Religious Orders and Growth through Cultural Change in Pre-Industrial England

by

Thomas Barnebeck Andersen,

Jeanet Bentzen,

Carl-Johan Dalgaard

and

Paul Sharp

Discussion Papers on Business and Economics
No. 12/2012

FURTHER INFORMATION
Department of Business and Economics
Faculty of Social Sciences
University of Southern Denmark
Campusvej 55
DK-5230 Odense M
Denmark

Tel.: +45 6550 3271
Fax: +45 6550 3237
E-mail: lho@sam.sdu.dk
http://www.sdu.dk/ivoe

ISBN 978-87-91657-65-8

Religious Orders and Growth through Cultural Change in Pre-Industrial England*

Thomas Barnebeck Andersen† Jeanet Bentzen‡ Carl-Johan Dalgaard
Paul Sharp

July 3, 2012

Abstract

We hypothesize that cultural appreciation of hard work and thrift, the "Protestant ethic" according to Max Weber, had a pre-Reformation origin. The proximate source of these values was, according to the proposed theory, the Catholic Order of Cistercians. In support, we document that the Cistercians influenced comparative regional development across English counties, even after the monasteries were dissolved in the 1530s. Moreover, we find that the values emphasized by Weber are comparatively more pervasive in regions where Cistercian monasteries were found historically. Pre-industrial development in England may thus have been propelled by a process of growth through cultural change.

Keywords: Cultural values; Protestant ethic; Economic development

JEL Classification codes: N13; O11; Z12

*We thank Daron Acemoglu, Philippe Aghion, Quamrul Ashraf, Sasha Becker, Roland Benabou, Matthias Doepke, Raquel Fernández, Oded Galor, Peter Sandholt Jensen, Andros Kourtellos, Thomas Markussen, Stelios Michalopoulos, Omer Moav, Kalle Moene, Ola Olsson, Enrico Perotti, Karl Gunnar Persson, Christoffer Sonne-Smith, Holger Strulik, Joachim Voth, Fabrizio Zilibotti as well as seminar participants at the 2011 AEA meeting in Denver, The conference on "Cultural Change and Economic Growth" in Münich, on "Intergenerational Transmission of Entrepreneurship, Occupations and Cultural Traits in the process of long-run economic growth" in Naples, DEGIT XV in Frankfurt, Gothenburg University, University of London Royal Holloway, the 2010 NBER Summer Institute, University of Oslo, University of Cyprus, and University of Zürich for comments and suggestions. Errors are ours.

†Andersen and Sharp are affiliated with the Department of Business and Economics, University of Southern Denmark, Campusvej 55, DK-5230 Odense M. Contact: Thomas Barnebeck Andersen (barnebeck@sam.sdu.dk) and Paul Sharp (pauls@sam.sdu.dk).

‡Bentzen and Dalgaard are affiliated with the Department of Economics, University of Copenhagen, Øster Farimagsgade 5, building 26, DK-1353 Copenhagen, Denmark. Contact: Jeanet Bentzen (jeanet.bentzen@econ.ku.dk) and Carl-Johan Dalgaard (carl.johan.dalgaard@econ.ku.dk).

1 Introduction

In what is surely one of the most famous works in all of social science, Max Weber (1905) argued that the Protestant Reformation was instrumental in facilitating the rise of capitalism in Western Europe. More specifically, Weber argued that Protestantism, in contrast to Catholicism, commends the virtues of hard work and thrift. These values, which Weber famously referred to as the "Protestant ethic", laid the foundation for the eventual rise of modern capitalism. Despite its prominence Weber's hypothesis nevertheless remains controversial.

The central hypothesis advanced in the present study is that the cultural virtues emphasized by Weber had a pre-Reformation origin in the religious Order of the Cistercians, a Catholic order which spread across Europe as of the 11th century, and that this monastic order served to stimulate growth during the second millennium by encouraging cultural change in local populations. That is, we argue that the Cistercians encouraged growth by instigating the kind of cultural change that Weber attributed to Protestantism.

The Cistercian order, a Benedictine offshoot, was established in France in 1098 as a reformist movement with the aim of returning to the literal observance of the "Rule of St. Benedict". They rejected the developments the Benedictines had undergone and tried to reproduce life exactly as it had been in St. Benedict's time; in fact, they often ventured beyond it in austerity. The salient feature in the reform was a return to hard manual labor and the restrain from consumption (Kieser 1987). This meant that within the walls of the Cistercian monasteries one would find cultural values similar to those which, promulgated by the Protestant Reformation centuries later, is thought to have assisted the rise of capitalism outside the monastic walls. Several scholars have noted that the simplicity of the Order's lifestyle and their pursuit of wealth were in fact early manifestations of "the Protestant ethic" (e.g., Baumol 1990, p. 906; Collins 1986, p. 54; Kieser 1987, p. 116). Weber (1958, p. 118-119) himself singled out the Cistercians as encompassing values with a clear antecedent to the Protestant ethic.

Accordingly, we hypothesize that cultural values associated with the Protestant movement started to spread long before Martin Luther posted his theses on the door of the All Saints' Church in Wittenberg. Of course, the cultural influence from the Cistercians was not immediate. Initially, the Cistercians may only have "convinced" a (potentially very) small group of people to "adopt" their attitudes towards hard work and thrift. But prior to the fertility transition, in an era where Malthusian forces are at play, work ethic and thrift translates into economic success and thus reproductive success. To the extent that cultural values carry over from parent to offspring, a cumulative process of growth through cultural change can be envisioned. If the pervasiveness of "Protestant-type" cultural values increases, this will stimulate work effort, investments and technological change; in turn, this works to encourage population growth and, as a consequence of selection,

cultural change.[1]

As testing ground for the theory we use cross-county panel data from England, where the Cistercians arrived early in the 12th century. England is of particular interest as it centuries later turned out to be the epicenter of the Industrial Revolution. Hence, if indeed the cultural values emphasized by Weber mattered to the emergence of the Industrial Revolution, an impact should be detectable in England. Moreover, an advantage of examining England is that high quality *regional* population data is available from the 13th century onwards.

Our estimates reveal that counties with a greater Cistercian presence experienced faster population growth from 1377 to 1801.[2] However, the particularly interesting finding is that this positive influence from the Cistercians is found during the period 1377-1600 as well as after 1600. During the 1530s England went through her own version of the Protestant Reformation, which entailed the dissolution of all monasteries. Accordingly, the Cistercians appear to impact growth *after* their physical presence is no longer felt in local communities.

Correlations should be interpreted with care. We cannot conclusively rule out that some omitted factor is driving the link between Cistercian presence and long-run population growth. But we do expose the theory to a rather demanding set of robustness checks. In particular, the link is observed both in a first difference specification, where county fixed effects are eliminated, and in a specification that allows for convergence and involves controls for auxiliary productivity determinants, such as soil quality and access to waterways. We also provide IV estimates of the Cistercian/population growth nexus, where we draw on the work of historians to produce a plausible instrument for the location of Cistercian monasteries in England. The IV estimates corroborate our OLS findings that the Cistercians had an impact on growth after the monasteries were dissolved. Hence, the weight of the evidence suggests a causal effect running from Cistercian presence to long-run comparative development in England.

We believe the most plausible interpretation of this finding is that the Cistercians influenced local cultural values, which subsequently took hold in the population. These new values in turn stimulated growth through attendant changes in work effort, investment behavior and technological progress. If indeed values changed, as hypothesized in the present study, it would provide a reasonable explanation for why Cistercian influence appears to extend itself beyond the Dissolution of the Monasteries.

In order to test this account further, we turn to data on contemporary cultural values. While it is possible

[1] The fundamental influence of parents on children in terms of transmitting cultural values is well established; see Bisin and Verdier (2000, 2001) and Dohmen et al. (2011). Observe, however, that one may well imagine values gradually spreading across dynasties, which would work to speed up the process of cultural change (see Dohmen et al. 2011). For evidence on the relevance of Malthusian dynamics during pre-industrial times, see Ashraf and Galor (2011).

[2] By 1377 most of the Cistercians were settled; only a few additional monasteries emerged after that year. Hence, by selecting 1377 we can treat Cistercian presence as pre-determined. 1801 is chosen to permit the longest possible window of observation while at the same time ending before the fertility transition in England occurs. After the fertility transition population growth is no longer a sensible marker of productivity growth.

to study comparative cultural differences across England we do not follow this track. The reason is simply that current English values might have been influenced by the Reformation as well as by the Cistercians, which prevents a clean test of the proposed hypothesis. We therefore test the impact of the Cistercians on the values Weber emphasized across current *Catholic* (NUTS 2 sub-) regions in Europe. If the hypothesized data pattern does not materialize itself in this sample it cannot be dismissed by a confounding influence from the Reformation.[3] Reassuringly, however, we find that Cistercian historical presence strongly predicts contemporary work ethic and (though admittedly to a lesser extent) thrift in Catholic regions, as befits our hypothesis.

To be sure, we cannot rule out that other mechanisms could have been at work simultaneously. For instance, the Cistercians were highly innovative and fostered early industrial developments, as explained below. If the pace of technology diffusion was sufficiently slow across English counties during the second millennium, this may also have influenced growth beyond the period where Cistercians were active in England. Yet our analysis makes probable that cultural change was an important part of the story.

The present research is related to the literature which examines the influence from religious values on economic activity (e.g., Landes 1999; Barro and McCleary 2003; Guiso et al. 2003; McCleary and Barro 2006; Becker and Woessmann 2009; Cantoni 2009). Whereas most of the existing studies (like the present one) explores the "Weberian transmission mechanism", Landes (1999) and Becker and Woessmann (2009) propose that the Protestant Reformation led to a higher appreciation of literacy due to the new religious dogma, which required Protestants to be able to read the Bible in their own language. Becker and Woessmann (2009) demonstrate the strength of this mechanism in accounting for comparative development across Prussia. They find little evidence of an influence from what Weber called "the Protestant ethic".

This paper provides a potential explanation for the latter finding: Values related to hard work and thrift may already have started to spread across Europe prior to the Reformation. At the same time, this study supports Weber's claim regarding the importance of hard work and thrift for long-run development.

More broadly, our theory is related to studies that propose that changes in the composition of the population affect long-run development in a fundamental way; whether such changes were cultural (e.g., Clark 2007; Doepke and Zilibotti 2008) or of a genetic nature (Galor and Moav 2002). We differ from these contributions in emphasizing a *shock* to cultural values: the settlement of the Cistercians. This allows us to test our argument statistically.

The rest of the paper is organized as follows: Section 2 provides background on the Order of the Cistercians, and develops the hypothesis that Cistercian values spread beyond the Order itself thereby influencing

[3] To see the issue more clearly: Suppose we examine current cultural values across England, and imagine we find no impact from the Cistercians. Does this mean: (a) that the Cistercians did not influence values? Or: (b) that the Reformation served to eventually spread the same values across England at large, erasing the early influence from the Cistercians on cultural differences across regions? In the "Catholic setting", by way of contrast, (b) is not a viable interpretation of a failure to detect the expected positive link between Cistercian historical presence and current values in ways of work ethic and thrift.

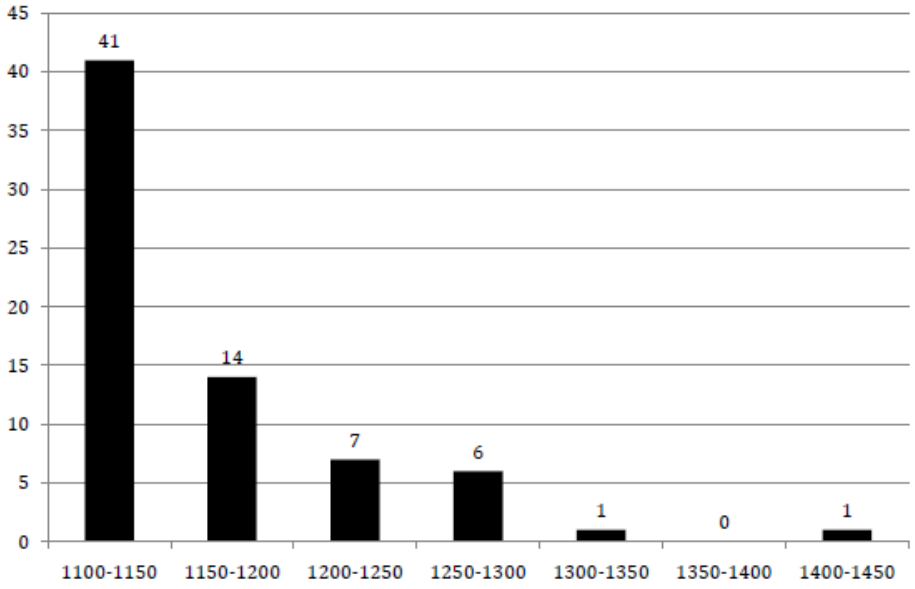


Figure 1: Frequency of founding years of Cistercian monasteries in England.

productivity and population growth. Sections 3 to 5 decribe, respectively, our empirical strategy, our data, and reports our OLS estimates. Section 6 provides IV estimates and Section 7 establishes empirically a link between Cistercian historical presence and contemporary cultural values across the Catholic parts of Europe. Finally, Section 8 concludes the paper.

2 Theory: The Cistercians and Why they Mattered

The Cistercian order was founded in 1098 in France; the first Cistercian monastery in England was founded in 1128 (Cooke 1893; Donkin 1963). During the 12th century the Order spread rapidly across England, cf. Figure 1. By the end of the 14th century the expansion of the Order had essentially ceased. Hence from the perspective of our regression analysis below, which involves the time period from 1377 onwards, we can treat Cistercian settlements as predetermined.

There is little doubt that the Cistercians held beliefs which were later to be associated with the Protestant ethic. By seeking to return to a literal interpretation of the Rule of St. Benedict, the small book written in the sixth century by its namesake, they stressed the trinity of prayer, work and study, as well as the values of practicality, adaptability, simplicity and moderation (Hill 1968, p. 3). The Exordium Cistercii, written in the 1120s, and the statutes promulgated at the general chapter of 1134, stated that the monks were to

work hard and live "*from the labour of their own hands, from cultivation and from their flocks*". They were also to live frugally, and were not permitted to have any possessions "*contrary to monastic purity*" such as parish churches, the tithes of other men's labour, dependent peasants, mills, ovens, or other income sources attached to the land. Hence it is no surprise that Baumol (1990, p. 906) suggests that the monks of the Order of Cistercians may have embodied an earlier "Protestant ethic": "*Puritanical, at least in the earlier years, in their self-proclaimed adherence to simplicity in personal lifestyle while engaged in dedicated pursuit of wealth, they may perhaps represent an early manifestation of elements of 'the Protestant ethic'*". Collins (1986, p. 54) is slightly more direct when he notes that the Cistercians: "*had the Protestant ethic without Protestantism*".[4]

The simplicity of the Cistercians was thus only a liturgical simplicity, replacing long days of ritual with short prayers that could be said in pauses from labor (Bouchard 1991; Hill 1968). Moreover, "useless" labor, such as painting pictures, decorating books, breeding useless animals, etc. was banned (Kieser 1987). Some have suggested that they were attempting to reduce the need for manual labor in order to leave more time for prayer (Bloch 1935; Gimpel 1976; Ovitt 1986; Landes 1999). Whatever the case, from the very beginning the Cistercians were involved in the rapidly developing economic practices of the 12th century, and were in some cases initiators of these practices. Moreover, the monks' asceticism, by keeping down consumption, drove up levels of investment (Kiefer 1987; Baumol 1990).

Kaelber (1998) points out that Weber himself saw monastic asceticism as a clear precursor to ascetic Protestantism, the key driving force behind European capitalism according to Weber. More specifically, as argued by Weber (1958, p. 118-19): "*In the rules of St. Benedict, even more so in the case of the monks of Cluny and the Cistercians...[Christian asceticism] has become a systematically developed method of rational life conduct, with the goal to overcome the status naturae, to free man from the power of irrational impulses and his dependence on the world and on nature...It attempted to subject man under the supremacy of purposive will, to bring his action under constant self-control with a careful consideration of their ethical consequences. Thus it trained the monk, objectively, as a worker in the service of the Kingdom of God, and thereby further, subjectively, assured the salvation of his soul. . . [T]he end of this asceticism was to be able to lead an alert, intelligent life: the most urgent task the destruction of spontaneous, impulsive enjoyment, the most important means was to bring order into the conduct of its adherents. All these important points are emphasized in the rules of Catholic monasticism as strongly as in the principles of conduct of the Calvinists.*" Hence the idea that the Cistercians held values close to those promulgated by the Protestant Reformation has a long and distinguished tradition.[5]

[4] Kiefer (1987, p. 116) makes the same observation.

[5] As Weber points out, similar values were found among the Cluniacs. The impact of the Cluny order has received scant attention in the literature in comparison with the Cistercians. Yet, as we shall see, they too seem to have left a mark (albeit far from as statistically robust as the Cistercians) on pre-industrial growth in England, conceivably for the same reasons the

The emphasis on hard work and thrift made the Cistercians entrepreneurial and ultimately very successful economically (Baumol 1990). They contributed much as agriculturists and as horse and cattle breeders. Their major contribution was the introduction of the grange system, whereby land was held in compact blocks, in contrast to the usual fragmented and unenclosed village holdings (Donkin 1963). Another contribution seems to have been advanced irrigation techniques, thus predating Rowland Vaughan's famous popularization of these methods by centuries.[6] Moreover, their high level of agricultural technology was matched by their industrial technology. Every monastery had a model factory, often as large as the church, with waterpower to drive the machinery (Gimpel 1976). This power was used for crushing wheat, sieving flour, fulling cloth and tanning (Baumol 1990). The Cistercians are also known to have been skilled metallurgists (Gimpel 1976).

The Cistercian monastic system was one based on the principle of kinship, and thus Cistercian work practices and technology seem to have spread easily from house to house (Donkin 1978). These values in turn spread into the local area partly due to the Cistercian practice of incorporating illiterate peasant lay brothers (known as conversi) for agricultural labor (Berman 2000). Lay brothers were bound by vows of chastity and obedience to their abbot, but were otherwise permitted to follow a less demanding form of Cistercian life. Work on Cistercian granges were also carried out by various classes of secular laborers. These included servi (servants), mercenarii (hired laborers), familiares (workers with intermediate status between hired workmen and lay brothers) and donate or oblate (pious laymen exchanging work for support). The exact fraction of lay brothers to these other types of labor is difficult to determine, but the latter seem to have become increasingly important at the turn of the 13th century (Noell 2006). Another important group of settlers in the abbeys were the corrodians, who spent their years of retirement there. Moreover, settled communities, including shopkeepers, formed outside the monasteries (Williams 1970). In this manner, the ways of the Cistercians spread beyond the Order itself.

If indeed the Cistercians influenced the values of local populations it is easy to envision how the process would become cumulative. Up until the fertility transition, which occurs in England around 1880 (e.g., Hatton and Martin 2010), households with greater earnings capabilities would proliferate at a greater rate (e.g., Clark 2007; Ashraf and Galor 2011). As a consequence, families valuing hard work and thrift should be expected to have more offspring. Provided cultural values are transmitted from generation to generation (e.g., Dohmen et al. 2011), the share of the population featuring the new values would gradually rise. As the fraction of the population with greater earnings capabilities increased there would be a positive feedback to overall population growth. In this manner, the initial cultural influence from the Cistercians would eventually have a macroeconomic impact on population density. The extent to which a process such as this

Cistercians influenced growth.

[6] Vaughan's Golden Valley was actually located in an area where the Cistercians had held extensive estates prior to the Dissolution (Cook, Stearne and Williamson 2003).

played out is an empirical matter to which we now turn.[7]

3 Empirical Specification

In a Malthusian setting changes in population density, P_{it}, can either be interpreted as shifts in its steady state level or as movements towards the steady state. In the empirical analysis to follow, we adopt both perspectives.

In a recent contribution Ashraf and Galor (2011) take the former approach and model population growth as

$$\Delta \log P_{it} = \mu_0 + \mu_1 \Delta \log (A_{it}) + \phi_{it}, \tag{1}$$

where A_{it} denotes productivity, $\Delta \log Z_{it} \equiv \log Z_{it} - \log Z_{it-1}$, and $Z_{it} = \{P_{it}, A_{it}\}$. This first difference specification has the virtue that time invariant productivity determinants are eliminated.

The convergence perspective, however, would call for a specification such as

$$\Delta \log P_{it} = \beta_0 + \beta_1 \log P_{it-1} + \beta_2 \log (A_{it}) + \varepsilon_{it}. \tag{2}$$

In keeping with the literature on "fundamental determinants of productivity" one may consider cultural values as an ultimate driving force behind productivity, alongside institutions and geography (see e.g., Acemoglu 2009, Ch. 4). If the fraction of the population with cultural values favoring "hard work" and "thrift" is denoted v_{it}, it would then be natural to assume that $\log (A_{it}) \propto v_{it}$ and $\Delta \log (A_{it}) \propto \Delta v_{it}$. We obviously have to take into account the remaining variation in A_{it}, which can be ascribed to the influence from institutions, geography, and other cultural values. But we will ignore these sources of variation for a moment in order to focus on how to think about v_{it}.

Unfortunately, v_{it} is not directly observable for medieval England. Hence, in order to obtain a specification we can take to the data, we need to make assumptions about how the Cistercians might have influenced the prevalence of work ethic and thrift in the English population.

Suppose the Cistercians arrive at time $t = 0$, after which the share of the population with high work ethic and thrift in county i is governed by the following law of motion:

$$v_{it+1} = \rho v_{it} + c_i, \rho < 1, \tag{3}$$

where c_i represents *the moral impact of the Cistercians* on the population in country i. As can be seen

[7] A previous draft (Andersen et al. 2010) contained a simple Malthusian model which captures these dynamics. See also Galor and Moav (2002) for a model where a subset of the population with high earnings capabilities grows in relative size in a Malthusian setting, eventually having an impact on overall productivity.

from equation (3) we assume that this influence comes in the shape of a county specific *permanent* "shock"; whether this cultural shock did in fact have permanent effects is what we test empirically.[8]

Next, suppose that $v_{i0} = 0$; that is, suppose the Cistercians brought *new* cultural values to the population. By solving the above difference equation, and invoking the initial condition, it is easy to show that

$$v_{it} = \frac{1-\rho^t}{1-\rho} c_i \text{ for all } t > 0,$$

and further that

$$\Delta v_{it} = \rho^{t-1} c_i.$$

Finally, to proxy for Cistercian moral influence, c_i, we make the following assumption:

$$c_i \propto \frac{M_{ci}}{M_i} + \delta M_i$$

where M_{ci}/M_i is the number of Cistercian monasteries, M_{ci}, relative to the total number of religious houses, M_i. The parameter δ is left unrestricted. Accordingly, we proxy the intensity of Cistercian influence as *Cistercian presence relative to other sources of moral influence*. Since the Church was the principal authority in matters of morality in medieval times, we construct c_i as the ratio of Cistercian monasteries to all religious houses; i.e., M_{ci}/M_i. However, the counterfactual we are interested in is that of changing the *composition* of moral influences while at the same time holding constant its *level*. This dictates that we also control for the total number of religious houses, M_i, separately. We test the implied link between Cistercian presence and cultural values, v_i, in Section 7 below.

Taken together, this allows us to reformulate equation (1):

$$\Delta \log P_{it} = \mu_0 + \tilde{\mu}_{1,t} \left(\frac{M_{ci}}{M_i} + \delta M_i \right) + \tilde{\phi}_{it},$$

where $\tilde{\mu}_{1,t} \equiv \mu_1 \rho^{t-1}$ and equation (2):

$$\Delta \log P_{it} = \beta_0 + \beta_1 \log P_{it-1} + \tilde{\beta}_{2,t} \left(\frac{M_{ci}}{M_i} + \delta M_i \right) + \tilde{\varepsilon}_{it},$$

where $\tilde{\beta}_{2,t} \equiv \beta_2 \frac{1-\rho^t}{1-\rho}$; $\tilde{\phi}_{it}$ and $\tilde{\varepsilon}_{it}$ captures noise as well as omitted factors. These two equations are now expressed in terms of observables since we have data on Cistercian settlements in England as well as on all other religious houses. So far, we have left the remaining determinants of productivity in the error terms. In

[8] This way of capturing the impact from the Cistercians can be viewed as a short-hand for the following set-up. Assume $v_{it+1} = v_{it} + \varepsilon_{it}$, where ε_{it} is a *random walk*. Assuming the inital shock, $\varepsilon_{i0} = c_i$ leaves us, in reduced form, with the formulation above.

order to estimate $\tilde{\mu}_{1,t}$ and $\tilde{\beta}_{2,t}$, we obviously need to take into account those additional determinants that correlate with $\left(\frac{M_{ci}}{M_i} + \delta M_i\right)$.

We therefore take the following equations to the data:

$$\Delta \log P_{it} = \mu_{0,t} + \tilde{\mu}_{1,t} \frac{M_{ci}}{M_i} + \mu_{2,t} M_i + \boldsymbol{\mu}_3' \mathbf{R}_i + u_{it}, \tag{4}$$

$$\Delta \log P_{it} = \beta_{0,t} + \tilde{\beta}_{2,t} \frac{M_{ci}}{M_i} + \beta_{2,t} M_i + \beta_3 \log P_{it-1} + \boldsymbol{\beta}_4' \mathbf{X}_i + \epsilon_{it}. \tag{5}$$

Equation (4), recall, is a first difference specification. Hence, the key concern is whether other "deep determinants" may have undergone change during the period under examination. Since the church played a key role in moral matters during this period, one could imagine that other religious orders may have instigated cultural change and thus propelled changes in productivity. We therefore gauge the robustness of a Cistercian impact to the inclusion of controls for other rival religious orders that were present in England during the same period, $\mathbf{R}_i$. Of particular interest is the Benedictine order, as the Cistercians originated from this particular monastic order. Moreover, England underwent her own version of the Protestant Reformation in the 1530s, which also may have influenced values. In particular, following Landes (1999) and Becker and Woessmann (2009), one might expect this event to be accompanied by an increased cultural appreciation for human capital accumulation. Note, however, that we are exploring comparative development *within* England. Since the Reformation was a *country-wide* affair it likely influenced all counties. To control for the influence of the Reformation we therefore allow the intercept in equation (4) to be time varying; i.e., we include time fixed effects. This approach should also capture country-wide changes which relate to the institutional fabric of society, such as the Glorious Revolution of 1688 (North and Weingast 1989).[9]

When turning to equation (5) one is faced with the challenge that culture, institutions as well as geography all might be relevant controls, since county level fixed effects have not been differenced out. As a result, we try to control as rigorously as possible for time invariant confounders. We include a range of geographic controls in addition to controls for other religious orders. As in equation (4) we also allow for time fixed effects.

The parameter for M_{ci}/M_i is allowed to change over time in both specifications. Since the theory is that the Cistercians influenced cultural values ("a permanent shock"), it is of particular interest to inquire whether M_{ci}/M_i is correlated with population growth *after* the monasteries were dismantled.

Despite our best efforts to control for potential confounders in either specification, legitimate concerns about omitted variable bias may linger. In an effort to overcome this concern we also provide IV estimates

[9] If indeed the steady state perspective, implicit in the first difference specification, is appropriate, one could alternatively examine a specification where the *level* of population density is regressed on Cistercian presence (interacted with time dummies) while allowing for county fixed effects. We have also entertained this specification; the results (available on request) are qualitatively similar to those obtained below.

of equations (4) and (5), as detailed in Section 6.

Before we turn to a description of our data two remarks on the testing strategy are warranted. First, when examining the proposed hypothesis we are studying the period 1377-1801. More specifically, we have county-level data on population density at three points in time: in 1377 (right after the Cistercians had completed their settlement in England); in 1600 (shortly after the Dissolution of the Monasteries); and in 1801. It is obviously important that this period, in its entirety, is a period during which English population growth is likely to be a sensible marker of productivity growth. We believe this is a plausible assumption as England did not go through the fertility transition until around 1880 (e.g., Hatton and Martin 2010). To be clear, the fact that the Industrial Revolution occurred earlier in England is immaterial to the present empirical analysis, as long as the productivity gains it brought about resulted in faster population growth, which it should have done until the onset of the fertility transition.

Second, we have made no mention of migration in the discussion above. Yet productivity gains in one county could plausibly attract immigrants from lagging counties. This is observationally equivalent to population growth arising from higher fertility. While we cannot distinguish between these two alternatives, a positive influence from the Cistercians on population growth will in any case testify to a productivity enhancing effect from this particular religious order.[10]

4 Data

4.1 Population density

Our dependent variable is population density. We obtained data on population density for the year 1377 from Campbell (2008). Campbell also provides the area of the counties; we transformed them from square miles into square kilometers. The distribution of the population in 1377 is based on 1.38 million adult males and females who contributed to the poll tax of 1377.[11] The level of the population is based on an estimate by Campbell (2000) of a total population of 4 million.[12] Campbell only reports population numbers for the aggregate of London and Middlesex, not for the two counties separately. In order to match the data, all data on all variables is aggregated in this way. Yet we end up excluding London and Middlesex in all regressions, since it is an outlier. We note for completeness, however, that including London and Middlesex makes no difference to our results. The data on population density in 1600 is from Broadberry et al. (2010), and are

[10] In order to distinguish between the two cases we would need county level data on income per capita. If productivity induces greater fertility, but only to a limited extent migration (perhaps not at all), income per capita should not be influenced by Cistercian presence. See Ashraf and Galor (2011) for further discussion and tests on cross-country data.

[11] These numbers are available in Dobson (1983).

[12] Campbell (2008) also reports population data for 1290 based on taxable wealth. But since about 10% of Cistercian settlement occurred around that time, the risk of reverse causality tainting our estimations would be enhanced if we used 1290 as our initial year. As a result we stick with 1377 as the initial date.

comparable to Campbell (2008). Finally, population density in 1801 is from Wrigley (2007). The latter data are based on registered marriages, which were more completely recorded than baptisms and burials on which previous population estimates were based (Rickman, 1802).

4.2 Religious Houses

In controlling for the intensity of Cistercian presence, as well as of other religious orders, we rely on the English Monastic Archive (EMA), which has been constructed by researchers at University College London. The database involves 776 religious houses in England, which date from the 10th to the 16th centuries. The database includes the name of the particular religious house, the order of the monks, nuns etc., year of foundation and dissolution, and the county in which the monastery was located.[13] We gathered these data into one dataset, which we then used to calculate the number of religious houses in each county (*relhouses*) and the number of Cistercian monasteries as a share of total religious houses in each county (*cistercianshare*). In order to gauge robustness, we also construct the share of other major religious orders: Benedictine monks, Augustinian canons, Premonstratensians and Cluniacs.

We made one correction to the data with respect to the city of York, which was listed in EMA as a county. York was (is) a walled city situated in North Yorkshire. To be able to match the data with the data on population density, we re-coded it as part of the county North Yorkshire. Table 1 lists the frequency distribution of the various religious houses in the EMA database, while Figure 2 maps the spatial distribution of the *cistercianshare*.

[Table 1 about here]

4.3 Time invariant productivity controls

When we estimate equation (5) we need to be concerned about time invariant determinants of productivity, and thus population density. We have therefore gathered data on agricultural land quality, as well as access to waterways and oceans. We also allow county area as an independent determinant to capture scale effects. Details are found in the Appendix.

Table 2a provides summary statistics, and Table 2b reports bivariate correlations.

[Table 2a and 2b about here]

As a prelude for things to come, it is worth observing from Table 2b that M_c/M (cistercianshare) is negatively correlated with population density in 1377, yet positively correlated with population density in 1801; both correlations are significant at a ten percent level of confidence (p-values of 0.08 and 0.09,

[13] The data are available online at: <http://www.ucl.ac.uk/history2/englishmonasticarchives/religioushouses/index.php>.

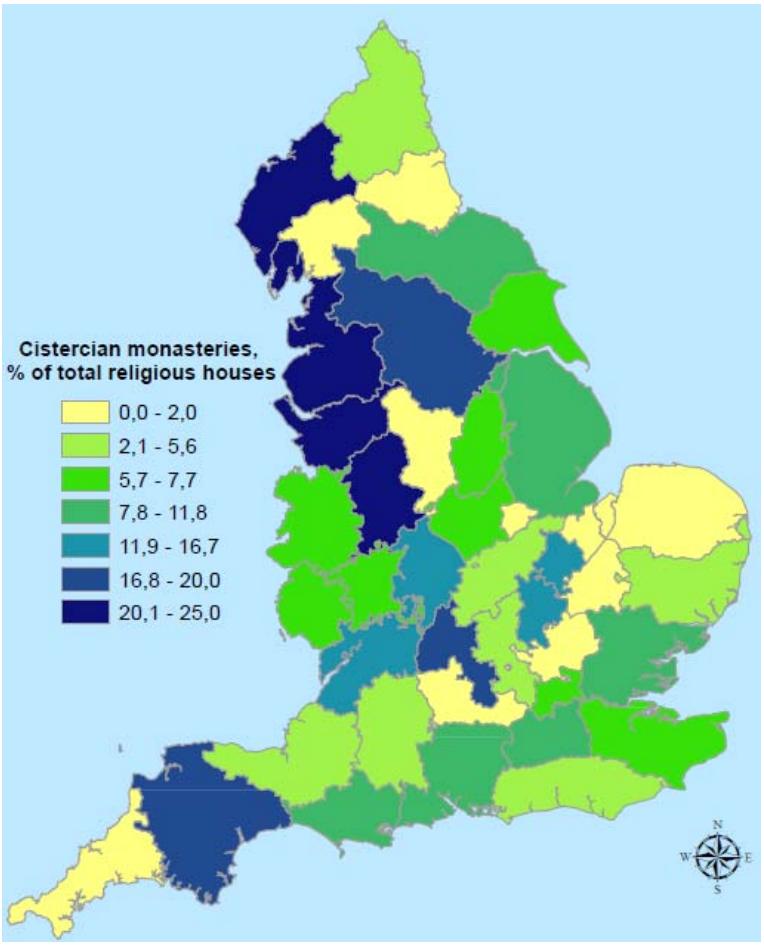


Figure 2: Cistercian monasteries as a share of all religious houses across England, 1098-1540

respectively). In the middle of the period, in 1600, the correlation is essentially nil. As explained in Section 6, the Cistercians had a preference for locating in sparcely populated areas, which likely explains the negative correlation in 1377. And yet, the correlation changes markedly during the ensuing roughly 450 years, consistent with a productivity enhancing influence from the Order beyond the Dissolution of the Monasteries in the 1530s. One may also observe that a similar time-varying correlation is not found between population density and any other religious order.

Figure 3 provides a complementary perspective. The figure shows the evolution of average population density in areas that were "treated" by Cistercians (i.e., areas that hosted at least one Cistercian monastery) and those that were not.[14] As is plain to see, population density essentially stagnates from 1377 to 1600.

[14] A total of eight counties were left "untreated": Berkshire, Cambridgeshire, Cornwall, Derbyshire, Durham, Hertfordshire, Rutland and Westmorland.

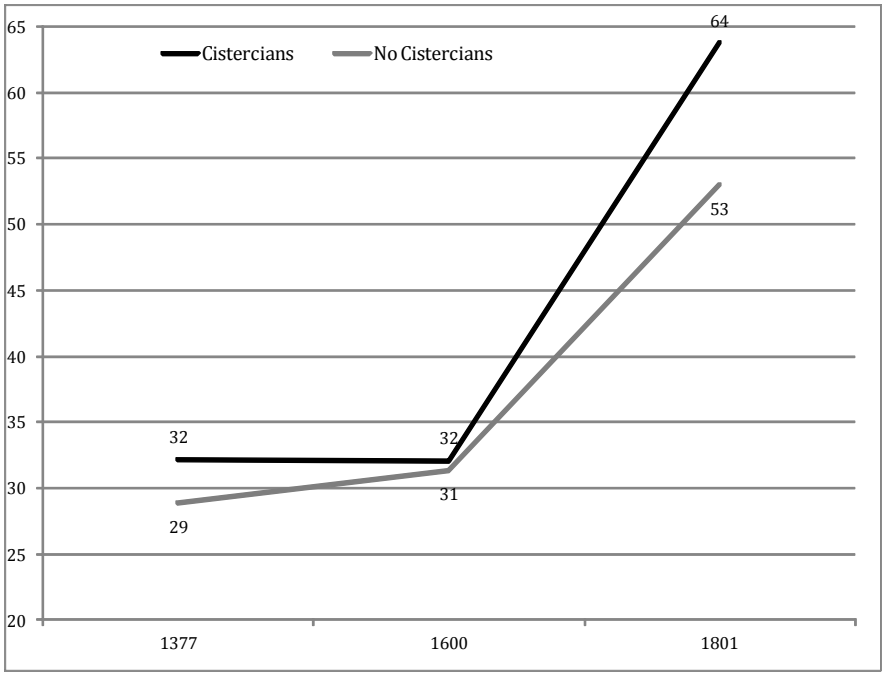


Figure 3: The figure compares average population density (persons/km2) in areas where at least one Cistercian monastery was found to areas without Cistercian monasteries.

But after 1600 one observes a clear tendency for population density to diverge: Areas where Cistercians historically *used to be* present grow faster, which is consistent with the hypothesis under scruntiny.[15]

5 OLS Results

We being by estimating equation (4) by pooled OLS. As a first pass we assume time-invariant parameters. The results are reported in Table 3.

[Table 3 about here]

In the first column we control for the intensity of Cistercian presence, total religious houses, and a time fixed effect, which takes on the value one for the period 1377-1600. This specification accounts for about 60% of the variation in population growth. The time dummy is significant and negative, which suggests that population growth has accelerated during the period 1600-1801, perhaps as a result of an emerging industrial revolution.

[15] The divergence is also statistically significant, as we show in Section 6 below.

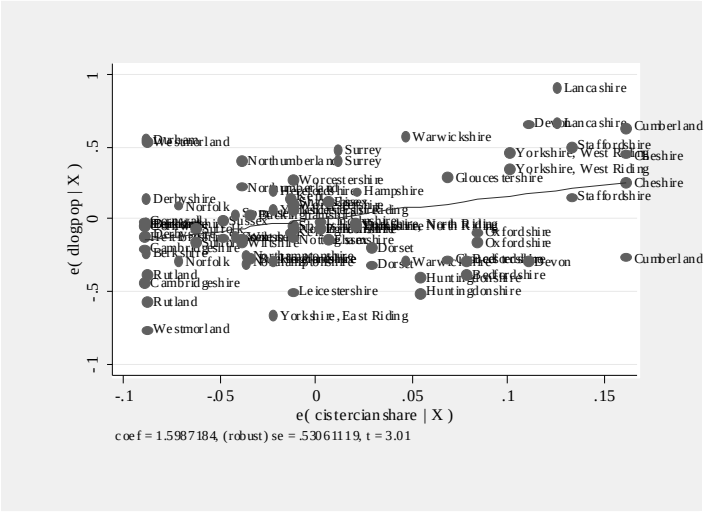


Figure 4: : Scatter plot of the partial correlation between the share of Cistercians and population growth, cf. column 1 of Table 3.

In the next five columns we examine whether other religious orders are correlated with population growth, conditional on Cistercian presence, during the period 1377-1801. In particular, in column 6 we control for all the major monastic orders simultaneously. The partial correlation is depicted in Figure 4.[16]

The general message conveyed by the table is that the intensity of Cistercian presence is strongly and positively correlated with population growth, regardless of controls. Among the controls it is particularly revealing to see that Benedictine presence does not correlate with population growth, as the Cistercians were an offshoot from this particular religious order.

If we take the point estimate in Table 3, column 6 at face value, we find that one additional Cistercian monastery (the average number of Cistercian monasteries is 1.8) instigated an increase in population size in each period (1377-1600 and 1600-1801, respectively) of about 11 percentage points evaluated at the mean number of religious houses. County population density rose on average by about 33 percent per sub-period. Hence the impact from Cistercians appears economically significant.

A potential concern with these results is that they derive from a model that does not allow for convergence; that is, lagged population density does not feature in the regression specification. If Cistercian presence is correlated with initial density, and the latter with population growth, the results in Table 3 may be tainted by omitted variables bias.

[16] A closer look at Figure 4 hints that Lancashire could be an influential observation. This is potentially concerning since Lancashire was a center for textile production during the Industrial Revolution, for which reason one might worry that the correlation between Cistercian presence and population growth is driven by an outlier. Reassuringly, the results reported in Table 3 are very similar if Lancashire is omitted; results are available upon request.

As shown in the Appendix, however, the correlation remains significant (and positive) if we introduce initial population density on top of the controls from Table 3 (see Table B1). Since this specification does not account for county-fixed effects, we examined the robustness of the partial correlation to an additional set of potential determinants of population growth: agricultural soil quality, access to waterways (river, stream and ocean, respectively) as well as county area (see Table B2). Here too the results are qualitatively similar to those reported above.

Another concern with the approach taken in Table 3 is the assumed uniform impact from Cistercians during the entire period 1377-1801. In reality the bulk of the correlation could be carried by the period where the Cistercians were physically present in English counties. If the Cistercians' presence is not felt after the Dissolution of the Monasteries, the hypothesized (permanent) cultural impact is difficult to maintain.

Table 4 reports the results from estimating the first difference specification, while allowing for a time varying impact from the Cistercians in the two periods 1377-1600 and 1600-1801, respectively.

[Insert Table 4 about here]

The choice of controls mimics that of Table 3. Hence, in Column 1 we only introduce Cistercians, total religious houses, and the time fixed effect. However, the influence from Cistercians as well as from the total number of religious houses is allowed to be time varying, taking on different values before and after the Dissolution of the Monasteries. In the next five columns we extend the list of controls to include other key religious orders; the impact from these is allowed to vary across time in a manner symmetrical to what we allow for the Cistercians.

The main result is that Cistercians indeed seem to have had a considerable impact on population growth while the monasteries were in operation; that is, prior to 1536-1540. Crucially, however, we also find a significant positive impact after 1600, which is a period during which the Cistercians were not physically present. Accordingly, places with pronounced Cistercian presence apparently grew faster than average, even after the Dissolution of the Monasteries.

One may once again worry about convergence effects. As before, we therefore check in the Appendix (see Tables B3 and B4) whether the above results hold once initial population density is introduced. In these checks the coefficient for initial population density is allowed to differ across periods, just as the rest of the estimated parameters. Moreover, we also check the time varying partial correlation between population growth and Cistercian presence in the "convergence specification" with the alternative set of controls (land quality, etc.). In this context we allow the impact from the time invariant productivity determinants to vary across time periods. In all checks, except for columns 4 of Table B4, we find that the share of Cistercians is significant, both before (pre 1600) and after (post 1600) the Dissolution of the Monasteries, at a 10 percent level of confidence or better. In the two mentioned exceptions to the rule, significance is only slightly lower at 11%.

Accordingly, a positive correlation between the intensity of Cistercian presence and population growth appears reasonably robust. Yet a legitimate concern is whether the positive correlation reflects a causal influence from the Cistercians. Moreover, even if such a causal link can be established, one may rightly wonder whether "cultural change" constitutes an underlying mechanism. The next sections address these concerns in turn.

6 Location of Cistercian Monasteries and IV estimates

An objection to the preceding results is that they could be spurious. That is, perhaps the Cistercians simply chose to locate in areas with a pronounced productive potential.

Based on the historical evidence, however, this possibility seems unlikely. The Order had a stated preference for situating their monasteries in remote, even devastated locations (Cooke 1893; Donkin 1963). Indeed, it has long been accepted by scholars that the Cistercians acted as transformers of wastelands into fertile farms, as mirrored in the poet Wordsworth's *Cistercian Monastery.*[17] The fact that Cistercian presence is negatively correlated with initial population density (see Table 2b) provides some formal corroboration of these assessments. Nevertheless we attempt to provide a further check of the Cistercian/population growth nexus by way of instrumental variables estimation.

The Cistercians had a particular preference for locating in secluded and sparsely populated areas, as explained above. At the time of arrival the most secluded areas may well have been the forests owned by the crown: royal forests.[18] As Donkin (1963, p. 184) observes: "*..there is a really significant connection with the Royal Forests; one-third of all the English [Cistercian] houses lay at first within or very near their bounds [...]. In these areas there was a good deal of land of low value for endowments; nonroyal landowners were gravely hampered by the forest laws; and, as elsewhere, prospective founders undoubtedly responded to the willingness of the early generations of monks to exploit rough, undeveloped country.*" Thus, there may well have been a double coincidence of wants. Nonroyal landowners, wanting to save their souls, had an interest in allowing Cistercians to settle at or near royal forests, which were of limited value beyond the occasional hunt with the monarch. At the same time, this location satisfied the ascetic needs of the Cistercian settlers. Finally, the monarch may also have had an incentive to encourage the practise. Madden (1963) notes that the king likely granted rights of pasture over wide tracts of the royal lands and forests because the Cistercians were willing to pay for this service using revenue from sale of wool; wool which derived from sheep using the royal lands for grazing. Hence the presence of a royal forest in a county could be a potentially viable

[17] "Where'er they rise, the sylvan waste retires, And aery harvests crown the fertile lea."

[18] The concept of a royal forest was introduced in England by the Normans in the 11th century. They were protected areas of land (not necessarily woodland) where the king had privileged hunting rights under the "forest law", which offered strict penalties to anyone using these areas for hunting or farming.

instrument for Cistercian settlements.

We obtained data on the location of royal forests in the 13th Century from Bazeley (1921). Based on the maps constructed by Bazeley, we constructed a dummy variable: *Rforest*, which is equal to one if a royal forest were to be found in the county in the 13th century. Accordingly, we expect to find a positive partial effect of royal forest on the intensity of Cistercian settlements.

A potential problem with the use of Rforest as an instrument for the intensity of Cistercian presence is that it could capture resource growth. The royal forest system was at its height in the late 12th and early 13th century. But already in 1215 Magna Carta laid down limits to the power of the monarchy in the forests, and the "Great Perambulation" of 1300 reduced the scale of the forests. Hence, counties with royal forests may have experienced growth in agricultural land area, as the importance of royal forests receded.[19]

To alleviate this cause for concern we add an additional control variable, based on Bazelay's map, which measures the size of the county area that was covered by royal forest in the 13th century as a share of the total county area: *Forestshare*. Needless to say, places with greater forest area should be places where the scope for growth in land area is greater once the royal forests start to recede. Thus, conditional on forest area there would seem to be little reason to expect that the presence of royal forest in the 1200s should impact on population growth from 1377-1801, beyond its potential effect via the location of the Cistercians. Hence, we believe the presence of royal forest plausibly fulfills the exclusion restriction, conditional on forest area. Since we only have a time invariant instrument, the IV analysis involves a pure cross-section; we examine both the full period as well as the period after the Dissolution of the Monasteries: 1600-1801.

[Table 5 about here]

Table 5 reports our results. Columns 1 and 2 examine the first difference specification. Rforest is a strong instrument for the share of Cistercians in both instances. However, only for the period 1600-1801 can the influence from the Cistercians apparently be given a causal interpretation. In columns 3 and 4 we next examine the convergence specification; both with and without the full set of controls featured in Table B4. Once again we only find a significant impact from the Cistercians during the period 1600-1801. The instrument is not "strong" in the statistical sense of the word, but from the Anderson-Rubin test we nevertheless learn that the Cistercian-population growth link is likely to be causal.

The 2SLS estimates are larger than the OLS counterparts; cf. Tables 3 and B3, where we find comparable OLS estimates in the range 1.5-2. A viable interpretation of this discrepancy is that our OLS estimates may suffer from attenuation bias, which arises since the share of Cistercians in total religious houses is a proxy

[19] We have admittedly been unable to find examples of historical writings hypothesizing that land expansion, prompted by deforestation, had an important impact on population growth. Still, it does seem to be the case that forest areas receded particularly markedly from the 16th century onwards (e.g., Young 1978). In this light it would appear reasonable to regard expansion of agricultural land expansion as a potential problem for identification.

variable for the fraction of individuals in the population with Protestant ethic. Still, it is worth observing that the IV estimates come with sufficiently large standard errors to make it difficult to reject that they differ significantly from their OLS counterparts. Hence, the conservative approach would be to use the OLS results as an estimate (perhaps lower bound) of the impact from early Protestant ethic on population growth.

As a final check we turn to an alternative measure of Cistercian influence than the one adopted hitherto. Instead of the share of monasteries, we employ an indicator variable which takes on the value "1" if at least one Cistercian monastery was found in the individual county. With this indicator variable in hand, we re-run the specifications from columns 1-4. The results are reported in Columns 5-8. The upshot is that Rforest appears to be a much stronger instrument for *whether* a Cistercian monastery is found in a county than for *how many* were found. Nevertheless, the main result is the same: only during the period 1600-1801 do the Cistercians appear to exert a causal influence on population growth.

7 The Cistercians and Contemporary Values

The analysis above makes probable that Cistercian monasteries left a lingering impact on county-level productivity. Yet we have not narrowed down the mechanism. It could be that the Cistercians simply managed to provide some areas with a technological lead, which was maintained and expanded after the Dissolution of the Monasteries. To be sure, this is a viable candidate explanation which could potentially motivate the results above, with little or no mentioning of cultural change. But if indeed the Cistercians had a historical impact on cultural values, and in light of the likely persistence of cultural values, one might expect to be able to detect an impact on cultural values today.

In order to examine whether this is the case or not, we follow McCleary and Barro (2006) in measuring "Protestant values": In their cross-country study McCleary and Barro use the fraction of World Values Survey (WVS) respondents who indicate that they think "hard work" is an important trait for children to learn at home, and the frequency of respondents indicating that "thrift, saving money and things" are important trait for children to learn at home. The European Values Study (EVS) provides information similar to the World Values Survey.[20] The latest wave of the EVS (2008-2010) includes information at the NUTS 2 (sub)regional level, thus providing us with data on values from 56,227 respondents.[21] We can then match this information with data on the location of Cistercians across European NUTS 2 regions.[22] In effect, this allows us to test the hypothesis that Cistercians have influenced cultural values across European regions. As our measure of hard work we calculate the fraction of respondents who indicated that they think

[20] http://www.europeanvaluesstudy.eu

[21] The 2008-2010 EVS wave includes information about the nuts 2 region where the respondent lived when he or she was 14 years old. We code the individual as belonging to this particular region. The rationale is that values are predominantly formed in the childhood.

[22] The previous waves have only very coarse regional information. Likewise for the World Values Survey.

that valuing "hard work" is an important trait for children to learn at home (variable a030 in EVS). To measure thrift we calculate the share of respondents indicating that "thrift, saving money and things" is an important trait for children to learn at home (variable a038 in EVS).

We focus on NUTS 2 regions with a Catholic majority, so as to be able to abstract from a potentially confounding influence from the Protestant Reformation. Specifically, we focus on regions where *at least* 50%, 75% and 90% of the population are Catholics, respectively; these three samples involve 135, 120 and 84 regions distributed across up to 19 countries. In the main text we focus on the "+50%" sample; the corresponding results for the two other samples are reported in Tables B6 and B7 in the Appendix.

In order to measure Cistercian influence we employ data on the location of European Cistercian monasteries from Donkin (1978). Donkin's map is reproduced in Figure 5. Using GIS software and a shapefile of European NUTS regions from eurostat.com, we construct a variable measuring the number of Cistercian monasteries per NUTS 2 region across Europe.[23] To make sure that we use only regions included in Donkin's map, we restrict our sample to regions with a centroid between longitudes -10 and 26 and latitudes 37 to 63.

Unfortunately, we do not have data on the total number of religious houses across Europe, so as an alternative to M we use the geographic area, N. Hence, Cistercian moral influence is proxied by the number Cistercian monasteries per km^2, M_{ci}/N_i.

Consequently, we can estimate regressions of the following form:

$$v_i = a_0 + a_1 M_{ci}/N_i + a_2 N_i + \mathbf{b}'\mathbf{X}_i + \varepsilon_i, \tag{6}$$

where v_i refers to cultural values (work ethic or thrift, respectively) in region i, M_{ci}/N_i is Cistercian monasteries per square kilometer in region i, $\mathbf{X}_i$ is a vector of controls and ε_i is noise. The parameter of interest is a_1, which is expected to be positive.

The controls contained in $\mathbf{X}_i$ fall in four categories: demographic controls (age, age squared and fraction of male respondents), geography (latitude and longitude), socio-economic circumstances (education and marital status) and a full set of country fixed effects.

Summary statistics for the "+50% sample" are reported in Table B5 in the Appendix. On average 47% and 41% of the respondents emphasize hard work and thrift. Notice, however, that the standard deviations are large, at 26 and 12 percent, respectively. It is also worth noting that in the average sub-region in our sample, 90% of the respondents are Catholic. In fact, the median is even higher at 94%. Hence, it seems to be meaningful to view these samples as comprising "Catholic areas".

Table 6 reports the results from estimating the above equation across NUTS 2 regions with in excess of

[23] The map is too imprecise to be able to perform the analysis on the smaller NUTS 3 regions. Further, our prior is that NUTS 3 regions might be too small to detect differences in cultural values after 500 years.

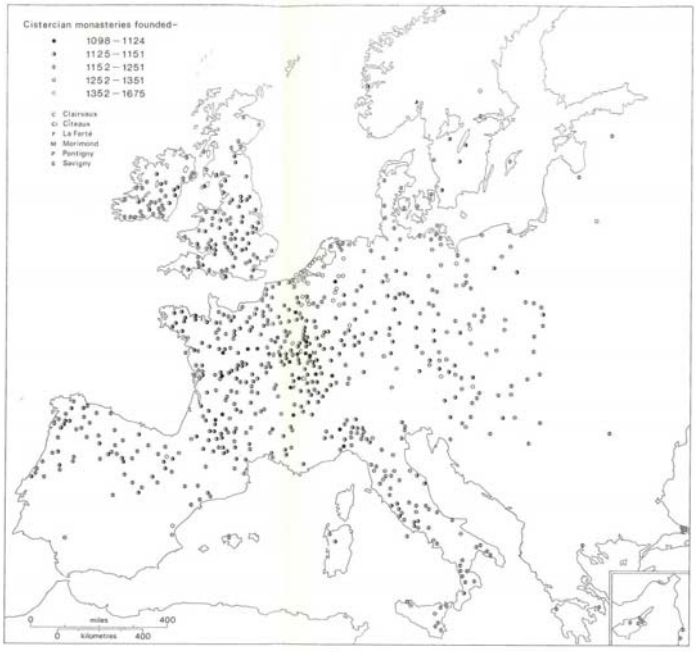


FIG. 1
The Cistercian settlement in Europe, 1098-1675.

Figure 5: Map of the historic location of Cistercian monasteries across Europe. *Source*: Donkin (1978).

50% of the population Catholic.

[Table 6 about here]

Inspection of the table reveals that a_1 is always statistically significant, regardless of whether we consider hard work or thrift, though the results are statistically stronger for the former. Figure 6 depict the partial correlation between Cistercian density and hard work and thrift, respectively, correponding to the results in Table 6, columns 9 and 10. Visual inspection of the top left and lower left panel suggest that the Province Brabant Wallon, a small area in Belgium, appears to be influential. Hence, the top right and lower right panels depict the result if this area is omitted. As can be seen, significance continues to be obtained, albeit at a slightly lower level of statistical confidence; this is especially so for "thrift", where Cistercian density only carries significance at the 10% level. As shown in the Appendix, these basic results carry over to alternative samples where at least 75% and 90% of the local populations are Catholic. Much like in Table 6, however, the results for "thrift" are weaker and, on occation, insignificant at conventional levels.

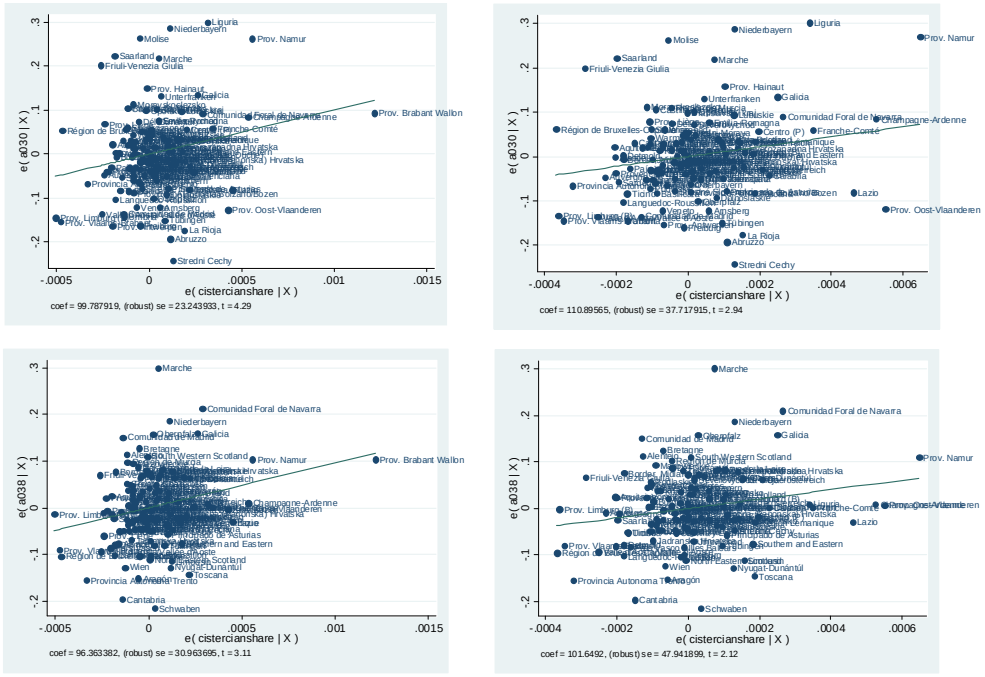


Figure 6. Cistercian density versus values. The two top panels shows the link to "hard work" with and without the province Brabant Wallon. The two bottom panels show the link to "thrift" with and without Brabant Wallon. The partial correlation correspond to column 9 and 10, Table 6.

Turning to economic significance, at first sight the point estimates look implausibly large. Remember, however, that the independent variable is Cistercian monasteries per square kilometer; a unit increase in M_{ci}/N_i is an enormous change. Suppose instead we allow M_{ci}/N_i to move by one standard deviation. Then the results above (Columns 9 and 10 in Table 6) imply that the fraction of the population valuing "hard work" increases by roughly three percent; the comparable number for "thrift" is two percent. Or, to put it differently, if we move from regions without Cistercian monasteries to the region with the greatest Cistercian presence, work ethic is expected to increase by 18 percent and thrift by 13 percent.

8 Concluding Remarks

The present paper documents that Cistercian monks left a persistent imprint on long-run comparative development across English counties during the pre-industrial era. In counties with greater Cistercian presence population growth was faster during the period 1377-1801, suggesting that the Cistercians stimulated over-all productivity. Further, the influence from the Cistercians was, if anything, larger in the post-1600 period, compared to the pre-1600 period.

The particularly interesting aspect of this finding is that the Catholic monasteries were all dissolved by 1540 in England. Hence the influence from the Cistercian order was felt more than 250 years after they had

disappeared from England. This result is robust to different specifications, a considerable number of controls for productivity, including controls for other religious orders. Moreover, our IV estimates suggest that the correlation can be given a causal interpretation.

We have also offered a potential explanation for these facts, namely that the Cistercians ignited a process of growth through cultural change. That is, a gradual change in local populations in terms of taste for hard work and thrift; much like Max Weber suggested was the end result of the Protestant Reformation.

We believe this explanation is plausible for three reasons. First, a cultural concordance between the Cistercians and the Protestants, in the dimensions of work ethic and thrift, has already been observed by several scholars including Weber himself. Second, the cultural explanation has the virtue of being able to plausibly account for the long-term persistency of Cistercian influence on growth. Third, consistent with the cultural mechanism we find, using data from the European Values Survey, that Catholic regions in Europe which historically were influenced relatively more by the Cistercians tend to have populations with greater taste for hard work and, to a lesser extent, thrift today.

Overall, this research suggests that Weber was right in stressing the importance of a cultural appreciation of hard work and thrift, but quite likely wrong in tracing the origins of these values to the Protestant Reformation.

A Data

Agricultural land quality. Natural England provides a measure of agricultural land classified into five grades plus classifications for non-agricultural and urban land. Grade one is best quality and grade five is poorest, grade six is non-agricultural land and grade seven is urban. The measure is calculated by Natural England using information on climate (temperature, rainfall, aspect, exposure, frost risk), site (gradient, micro-relief, flood risk) and soil (depth, structure, texture, chemicals, stoniness). The source of the data is Raster Digital mapping with a scale of 1:250,000.[24] The data was gathered with coordinate precision of 1 meter. We used these data to create a measure of agricultural land quality within each county.

The earliest digital map of English counties is from 1851. These data were kindly provided to us by University of Portsmouth and the Great Britain Historical GIS Project. Combining the shapefile including the agricultural land quality and the shapefile including English county borders, we were able to create measures of the area in a county with agricultural land of quality level 1-5, each as a share of total county area.[25] Our preferred variable is the combination of qualities 1 and 2, which we shall denote *Agrquality*.[26] The data is visualized in Figure 8.

Data on county area (*Area)* are from Campbell (2008). We include the log of the land area in the robustness checks to control for potential scale effects.

Waterways. As noted in Section 2, the Cistercians were strong exponents of water powered production and they employed advanced irrigation techniques, which could be responsible for their influence on English population growth. To control for this kind of influence from Cistercian presence we therefore add controls for waterways.

The German company Geofabrik freely provides shapefiles on various geographic features.[27] Of our interest is their data on waterways in Great Britain, where waterways are divided into canal, dock, drain, moat, river, and stream.[28] As with the data on agricultural land quality, we merge the shapefile describing waterways with the shapefile describing the county borders of England. The outcomes of interest from this procedure is the total length of, respectively, rivers and streams as a share of the total county area (donoted, respectively, *Rivershare and Streamshare*). The data is visualized in the figure below.

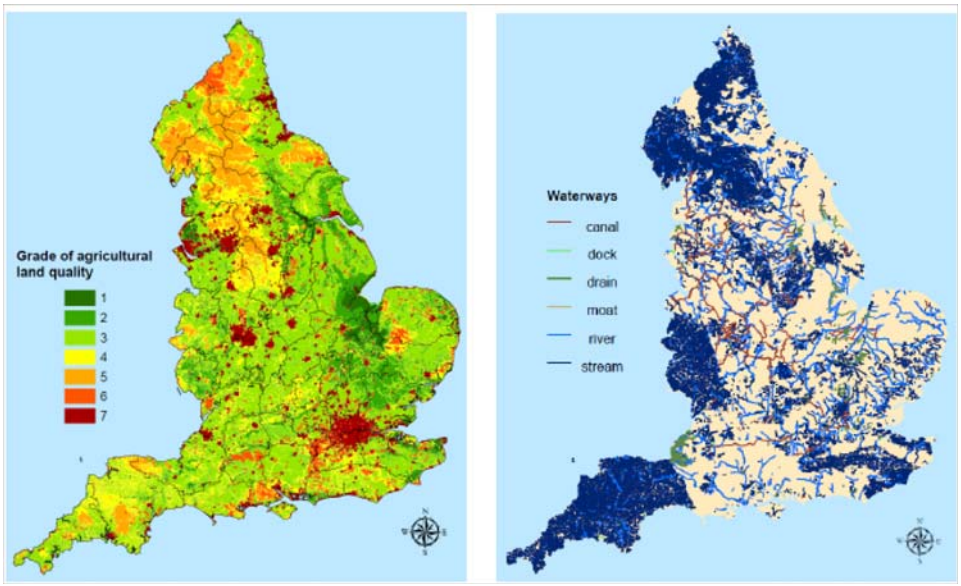
[24] Available online at: <http://www.gis.naturalengland.org.uk/pubs/gis/gis_register.asp>. Data description available online at: <http://www.magic.gov.uk/datadoc/metadata.asp?dataset=2&x=16&y=10> and <http://naturalengland.etraderstores.com/NaturalEnglandShop/product.aspx?ProductID=88ff926a-3177-4090-aecb-00e6c9030b29>.

[25] The total county area was here calculated by summing over the land quality variable, since this variable spans the entire area.

[26] None of the results change if we instead include agrquality1 and agrquality2 together or separately. If we include a variable measuring the aggregate agricultural quality over grades 1, 2, and 3, results are unchanged, except column 9 of Table 4 below, where the t-value on *Ciscercianshare* drops to 1.16.

[27] These shapefiles are based on maps created by the OpenStreetMap project using data from portable GPS devices, aerial photography, other free sources, or simply from local knowledge.

[28] Available online at: <http://download.geofabrik.de/osm/europe/great_britain/>



Data on soil quality (left panel) and rivers and stream (right panel). We also include a dummy variable (*Ocean dummy)* which takes on a value of 1 if the county in question has direct access to the ocean.

B Results using an alternative specification

[Insert Tables B1 - B7]

References

[1] Acemoglu, D., 2009. *Introduction to Modern Economic Growth*. Princeton University Press.

[2] Ashraf, Q. and O. Galor, 2009. Dynamics and Stagnation in the Malthusian Epoch: Theory and Evidence. Working Paper (Brown University). *American Economic Review* (forthcoming)

[3] Barro, R. and R. McCleary, 2003. Religion and Economic Growth across Countries. *American Sociological Review*, 68, 760-781

[4] Baumol, W., 1990. Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Political Economy*, 98, 893-921

[5] Bazeley, M.L., 1921. The Extent of the English Forest in the Thirteenth Century. Transactions of the Royal Historical Society, 4 , pp. 140-172.

[6] Becker, R.A., 1980. On the long-run steady state in a simple dynamic model of equilibrium with heterogeneous households. *Quarterly Journal of Economics*, 95, 375–82

[7] Becker, S. and L. Woessmann, 2009. Was Weber Wrong? A Human Capital Theory of Protestant Economic History. *Quarterly Journal of Economics*, 124, 531-596

[8] Berman, C.H., 2000, *The Cistercian Evolution*. Penn Press

[9] Bisin, A. and T. Verdier, 2000. Beyond the Melting Pot: Cultural Transmission, Marriage, and the Evolution of Ethnic and Religious Traits. Quarterly Journal of Economics 115, 955-88.

[10] Bisin, A. and T. Verdier, 2001. The Economics of Cultural Transmission and the Dynamics of Preferences. *Journal of Economic Theory* 97, 298-319.

[11] Bloch, M., 1935. *Avènement et conquêtes du moulin a eau. Annales d'Histoire Èconomique et Sociale,* 7, 538–563

[12] Bouchard, C., 1991. *Holy Entrepreneurs*. Cornell University Press

[13] Broadberry S., B. Cambell and Leeuwen B., 2010. English Medieval Population: Reconciling time series and cross sectional evidence. Working Paper (Warwick)

[14] Cameron, C. and P. Trivedi, 2005. *Microeconometrics*. Cambridge University Press

[15] Campbell, B., 2000. *English seigniorial agriculture, 1250-1450*. Cambridge University Press

[16] Campbell, B., 2008. Benchmarking medieval economic development: England, Wales, Scotland and Ireland, c. 1290. *Economic History Review*, 61, 896-945

[17] Cantoni, D., 2009. The Economic Effects of the Protestant Reformation: Testing the Weber Hypothesis in the German Lands. Manuscript (Harvard University)

[18] Clark, G., 2007. *A Farewell to Alms*. Princeton University Press

[19] Clark, G. and Y. Van Der Werf, 1998. Work in progress? the industrious revolution, *Journal of Economic History*, 58, 830–43

[20] Collins, R., 1986. *Weberian Sociological Theory*. Cambridge University Press

[21] Cook, H., Stearne, K., and T. Williamson, 2003. The origins of water meadows in England. *Agricultural History Review*, 51, 155-162

[22] Cooke, A., 1893. The Settlement of the Cistercians in England. *English Historical Review*, 8, 625-676

[23] Dobson, R., 1983. *The Peasants' Revolt*. Palgrave Macmillan

[24] Doepke, M. and F. Zilibotti, 2008. Occupational choice and the spirit of capitalism. *Quarterly Journal of Economics*, 747-93

[25] Dohmen, T., A. Falk, D. Huffman and U. Sunde, 2011. The Intergenerational Transmission of Risk and Trust Attitudes. Forthcoming: *Review of Economic Studies.*

[26] Donkin, R., 1963. The Cistercian Order in Medieval England: Some Conclusions. *Transactions and Papers (Institute of British Geographers)*, 33, 181–198

[27] Donkin, R., 1978. *The Cistercians: Studies in the geography of medieval England and Wales*. Toronto: Pontifical Institute of Medieval Studies

[28] Galor, O. and O. Moav, 2002. Natural Selection and the Origin of Economic Growth. *Quarterly Journal of Economics*, 117, 1133–91

[29] Gimpel, J., 1976. *The medieval machine*. Penguin

[30] Grant, R. (1991). *The Royal Forests of England*. Stroud, UK: Alan Sutton Publishing

[31] Guiso, L., Sapienza, P., and L. Zingales, 2008. Long Term Persistence. EUI Working Paper 2008/30

[32] Hatton, T. and R.M. Martin, 2010. Fertility decline and the heights of children in Britain, 1886–1938. *Explorations in Economic History* 47, 505-19.

[33] Hill, B.D., 1968. *English Cistercian monasteries and their patrons in the twelfth century*. University of Illinois Press

[34] Kaelber L., 1998. *Schools of Asceticism: Ideology and Organization in Medieval Religious Communities.* Penn State Press

[35] Kelly, M. and C. O'Grada, 2008. Living Standards and Mortality in England since the Middle Ages: The Poor Law versus the Positive Check. Manuscript (University College Dublin)

[36] Kieser, A., 1987. From Asceticism to Administration of Wealth. Medieval Monasteries and the Pitfalls of Rationalization. *Organization Studies*, 8, 103-123

[37] Landes, D., 1999. The Wealth and Poverty of Nations. Abacus

[38] Madden, J.E. (1963). Business Monks, Banker Monks, Bankrupt Monks: The English Cistercians in the Thirteenth Century. *The Catholic Historical Review*, Vol. 49, No. 3, pp. 341-364

[39] McCleary, R. and R. Barro, 2006. Religion and Economy. *Journal of Economic Perspectives*, 20, 49-72

[40] Noell, B., 2006. Expectation and unrest among Cistercian lay brothers in the twelfth and thirteenth centuries. *Journal of Medieval History*, 32, 253-274

[41] North, D. and B.R. Weingast, 1989. Constitutions and commitment: the evolution of institutions governing public choice in seventeenth-century England. *Journal of Economic History* 49, 803–32.

[42] Ovitt Jr, G., 1986. The Cultural Context of Western Technology: Early Christian Attitudes toward Manual Labor. *Technology and Culture*, 27, 477–500

[43] Rickman, J., 1802. *Observations on the Results of the Population Act,* 41 Geo. III. Gregg.

[44] Young, C.R. (1978). 'Conservation Policies in the Royal Forests of Medieval England'. *Albion: A Quarterly Journal Concerned with British Studies*, 10, 95-103

[45] Weber, M., 1905. *The Protestant Ethic and the Spirit of Capitalism.* Allen & Unwin

[46] Weber, M., 1958. *The Protestant Ethic and the Spirit of Capitalism.* Charles Scribner's Sons

[47] Williams, D.H., 1970. *The Welsh Cistercians: Aspects of Their Economic History.* The Griffin Press

[48] Wrigley, E., 2007. English county populations in the later eighteenth century. *Economic History Review*, 60, 35-69

Table 1: Frequency distribution of monastic orders	Number	Share of total
Benedictine monks	239	30.8
Augustinian canons	208	26.8
Benedictine nuns	77	9.9
Cistercian monks	70	9.0
Premonstratensian canons	37	4.8
Cluniac monks	34	4.4
Cistercian nuns	28	3.6
Augustinian canonesses	24	3.1
Gilbertine canons	15	1.9
Trinitarian brothers	10	1.3
Gilbertine canons & nuns	9	1.2
Carthusian monks	8	1.0
Fontevraud nuns	3	0.4
Grandmontine monks	3	0.4
Premonstratensian canonesses	3	0.4
Bonhommes brothers	2	0.3
Cluniac nuns	2	0.3
Brigettine nuns & brothers	1	0.1
Fontevraud monks	1	0.1
Gilbertine nuns	1	0.1
unknown monks or brothers	1	0.1
Total	776	100.0

Table 2a: Summary statistics	**Obs**	**Mean**	**Std.**	**Min**	**Max**
ciscistercianshare	40	0.09	0.07	0.00	0.25
relhouses	40	19.03	12.93	2.00	73.00
popdens1377	40	31.55	11.83	8.98	52.98
popdens1600	40	29.99	6.46	13.97	43.33
popdens1801	40	60.45	24.82	20.92	143.77
augustinianshare	40	0.28	0.13	0.00	0.62
benedictineshare	40	0.31	0.16	0.00	0.67
cluniacshare	40	0.04	0.05	0.00	0.15
premonstratensianshare	40	0.05	0.09	0.00	0.50

Table 2b: Correlation matrix

ciscistercianshare	1								
relhouses	0.01	1							
popdens1377	-0.28	0.31	1						
popdens1600	-0.01	0.01	0.45	1					
popdens1801	0.32	-0.16	-0.06	0.57	1				
augustinianshare	-0.10	-0.12	0.35	0.23	0.30	1			
benedictineshare	-0.15	0.04	0.01	0.06	-0.05	-0.27	1		
cluniacshare	-0.09	0.07	-0.01	0.34	0.26	0.18	-0.15	1	
premonstratensianshare	-0.18	-0.07	-0.33	-0.24	-0.14	-0.22	-0.46	0.02	1

Table 3: POLS, first difference regressions of changes in population density on Cistercianshare and controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$						
Cistercianshare	1.599***	1.584**	1.623***	1.674***	1.720***	2.107***
	-0.531	(0.601)	(0.604)	(0.582)	(0.535)	(0.548)
Relhouses	-0.008***	-0.008***	-0.008***	-0.008***	-0.007***	-0.008***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
$t_{1377\text{-}1600}$	-0.640***	-0.640***	-0.640***	-0.640***	-0.640***	-0.640***
	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.069)
Augustinianshare		-0.086				0.177
		(0.298)				(0.336)
Benedictineshare			0.074			0.493
			(0.268)			(0.324)
Cluniacshare				1.352*		1.521**
				(0.723)		(0.705)
Premonshare					0.545	1.034**
					(0.405)	(0.458)
Constant	0.658***	0.685***	0.634***	0.601***	0.613***	0.292
	(0.073)	(0.110)	(0.094)	(0.084)	(0.090)	(0.204)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.577	0.577	0.577	0.594	0.587	0.620

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level. ***,**,* indicates significance at 1, 5, and 10 percent, respectively.

Table 4: POLS, first difference with time-varying effects

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$						
Ciscercianshare x t_{1600}	1.716**	1.567**	1.758**	1.807**	2.049**	2.435***
	(0.810)	(0.760)	(0.848)	(0.828)	(0.768)	(0.754)
Ciscercianshare x t_{1801}	1.481**	1.601**	1.488*	1.541**	1.392*	1.779**
	(0.719)	(0.694)	(0.762)	(0.726)	(0.720)	(0.744)
Relhouses x t_{1600}	-0.011***	-0.012***	-0.011***	-0.011***	-0.010***	-0.011***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Relhouses x t_{1801}	-0.005	-0.004	-0.005	-0.005*	-0.005*	-0.004*
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
t_{1600}	-0.543***	-0.044	-0.577*	-0.566**	-0.699***	-0.516
	(0.178)	(0.249)	(0.334)	(0.225)	(0.134)	(0.309)
Augustinianshare x t_{1600}		-0.875*				-0.413
		(0.471)				(0.458)
Augustinianshare x t_{1801}		0.703**				0.768**
		(0.316)				(0.375)
Benedictianshare x t_{1600}			0.127			0.706
			(0.477)			(0.453)
Benedictianshare x t_{1801}			0.022			0.281
			(0.303)			(0.350)
Cluniacshare x t_{1600}				1.623		2.192**
				(1.170)		(1.000)
Cluniacshare x t_{1801}				1.081		0.849
				(1.011)		(1.014)
Premonshare x t_{1600}					1.490***	1.947***
					(0.415)	(0.549)
Premonshare x t_{1801}					-0.400	0.121
					(0.682)	(0.643)
Constant	0.609***	0.387***	0.602***	0.563***	0.642***	0.230
	(0.097)	(0.138)	(0.170)	(0.111)	(0.083)	(0.256)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.584	0.629	0.585	0.602	0.627	0.694

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level. ***,**,* indicates significance at 1, 5, and 10 percent, respectively.

Table 5: 2SLS estimates of changes in population density on Cisterciansharе/Cistercian present and controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$								
Time period	1377-1801	1600-1801	1377-1801	1600-1801	1377-1801	1600-1801	1377-1801	1600-1801
Ciscterciansharе	1.330	3.424*	2.301	2.643*				
	(2.172)	(2.020)	(1.684)	(1.587)				
Relhouses	-0.017***	-0.006*	-0.018***	-0.010***	-0.019***	-0.011***	-0.020***	-0.016***
	(0.004)	(0.003)	(0.005)	(0.004)	(0.005)	(0.003)	(0.005)	(0.003)
Cistercians present (=1)					0.174	0.447*	0.349	0.323*
					(0.293)	(0.262)	(0.287)	(0.193)
Forestshare	-0.527	-0.303	-0.293	-0.323*	-0.531	-0.315	-0.334	-0.301
	(0.390)	(0.221)	(0.193)	(0.167)	(0.404)	(0.212)	(0.233)	(0.187)
(log)Popdens$_{t-1}$			-0.532***	0.097			-0.721***	0.046
			(0.201)	(0.226)			(0.187)	(0.186)
Ocean dummy			-0.081	-0.101			-0.070	-0.066
			(0.128)	(0.094)			(0.132)	(0.109)
Rivershare			-0.055	-2.888*			0.777	-1.509
			(2.112)	(1.629)			(2.059)	(1.485)
Streamshare			-0.331	-0.235			-0.553**	-0.397**
			(0.312)	(0.251)			(0.281)	(0.192)
Agrquality			-0.505*	-0.488***			-0.424	-0.495***
			(0.282)	(0.168)			(0.285)	(0.162)
(log)Area			0.333***	0.226*			0.304**	0.280**
			(0.123)	(0.116)			(0.154)	(0.132)
Kleibergen-Paap	18.10	18.10	7.89	7.82	39.97	39.97	20.12	25.13
Anderson-Rubin (p-value)	0.552	0.074	0.188	0.069	0.552	0.075	0.188	0.069
Observations	40	40	40	40	40	40	40	40

Robust standard errors in paranthesis. ***,**,* indicates significance at 1, 5, and 10 percent, respectively. All regressions contain a constant term. The excluded instrument in all columns is "Royal Forest" (=1 if "yes"). In columns 5-8 an indicator variable "Cistercian present" is employed, which takes on the value of 1 if just one Cistercian monestary was to be found in the county. The left hand side variable in columns 1, 3, 5 and 7 is population growth, 1377-1801, whereas the remaining columns focus on 1600-1801.

Table 6. Values across NUTS 2 regions of Catholic (+50%) Europe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift
Cistercianshare	114.779***	119.452***	104.990***	99.435***	122.175***	125.559**	93.221***	93.782***	99.788***	96.363***
	(23.296)	(37.344)	(24.755)	(24.317)	(23.343)	(44.145)	(24.780)	(30.978)	(23.244)	(30.964)
Area	-0.000	0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Geography	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Socio-econ	No	No	No	No	No	No	Yes	Yes	Yes	Yes
# Controls	19	19	22	22	21	21	22	22	27	27
Countries	19	19	19	19	19	19	19	19	19	19
Observations	135	135	135	135	135	135	135	135	135	135
R-squared	0.839	0.320	0.853	0.491	0.853	0.368	0.868	0.557	0.875	0.577

Robust standard errors in paranthesis. ***,**,* indicates significance at 1, 5, and 10 percent, respectively. All regressions contain a constant term. "Demography" involves controls for age, age squared and fraction male; "Geography" controls for latitude and longitude; "Socio-econ" controls for education and marital status. "Cistercianshare" is the number of Cistercian monasteries per km2. All estimations by OLS. # controls refers to the number of additional controls beyond Cistercianshare and Area. All sub-regions in the sample have a population where at least 50% are Catholic.

Table B1: Robustness check of Table 3, allowing for convergence and including other monastic orders as controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$						
(log)Popdens$_{t-1}$	-0.488***	-0.528***	-0.490***	-0.514***	-0.504***	-0.546***
	(0.078)	(0.077)	(0.078)	(0.067)	(0.092)	(0.090)
Cisterciansshare	1.151**	1.177**	1.187**	1.226**	1.097*	1.464**
	(0.514)	(0.519)	(0.521)	(0.490)	(0.560)	(0.603)
Relhouses	-0.005*	-0.004*	-0.005*	-0.005***	-0.005*	-0.005**
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
t_{1600}	-0.647***	-0.647***	-0.647***	-0.647***	-0.647***	-0.648***
	(0.050)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)
Augustinianshare		0.372				0.452
		(0.299)				(0.304)
Benedictineshare			0.113			0.394
			(0.218)			(0.272)
Cluniacshare				1.797**		1.816**
				(0.697)		(0.680)
Premonshare					-0.175	0.263
					(0.502)	(0.522)
Constant	2.293***	2.311***	2.262***	2.307***	2.361***	2.119***
	(0.258)	(0.254)	(0.251)	(0.233)	(0.315)	(0.375)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.711	0.720	0.712	0.742	0.712	0.756

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level. ***,**,* indicates significance at 1, 5, and 10 percent, respectively.

Table B2: Robustness check of Table 3, allowing for convergence and including geography controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)$Popdens_t$ - (log)$Popdens_{t-1}$						
(log)$Popdens_{t-1}$	-0.488***	-0.447***	-0.499***	-0.397***	-0.477***	-0.424***
	(0.078)	(0.079)	(0.109)	(0.079)	(0.077)	(0.115)
Cistercianshare	1.151**	1.098**	1.059*	0.946**	1.129**	0.804+
	(0.514)	(0.511)	(0.557)	(0.452)	(0.502)	(0.508)
Relhouses	-0.005*	-0.004*	-0.005**	-0.010***	-0.005*	-0.010***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
t_{1600}	-0.647***	-0.646***	-0.647***	-0.646***	-0.647***	-0.646***
	(0.050)	(0.052)	(0.061)	(0.053)	(0.051)	(0.060)
Agrquality		-0.332*				-0.239
		(0.195)				(0.200)
Rivershare			1.209			0.611
			(1.253)			(1.346)
Streamshare			-0.102			-0.194
			(0.177)			(0.199)
(log)Area				0.168**		0.206**
				(0.067)		(0.082)
Ocean dummy					0.024	-0.044
					(0.070)	(0.082)
Constant	2.293***	2.203***	2.227***	0.764	2.253***	0.611
	(0.258)	(0.256)	(0.374)	(0.635)	(0.261)	(0.745)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.711	0.722	0.715	0.730	0.712	0.744

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level. ***,**,* indicates significance at 1, 5, and 10 percent, respectively.

Table B3: Robustness check of Table 4, allowing for convergence and including other monastic orders as controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$						
(log)Popdens$_{t-1}$ x t_{1600}	-0.663***	-0.662***	-0.663***	-0.664***	-0.657***	-0.624***
	(0.087)	(0.098)	(0.087)	(0.074)	(0.101)	(0.097)
(log)Popdens$_{t-1}$ x t_{1801}	0.039	-0.050	0.038	-0.035	-0.001	-0.144
	(0.229)	(0.205)	(0.230)	(0.213)	(0.229)	(0.211)
Cisterciansshare x t_{1600}	0.538	0.539	0.583	0.629	0.562	0.941
	(0.398)	(0.403)	(0.402)	(0.392)	(0.473)	(0.580)
Cisterciansshare x t_{1801}	1.483**	1.601**	1.489*	1.542**	1.392*	1.784**
	(0.726)	(0.711)	(0.767)	(0.740)	(0.735)	(0.783)
Relhouses x t_{1600}	-0.004*	-0.004	-0.004*	-0.004**	-0.004	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Relhouses x t_{1801}	-0.005	-0.004	-0.005	-0.005*	-0.005*	-0.004*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
t_{1600}	1.785*	1.714**	1.743*	1.517*	1.594	1.198
	(0.929)	(0.846)	(0.965)	(0.888)	(0.962)	(0.941)
Augustinianshare x t_{1600}		-0.012				0.030
		(0.285)				(0.304)
Augustinianshare x t_{1801}		0.724**				0.810**
		(0.325)				(0.384)
Benedictianshare x t_{1600}			0.138			0.372
			(0.182)			(0.295)
Benedictianshare x t_{1801}			0.016			0.305
			(0.301)			(0.345)
Cluniacshare x t_{1600}				1.659**		1.846**
				(0.800)		(0.763)
Cluniacshare x t_{1801}				1.140		1.085
				(0.913)		(0.919)
Premonshare x t_{1600}					0.060	0.458
					(0.299)	(0.519)
Premonshare x t_{1801}					-0.400	0.058
					(0.715)	(0.675)
Constant	0.479	0.548	0.477	0.680	0.645	0.690
	(0.806)	(0.704)	(0.823)	(0.756)	(0.797)	(0.775)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.760	0.778	0.762	0.779	0.763	0.803

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level.
***,**,* indicates significance at 1, 5, and 10 percent, respectively.

Table B4: Robustness check of Table 4 - allowing for convergence and including geography controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : (log)Popdens$_t$ - (log)Popdens$_{t-1}$						
(log)Popdens$_{t-1}$ x t_{1600}	-0.663***	-0.659***	-0.591***	-0.600***	-0.660***	-0.558***
	(0.087)	(0.088)	(0.120)	(0.104)	(0.099)	(0.125)
(log)Popdens$_{t-1}$ x t_{1801}	0.039	0.117	-0.001	0.124	0.057	0.113
	(0.229)	(0.233)	(0.174)	(0.240)	(0.244)	(0.165)
Ciscercianshare x t_{1600}	0.538	0.537	0.514	0.476	0.535	0.453
	(0.398)	(0.404)	(0.566)	(0.378)	(0.405)	(0.537)
Ciscercianshare x t_{1801}	1.483**	1.326*	1.538***	1.172+	1.435*	1.019*
	(0.726)	(0.725)	(0.529)	(0.705)	(0.731)	(0.521)
Relhouses x t_{1600}	-0.004*	-0.004	-0.004	-0.007**	-0.004	-0.006
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)
Relhouses x t_{1801}	-0.005	-0.003	-0.005*	-0.009**	-0.005*	-0.012***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
t_{1600}	1.785*	1.955**	1.008	2.467	1.842*	2.890*
	(0.929)	(0.932)	(0.773)	(1.700)	(1.022)	(1.497)
Agrquality x t_{1600}		-0.032				-0.003
		(0.195)				(0.253)
Agrquality x t_{1801}		-0.593**				-0.520**
		(0.224)				(0.249)
Rivershare x t_{1600}			2.290			2.203
			(1.552)			(1.526)
Rivershare x t_{1801}			-0.877			-2.070
			(1.576)			(1.551)
Streamshare x t_{1600}			0.006			-0.018
			(0.206)			(0.201)
Streamshare x t_{1801}			-0.108			-0.298
			(0.185)			(0.192)
(log)Area x t_{1600}				0.101		0.072
				(0.077)		(0.124)
(log)Area x t_{1801}				0.184*		0.330***
				(0.100)		(0.120)
Ocean dummy x t_{1600}					0.007	-0.000
					(0.078)	(0.106)
Ocean dummy x t_{1801}					0.038	-0.080
					(0.106)	(0.105)
Constant	0.479	0.299	0.751	-1.152	0.410	-1.750*
	(0.806)	(0.825)	(0.602)	(1.292)	(0.868)	(1.027)
Observations	80	80	80	80	80	80
Counties	40	40	40	40	40	40
R-squared	0.760	0.778	0.775	0.776	0.761	0.822

Pooled OLS on the two periods 1377-1600 and 1600-1801. Standard errors, reported in paranthesis, are clustered at the county level.
***,**,*, + indicates significance at 1, 5, 10, and 15 percent, respectively.

Table B5. Summary statistics: EVS

Variable	mean	sd	min	max
Hard work	0.47	0.26	0	0.95
Thrift	0.41	0.12	0	0.68
Cistercian share (density per km2)	0.0002193	0.0002529	0	0.0017079
Age	48.3	5.30	27	69.3
Married respondents	0.5	0.12	0	1
Edu secondary	0.51	0.18	0	0.90
Edu tertiary	0.21	0.12	0	1
Catholic	0.90	0.12	0.52	1

These summary statistics correspond to the "+50%" sample; cf. results in Table 6.

Table B6. Values across NUTS 2 regions of Catholic (+75%) Europe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift
Cisterciansshare	116.021***	91.689***	113.666***	83.056**	122.254***	96.478***	98.876***	70.451*	104.635***	75.727**
	(28.125)	(22.857)	(25.297)	(29.211)	(24.899)	(26.942)	(25.332)	(34.329)	(23.419)	(35.594)
Area	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Geography	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Socio-econ	No	No	No	No	No	No	Yes	Yes	Yes	Yes
# Controls	19	19	22	22	21	21	22	22	27	27
Countries	19	19	19	19	19	19	19	19	19	19
Observations	120	120	120	120	120	120	120	120	120	120
R-squared	0.840	0.363	0.852	0.486	0.858	0.424	0.868	0.557	0.878	0.575

Robust standard errors in paranthesis. ***,**,* indicates significance at 1, 5, and 10 percent, respectively. All regressions contain a constant term. "Demography" involves controls for age, age squared and fraction male; "Geography" controls for latitude and longitude; "Socio-econ" controls for education and marital status. "Cisterciansshare" is the number of Cistercian monasteries per km2. All estimations by OLS. # controls refers to the number of additional controls beyond Cisterciansshare and Area. All sub-regions in the sample have a population where at least 75% are Catholic.

Table B7. Values across NUTS 2 regions of Catholic (+90%) Europe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift	Hard Work	Thrift
Cisterciansshare	140.376***	79.873***	144.249***	74.381**	131.682***	72.968***	125.096***	54.912	123.898***	37.736
	(32.059)	(26.075)	(20.498)	(28.858)	(24.044)	(21.566)	(17.357)	(35.080)	(20.476)	(23.890)
Area	-0.000*	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Geography	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Socio-econ	No	No	No	No	No	No	Yes	Yes	Yes	Yes
# Controls	18	18	21	21	20	20	21	21	26	26
Countries	18	18	18	18	18	18	18	18	18	18
Observations	87	87	87	87	87	87	87	87	87	87
R-squared	0.818	0.335	0.842	0.470	0.838	0.414	0.862	0.586	0.870	0.641

Robust standard errors in paranthesis. ***,**,* indicates significance at 1, 5, and 10 percent, respectively. All regressions contain a constant term. "Demography" involves controls for age, age squared and fraction male; "Geography" controls for latitude and longitude; "Socio-econ" controls for education and marital status. "Cisterciansshare" is the number of Cistercian monasteries per km2. All estimations by OLS. # controls refers to the number of additional controls beyond Cisterciansshare and Area. All sub-regions in the sample have a population where at least 90% are Catholic.