which gave the landlords momentum for getting support for re-introducing serfdom from the government. Domar (1970) proposed a theory of serfdom introduction based on scarcity of labor as compared to land. The Danish historical narrative is in line

with this except that serfdom was introduced by the political system, which Domar himself acknowledged is not in his model. Our test is on the impact in of serfdom, but Domar's theory indicates that the agricultural crisis or the end of *vornedskab* could have been important for which reason we investigate whether there were early impacts prior to serfdom.

Tightening and abolition of serfdom

From 1742, serfdom was tightened to the age group 9 to 40 years old. Further edicts from the 1740s link the reduced mobility to the presence of cattle plague (Christensen et al., p. 75). From 1764, serfdom was further tightened to the age group 4 to 40 years. As part of wider agrarian reforms, serfdom reverted to the 1733 version in 1788 and was finally abolished in 1800.⁷

3. Empirical strategy

We begin our analysis by focusing on the period 1705-1741 which includes the year in which serfdom was re-introduced (1733) but ends before the rules regarding ages where changed in 1742. We focus on this period for three reasons. First, as mentioned above this was when the first shock to mobility occurred and likely to be the largest shock to the mobility of farmhands. Second, the fact that serfdom was tightened subsequently could indicate a reaction on the part of landlords to wage developments, and for this reason subsequent shocks are less likely to be exogenous as compared to the initial shock. Third, starting in the 1740s, the rural economy was hit by cattle plague, and so to ensure that results are not driven by this, we focus on the initial period. Further, the subsequent period is quite long and presumably many other shocks could have affected unskilled workers. For the period 1705-1741, we estimate the following regression model for the log of wages lnw_{it} :

$$lnw_{it} = \alpha_0 + \alpha_t + \alpha_r + \alpha_g + \alpha_s + farmhand_{it}serfdom_{1733}\beta + \varepsilon_{it},$$

⁷ The agrarian reforms also included the enclosure movement, see e.g. Christensen (1925)..

i indicates individual and t indicates time. Moreover, α_o indicates fixed effects for occupation, α_t indicates year fixed effects, α_r indicates region fixed effects⁸, α_g is a dummy for gender, α_s is a dummy for season, $farmhand_{it}$ indicates whether the individual observed is a farmhand, and finally $serfdom_{1733}$ is a dummy which is equal to 1 from 1733-1741. The parameter of interest is β , which measures the impact of serfdom on the farmhands.

We also estimate rolling regression models in which we evaluate whether wages responded to subsequent changes to the age group to which serfdom applied. Thus, for the period 1733-1763, we estimate an equation similar to the one above, but now we turn the treatment on in 1742:

$$\ln w_{it} = \alpha_o + \alpha_t + \alpha_r + \alpha_g + farmhand_{it} serfdom_{1742} + \varepsilon_{it},$$

We estimate similar equations for subsequent period.

Finally, taking advantage of the fact that we have data after 1741, we estimate the following flexible model:

$$\ln w_{it} = \alpha_o + \alpha_t + \alpha_r + \alpha_g + farmhand_{it} serfdom_{1733} \beta_1 + farmhand_{it} serfdom_{1742} \beta_2 + farmhand_{it} serfdom_{1764} \beta_3 + farmhand_{it} relaxation_{1788} \beta_4 + \varepsilon_{it},$$

Here $serfdom_{1764}$ is a dummy from 1764-1787, $relaxation_{1788}$ is a dummy for the period 1788-1799. We also estimate versions of this model in which we impose $\beta_1 = \beta_2 = \beta_3 = \beta_4$. While using more periods allow for more data, this test suffers from the fact that we cannot keep the same estates in the dataset and that many other things are going on at this stage such as the cattle plague, the enclosure movement and so on.

4. Data

For the purpose of implementing the aforementioned regression models, we need a measure of individual (log) wages as well as an indication of which individuals are unskilled farmhands.

⁸ We include region fixed effects as the literature argues that the group of manor owners must have comprised a kind of employer organisation at the regional level, and they may have had some agreements on wages.

Fortunately, it turns out that for the eighteenth century, a vast amount of data was collected by the Danish Price History Project, which was started at the University of Copenhagen in 1939 and terminated in 2004. The data were collected from accounts and material from the Danish government, the royal court and its property, the army, firms, churches, and from local and private archives. Although these data are referenced and briefly summarized in the two-volume *History of Prices and Wages in Denmark 1660-1800*, they have not otherwise been exploited. The period covered is 1660-1800, which overlaps the age of absolutism, and represents a unique dataset on labor and product markets during that time, unrivaled to our knowledge in detail by anything available for other countries. For our purposes, we need a measure for our left hand side variable, namely wages. Radu (2015) details how the wage data are harmonized at the individual level, though we note that the wage series have been corrected for in-kind payments. We are not able to track individuals across time, but we have data for individuals working for a total of 16 estates in the full dataset covering 1705-1799.⁹ This implies that the dataset consists of repeated cross-sections available at an annual level. For measuring whether a person is a farmhand, we use the fact that we have information on occupation, which we have coded according to the HISCO system (Historical International Standard of Classification of Occupations).¹⁰ We code as farmhands those who are designated as “farm laborers”, “day laborers” and “laborers”¹¹ as our baseline, but also consider specifications in which we only use “farm laborers”, which arguably captures most closely those who worked the field. To provide an impression of the data, Table 1 summarizes data for the three regions of Jutland, Funen and Zealand. The table reveals that for many estates, we do not have observations in the period which contains the reintroduction of serfdom (1705-1741), and data are thickest for the period 1764-1787. The majority of farmhands for whom we have data are those who were allowed to work on other estates (see

⁹ We only have data for five years after serfdom was abolished, and 98% of these data are for the years 1800 (330 observations) and 1801 (64 observations). As this is likely to be too short a period for abolition to have had detectable effect we end the sample in 1799. We also note that the number of observations is falling from 1800 to 1805. Yet, we show below that our results do not depend on excluding these observations.

¹⁰ See <http://historyofwork.iisg.nl/>.

¹¹ Farm laborers perform a variety of tasks in growing crops and breeding and raising livestock according to the HISCO classification scheme. Laborers performs lifting, carrying, stacking, shoveling, digging, cleaning and similar tasks by hand, using simple laboring tools such as pick, shovel, wheelbarrow and street broom where necessary. Day laborers perform the same range of tasks as laborers using the same types of tools as a laborer (9-99.10), but is specifically hired and paid by the day.

Olsen, 1950) for wages temporarily. Yet, we stress that given that landlords had the right to make the local peasants stay to farm the land on their estates, the wages of those who were allowed to move even temporarily is also likely to be affected.

Table 1 about here

Other than occupation and wages, the data also provide information on gender, the season of the year that the work was carried out, job title (master or ordinary craftsmen), whether the individual is a child, and the location of the individual as given by region and estates.

Figure 1 about here

5. Results

We begin by discussing the main results for the introduction of serfdom using the period 1705-1741. Then we discuss the rolling estimates followed by the flexible estimates for the full dataset. We conclude the results section by discussing a number of robustness checks.

Main results

We report the main results in Table 2. Column 1 shows a negative and significant estimate of β , which is consistent with the view that serfdom did affect farmhands more strongly compared to other groups in the labor market. In column 2, we begin to investigate whether there are pre-existing trends in the form of the abolition of the early serfdom as discussed above. As this would start to matter from 1717, when the first farmhands who were free of early serfdom turned 18, we interact a dummy for 1717-1732 with farmhand and obtain a positive yet statistically insignificant estimate to this variable. Next in column 3, we add year by Jutland and Funen fixed effects to control for the possibility that these regions followed a different path for wages due to the fact that they never experienced early serfdom. The result is similar to what we observe in column 1 for the effect of serfdom. Next, we investigate whether serfdom affected women differentially as they were not affected by the rules. The results suggest that they were not affected directly, but they did fare better

relative to farmhands. Column 5 uses tighter fixed effects for estates (replacing region fixed effects). The coefficient is reduced in size, but remains significant. Moreover, the 95% confidence interval contains the point estimate given in column 1. In column 6, we add estate by year Fixed effects to allow the unobservables to exert a differential impact over time at the level of the estate. In column 7, we use an alternative measure of farmhands using only those identified as farm laborers, and we get similar, yet much stronger results. This may suggest some measurement error in our original measure. Finally in column 8, we add categories that have more human capital. Masons did experience higher wages than farmhands, but not higher wages than everyone else. Yet, this is true for teachers, who are likely to be more mobile than everyone else. This effect could be due to the supply of teachers contracting over time, as those able to become teachers may have e.g. migrated out of the country.

Table 2 about here

Rolling regressions & Flexible estimates

We next investigate whether the changes to serfdom mattered for wage differences subsequently. We begin by showing rolling regressions for the periods 1705-1741, 1733-1763, 1764-1788 as described above. The overall finding is that changing the rules did not matter for how serfdom affected the wages of farmhands, see columns 2-4 in Table 3. We also investigate whether there are any significant effects of an interaction which is 1 in the period 1717-1732 for farmhands to capture the impact of the abolition of early serfdom, when we estimate on data for 1705-1732. We obtain a coefficient equal to -0.06 with a standard error of 0.09. Further, as an alternative timing we consider 1721-1732, which is the period of falling agricultural prices. The coefficient is -0.055 with a standard of 0.13. This suggests the absence of strong pre-trends and that rising wages drove the adoption of serfdom.

Table 3 about here

We obtain similar results for the different periods when we consider flexible estimations. Column 1 shows the baseline model with a common coefficient for all periods. The coefficient is smaller than

that observed in column 1 of Table 4 described above, but the confidence interval contains the coefficient from the smaller sample. Column 2 shows the flexible specification which allows for differential effects in each sub-period. There is a tendency for the coefficients to become smaller over time even when the rules are tightened. This could suggest that serfdom is becoming less effective over time, yet we cannot reject the hypothesis that the coefficients are equal for all for periods. Columns 3 and 4 add Funen and Jutland time fixed effects. This leads to a coefficient that is smaller though precision is reduced and the data are consistent with the coefficient being equal to the one given in column 1. Column 4 shows the same pattern as in column 2, though the coefficients are lower. Again, that coefficients are similar across time cannot be rejected. In column 5, we test again whether early serfdom mattered, and find again that it does not.

Table 4 about here

Robustness

We consider three robustness checks. First, we investigate the importance of including other potentially unskilled groups in the comparison group in Table 5, which shows that results are not driven by any other unskilled group. Second, we investigate the effect of dropping women or children. Without women, the coefficient to $\text{farmhand} \times \text{serfdom}$ equals -0.39 with a standard error of 0.16 using the same specification as in column 1 in Table 2. The coefficient suggests a larger effect, but is still in the same ballpark. Similarly without children, the coefficient becomes -0.36 with a standard error of 0.175. Thus, the inclusion of women and children are not in any way driving results. Finally, we consider different types of clustering. In Tables 2 to 5, we use clustering by estate,¹² but we could equally cluster by occupation as these would be similar labor markets. We could also cluster by both estate and cluster. Results for different types of clustering are shown in Table 6. We also note that one may be concerned about the low number of clusters when clustering by estate. Yet, we show that our results are robust to different types of clustering.

¹² Ideally, we would cluster by region, but this is not feasible as we have only three regions.

Table 5 and 6 about here

6. Discussion

All the results presented are consistent with the view that farmhands were negatively affected by the introduction of serfdom. In this section, we discuss interpretations as well mechanisms.

We noted that serfdom has partly been seen as a response to an agricultural crisis with falling prices beginning after 1720. Yet, we note that wages of farmhands were not statistically significantly different from other groups in society in the period 1717-1732, which marks the time that abolishment of *vornedskab* would start to work, which would relate to some of the underlying scarcity. The same is true if we use an interaction for the period 1721-1732, which marks the period after the great northern war and the time at which prices started falling.

Our results necessarily allow for a number of mechanisms as to why the wages of farmhands are relatively low. One mechanism alluded to in the introduction is that farmhands could to a lesser extent exert their outside option by getting jobs at other estates as compared to craftsmen. The relatively stronger mobility of craftsmen may be attributed to the fact that they could more easily find jobs outside the village due to their education (Løgstrup, 1988) or they might have better options if they were to run away and migrate to another country (Olsen, 1933). Olsen (1933, p. 75) argues that the young craftsmen tied to an estate could easily find jobs abroad, and also argue that they were relatively numerous among those that ran away.

A related mechanism is that the supply of apprentices coming to the cities from the rural areas would contract as also suggested by Olsen (1933). If serfdom prevented young men from moving to other occupations, this would tend to weaken their outside options. This could also lead to a shortage in craftsmen in both cities and the rural sector which would mean that the relative wages of farmhands would decrease. To get some suggestive evidence on this mechanism, we employ micro-level data for the city of Odense for which information of the birthplaces of apprentices has been coded. These data

include information on what type of guild the apprentice joined (e.g. for shoemakers, tailors etc.) with data points for 1700-1790 yielding a total of 516 observations.¹³

While we cannot employ a differences-in-differences approach in this setting, it is possible to test whether the probability the apprentice is recruited from the countryside declines from 1733. We do this by estimating the following linear probability model:

$$pr(\text{apprentice from country side} = 1) = \alpha_{\text{guild}} + \text{serfdom}_{1733-1790}\gamma + \varepsilon_{it},$$

α_{guild} indicates a guild fixed effects and γ indicates the effect of serfdom on the probability of recruiting from the country. Now $\gamma < 0$ would be consistent with this mechanism. When we estimate the model, we find that $\check{\gamma} = -0.267$ (standard error clustered by guild = 0.028). Though, this could possibly indicate a general, negative trend for potential apprentices from the country unrelated to serfdom, we find that this is implausible given our evidence on rural wages.

We can also test whether the changes to serfdom mattered by allowing for separate coefficients for the four periods by estimating the following model:

$$pr(\text{apprentice from country side} = 1) = \alpha_{\text{guild}} + \text{serfdom}_{1733}\gamma_1 + \text{serfdom}_{1742}\gamma_2 + \text{serfdom}_{1764}\gamma_3 + \text{serfdom}_{1788}\gamma_4 + \varepsilon_{it},$$

The estimated equation becomes:

$$pr(\text{apprentice from countryside} = 1) = \alpha_{\text{guild}} - \text{serfdom}_{1733}0.188 - \text{serfdom}_{1742}0.309 - \text{serfdom}_{1764}0.251 - \text{serfdom}_{1788}0.24 + \varepsilon_{it},$$

The coefficients are all negative and statistically significant. Moreover, they are statistically different from each other. This suggests that changes to the affected age groups did matter for those who wanted to become apprentices – especially the tightening in 1742 seems to have mattered. Holmgaard (2003) argues that the background for changing the age to 9 years old was that the younger residents of the estate left before serfdom would apply to them.

¹³ We do not have data points for each year meaning that for some years we have at least one observations, whereas for others we have none.

As a final test of this, we investigated whether we observe effects in case we only estimate on data from 1733, and then code the dummy as 1 from 1742. We find that there is a negative coefficient, which is statistically significant at the 10% level, and so this suggests that the observed pattern is associated with serfdom and not simply general trends. The tightening in 1764 does not seem to have changed much and we find no detectable difference between the period 1742-1763 and the period 1764-1790. This may suggest that reducing the lower age from 9 to 4 would not matter much for the supply of apprentices.

In sum, these results suggest that possibilities for becoming apprentices for young men from the countryside diminished after serfdom as well as the tightening of the rules. As mentioned, there are other plausible mechanisms, and while we do not know whether the effect on recruitment of apprentices from serfdom is more or less important than migration out of the country, its presence suggests that labor markets were, in fact, affected by serfdom.

7. Conclusion

This paper offers new quantitative evidence on the impact of serfdom on the labor market by considering the effects of the wages on farmhands. The evidence is consistent with the more traditional historical view that serfdom did matter. We do, however, find indications that serfdom lost strength over time. Yet, from a statistical point of view, we cannot reject that the effect stayed the same. While, it is plausible that runaways as well as other ways to leave an estate alleviated the effect of serfdom, it appears to have kept wages down.

Thus, this evidence is more in line with the view that institutions such as serfdom did matter as suggested by economists and economic historians such as Acemoglu et al. (2005) and Ogilvie (2007, 2014). Our evidence can therefore be read as suggesting that restrictions on mobility do have negative impacts on the labor market and development overall.

Nonetheless, it should be recalled that serfdom may not only have had negative impacts. Olsen (1933), for example, links serfdom with the adoption of the labor intensive field system of

Koppelwirtschaft, which in the Danish context was associated with the establishment of modern dairying. Recent work by Jensen, Lampe, Sharp and Skovsgaard (2015) suggests that the dairies established in the 18th century were important for spreading knowledge on how to run dairies to ordinary peasants in the late 19th century. Since the cooperative dairies established in this period played a large role in the Danish economic take-off, it is possible that serfdom played some role. Research on other contexts (See Dennison, 2006) also highlight that serfdom may have had some positive effects, and we believe that investigating whether this was, in fact, the case is an important topic for future research.

References

- Acemoglu, D., S. Johnson, and J. Robinson (2005). 'Institutions as a Fundamental Cause of Economic Growth.' In Aghion, P. and S. Durlauf (eds). *Handbook of Economic Growth*. Amsterdam, Holland, North-Holland.
- Acemoglu, D. and A. Wolitzky (2011). The economics of labor coercion. *Econometrica* 79: 2, pp. 555–600
- Andersen, D.H. and E.H. Pedersen (2004). *History of Prices and Wages in Denmark: 1660-1800. Volume II*. Copenhagen: Schultz Grafisk.
- Andrees, B., and P. Belser (2009). *Forced Labor: Coercion and Exploitation in the Private Economy*. Lynne Rienner Publishers: Boulder, CO.
- Bobonis, G.J. and P. Morrow (2010). *Labor Coercion and the Accumulation of Human Capital*. Mimeo.
- Brenner, R. (1976). Agrarian Class Structure and Economic Development in Pre-Industrial Europe. *Past & Present* 70: pp. 30-75.

Christensen, O., Milthers, A., Hansen, J.J. (1934). *Danske Landboforholds Historie*. Copenhagen: GEC Gads forlag.

Clark, G. (2007). *A Farewell to Alms*. Princeton University press.

Dennison, T. (2006). Did serfdom matter? Russian rural society, 1750–1860. *Historical Research*, 79: pp. 74-89.

Genicot, G. (2002). Bonded labor and serfdom: a paradox of voluntary choice. *Journal of Development Economics* 67: pp.101–127

Domar, E.D. (1970). The Causes of Slavery or Serfdom: A Hypothesis. *The Journal of Economic History* 30: 1, pp.18-32.

Domar, E.D., Machina, M. (1984). *On the Profitability of Russian Serfdom*. *Journal of Economic History* 44(4):pp. 920-955.

Falbe Hansen, V. (1888). *Stavnsbaands-Løsningen og Landboreformerne*. Copenhagen: J.H. Schultz.

Friis, A. and K. Glamann (1958). *A History of Prices and Wages in Denmark: 1660-1800. Volume I*. Copenhagen: Institute of Economics and History.

Hagen, W.W. (2002). *Ordinary Prussians: Brandenburg Junkers and Villagers, 1500-1840*. Cambridge University Press.

Hansen, S.A. (1984). *Økonomisk vækst i Danmark*. (2 volumes). Copenhagen: Akademisk Forlag.

Holmgaard, J. (2003). Den danske bondeungdoms mobilitet i 1730'erne. *Fortid og Nutid*: pp. 26-48

Jensen, P.S., Lampe, M., Sharp, P., Skovsgaard, C. (2015). *A Land of Milk and Butter*. Mimeo.

Klein, A., Ogilvie, S. (2013). Occupational structure in the Czech lands under the second serfdom. *CAGE Online Working Paper Series*, University of Warwick.

Løgstrup, B. (1987). *Bundet til Jorden*. Landbohistorisk selskab.

Løgstrup, B. (1988). Svar til Asger Simonsen. Fortid og nutid: pp.248-250.

Nafziger, S. (2012). Serfdom, Emancipation, and Off-farm Labour Mobility in Tsarist Russia. *Economic History of Developing Regions*, 27:1, 1-37

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

Naidu, S., Yuchtman, N. (2012). Coercive Contract Enforcement: Law and the Labor Market in Nineteenth Century Industrial Britain. *American Economic Review* 103:pp. 107–144

North, D. and Thomas, R.P. (1974). The Rise and Fall of the Estateial System: A Theoretical Model. *The Journal of Economic History* 31: 4, pp 777-803.

Ogilvie, S. (2007). 'Whatever is, is right'? Economic institutions in pre-industrial Europe. *Economic History Review*, 60, 4 (2007), pp. 649–684

Ogilvie, S. and Carus, A.W. (2014). Institutions and Economic Growth in Historical Perspective. In Aghion, P. and Durlauf, S. (eds). *Handbook of Economic Growth*. Amsterdam:North-Holland.

Ogilvie, S. And J. Edwards (2000). Women and the 'Second Serfdom ': Evidence from Early Modern Bohemia. *The Journal of Economic History*, Vol. 60, No. 4

Olsen, A. (1933). Stavnsbaandets virkninger paa Byerne. *Scandia* ??:pp. 62-82

Olsen, G. (1950). Stavnsbåndet OG tjenestekarlene. *Historie/Jyske Samlinger*, Bind Ny række, 1:pp. 197-218.

Munch, T. (1974). Vornedskabet under den tidlige enevælde. *Historie/Jyske Samlinger*, Bind Ny række, 11:pp.289-308.

Persson, G. and Sharp, P. (2015). *An Economic History of Europe*. Cambridge University Press.

Radu, C.V. (2015). *Building Macro-Wage Series for Denmark for the Eighteenth Century*. Unpublished working paper, University of Southern Denmark.

Rudé, G. (1972). *Europe in the 18th Century: Aristocracy and the Bourgeois Challenge*. London: Weidenfeld and Nicholson.

Whalley, J., Zhang, S. (2007). A numerical simulation analysis of (Hukou) labour mobility restrictions in China. *Journal of Development Economics* 83: pp. 392–410.

Regions and estates	Number of observations (all occupations)					Farmhands (% of total occupations)	Women (% of total occupations)
	Period						
	1661-1800	1705-1741	1742-1763	1764-1788	1789-1800		
Zealand	12554	440	3514	6826	1600		
Giesegaard (1721-1800)	436	12	109	302	13	34%	0%
Bregentved (1746-1800)	989	0	282	559	148	39%	1%
Gisselfeld Household (1706 1740)	317	317	0	0	0	30%	26%
Herlufsholm (1661-1728)	227	0	0	0	0	31%	13%
Holsteinborg (1748-1800)	927	0	39	207	681	40%	5%
Fuirendal (1756-1795)	1340	0	324	774	241	25%	18%
Sorø Academy (1740-1800)	466	0	44	261	161	5%	0%
Løvenborg (1752-1794)	6929	0	2427	4403	153	28%	1%
Gauno (1751-1800)	787	0	265	319	203	21%	2%
Juellinge (1726-1748)	136	111	24	1	0	4%	0%
Funen	5573	73	1061	2404	2035		
Taasinge (1725-1800)	3020	52	801	1199	968	26%	11%
Frederiksgade 1773-1800	1932	0	0	996	936	76%	21%
Erholm Søndergade (1723-1800)	621	21	260	209	131	56%	8%
Jutland	3347	218	286	1855	988		
Frijsenborg (1777-1800)	1250	0	0	899	351	23%	9%
Støvringgard (1734-1800)	722	35	132	323	232	24%	16%
Lindenberg (1714-1799)	1309	117	154	633	405	51%	23%
Odden (1703-1732)	66	66	0	0	0	33%	0%

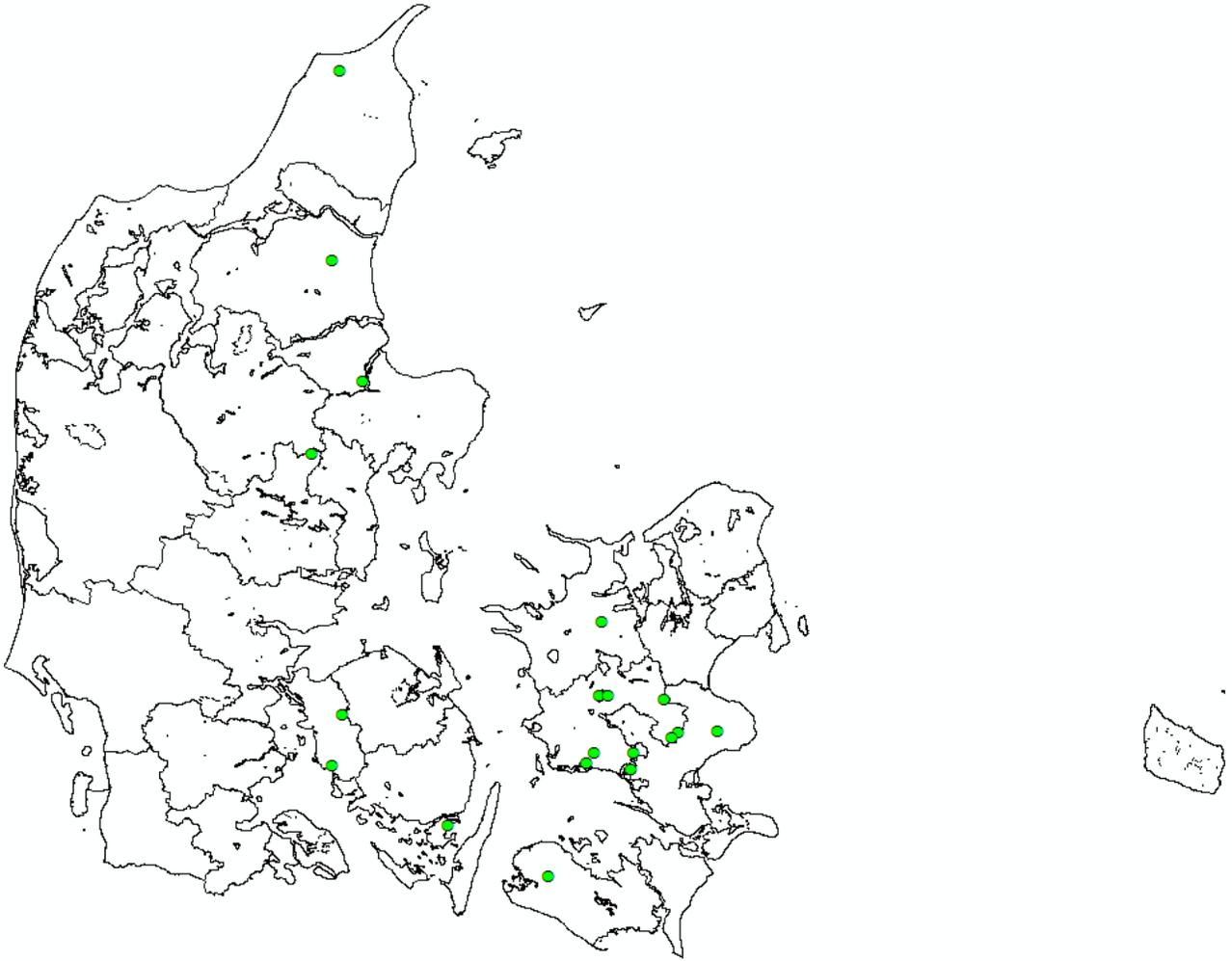


Figure 1: Map of Denmark.

Note: Green circles indicate location of manor.

Table 2: Baseline results for the introduction of serfdom

	Dependent variable							
	Log wage							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Serfdom x Farmhand	-		-	-	-	-0.219**		-0.291**
	0.350**		0.331**	0.352**	0.231***			
	[-2.427]		[-2.689]	[-2.402]	[-3.773]	[-2.86]		[-2.289]
Serfdom x Farmhand_alt							-0.650***	
							[-3.03]	
Vornedskab x Farmhand		0.21						
		[1.306]						
Serfdom x Women				-0.0405				
				[-0.302]				
Serfdom x Mason								-0.0798
								[-1.036]
Serfdom x Teacher								2.347**
								*
								[12.52]
Observations	731	731	731	731	731	731	731	731
R-squared	0.763	0.761	0.789	0.763	0.826	0.856	0.713	0.797
Fixed effects for								
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Estate	No	No	No	No	Yes	Yes	No	No
Season	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Master craftsman	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jutland and Funen by year	No	No	Yes	No	No	No	No	No
Manor by year	No	No	No	No	No	Yes	No	No
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the natural logarithm of the daily wage. Serfdom represents a dummy variable which takes the value of 1 in the period in which serfdom affected workers (1733-1788); unskilled is represented by laborers, day laborers and farm laborers; vornedskab is a dummy variable which takes the value of 1 during the working age of those affected by earlier serfdom known as vornedskab (1717-1733); additional specification include dummy variables interacted with the serfdom variable: women, mason and head teacher; column (6) reports the results by excluding the farm servants from the data; the analysis is conducted for the period 1705-1741; Yes and No indicate if a control variable is included in the specification; coefficients are reported with the robust t-statistics in parentheses (** p<0.01, * p<0.05, * p<0.1); the standard errors are clustered at the estate level.

Table 3. Rolling estimates for the changes to the ages

	Treatment periods			
	1705 -1741	1733 -1763	1742 -1787	1788 -1799
	Log wage			
	(1)	(2)	(3)	(4)
Serfdom x Farmhand	-0.350** [-2.427]			
Period 2 x Farmhand		0.0489 [0.156]		
Period 3 x Farmhand			0.061 [1.057]	
Period 4 x Farmhand				0.544 [1.463]
Observations	731	5,137	15,528	4,639
R-squared	0.763	0.635	0.647	0.676

Notes: The dependent variable is the natural logarithm of the daily wage. Serfdom represents a dummy variable which takes the value of 1 in the period in which serfdom affected workers (1733-1788); unskilled is represented by laborers, day laborers and farm laborers; period 2 is defined by 1741-1763, period 3 by 1764-1787 and period 4 by 1788-1799; All estimations include the same controls as in column 1 of Table x; coefficients are reported with the robust t-statistics in parentheses (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$); the standard errors are clustered at the estate level.

Table 4: The flexible specification, 1705-1799

	Dependent variable					
	Log wage					
	(1)	(2)	(3)	(4)	(5)	(6)
Serfdom x Farmhand	-0.398** [-2.63]		-0.273* [-2.02]			-
Period 1 x Farmhand		-0.606*** [-5.06]		-0.407*** [-4.30]		-0.371*** [-3.56]
Period 2 x Farmhand		-0.4378** [-2.68]		-0.315** [-2.15]		-0.204** [2.185]
Period 3 x Farmhand		-0.382** [-2.48]		-0.260* [-1.92]		-0.148 [1.657]
Period 4 x Farmhand		-0.342** [-2.09]		-0.217 [-1.45]		-0.104 [-0.922]
Vornedskab x Farmhand					0.187 [1.01]	
Observations	20,898	20,898	20,898	20,898	20,898	21,300
R-squared	0.642	0.642	0.647	0.647	0.647	0.642
F-test for overall significance		7.36***		6.04***		3.44**
F-test for equality of periods		1.69		1.07		1.62

Notes: The dependent variable is the natural logarithm of the daily wage. Columns (1), (3) and (5) show the results for the non-flexible model; the variable "serfdom" represents a dummy variable which takes the value of 1 in the period in which serfdom affected workers (1733-1799); unskilled is represented by laborers, day laborers and farm laborers; vornedskab is a dummy variable which takes the value of 1 during the working age of those affected by vornedskab (1717-1733); Columns (2), (4) and (6) show the results for the flexible model: Period 1 is defined by the years 1733-1740, period 2 by 1741-1763, period 3 by 1764-1787 and period 4 by 1788-1799. Column 6 adds the 402 observations for 1800-1805. All models include the same controls as in Table 1, column 1. Jutland Funen year fixed effects are added in (3)-(5); coefficients are reported with the robust t-statistics in parentheses (***) p<0.01, ** p<0.05, * p<0.1); the standard errors are clustered at the estate level.

Table 5: The effect of excluding other possible low skilled jobs

	Dependent variable							
	Log wage							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Serfdom x farmhands	-0.336*	-0.35**	-0.3503**	-0.35605**	-0.4145**	-0.3495**	-0.35024**	-0.3777***
	[-1.957]	[-2.48]	[-2.48]	[-2.49]	[-2.48]	[-2.48]	[-2.48]	[-2.63]
Occupations excluded	Farm servant	Janitor	Livestock worker specialisation unknown	Fur bearing animal farm worker	Gardener	Woodchopper	Stone splitter	Coach-rider
Observations	659	718	729	694	672	729	730	713
R-squared	0.713	0.7616	0.7606	0.7333	0.7896	0.7626	0.7626	0.769
Controls for								
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Season	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Master	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the natural logarithm of the daily wage. Serfdom represents a dummy variable which takes the value of 1 in the period in which serfdom affected workers (1733-1788); unskilled is represented by laborers, day laborers and farm laborers; the analysis is conducted for the period 1705-1741; Yes and No indicate if a control variable is included in the specification; coefficients are reported with the robust t-statistics in parentheses (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; the standard errors are clustered at the estate level.

Table 6: Clustering by occupation and two-way clustering by estate and occupation

	Dependent variable					
	Log wage					
	(1)	(2)	(3)	(4)	(5)	(6)
Serfdom x Farmhand	-0.350**	-0.350**	-0.350**	-0.398**	-0.398***	-0.398**
	[-2.427]	[-2.479]	[-3.005]	[-2.63]	[-3.20]	[-2.81]
Observations	731	731	731	20,898	20,898	20,898
R-squared	0.763	0.761	0.789	0.763	0.826	0.713
Clustering for						
Estate	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	No	Yes

Notes: The dependent variable is the natural logarithm of the daily wage. Serfdom represents a dummy variable which takes the value of 1 in the period in which serfdom affected workers (1733-1788); unskilled is represented by laborers, day laborers and farm laborers; All estimations include the same controls as in column 1 of Table 1. Columns 1-3 cover the period 1705-1741, whereas columns 4-6 cover 1705-1805; Yes and No indicate if a control variable is included in the specification; coefficients are reported with the robust t-statistics in parentheses (** p<0.05, * p<0.1);