

# **A macroeconomic perspective on the Reformation and the downscaling of the Church in Denmark, 1500-1600**

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**Abstract:** In 1536, the Reformation of Denmark changed the state religion from Catholic to Lutheran. The paper assesses that the Church-sector in the economy peaked around year 1500, where its share of the economy (the GDP) was about 12%. After the Reformation, the share fell to about half. These assessments are reached by combining the few macroeconomic facts known about the period with our knowledge about the structure in the economy today in countries at the same level of development as Denmark at that time. It is discussed how the fall in the share of the Church was accommodated and how it influenced the political structure in the country.

**Keywords:** Institutional change, religious transition, patterns of development

**Jel:** E02, N13, Z12

**Acknowledgement:** This paper is a spin-off paper from a project that has led to a dozen papers on the grand pattern of development that have been updated and rewritten in Paldam (2021). I am grateful to Erich Gundlach and Ella Paldam for many discussions on the subject matter of the present paper.

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## 1. Introduction

In 1536, the Danish state religion changed from Catholic to Lutheran. This paper considers the period around this change in a macroeconomic perspective and assesses the share of the Church sector in percent of GDP. The *Church* is an organization, and a *church* is a building of the Church. The Danish state Church had monopoly until 1849, when a new democratic constitution gave religious freedom. It appears that the Church sector peaked at the end of the Catholic time when the share was about 12%. Today it is below 1%.

The fall has two independent parts: (1) The Reformation cut the income of the Church to about half. This caused a similar fall in the activity of the Church. (2) The Religious Transition from about 1750 reduced religiosity five times until now, causing a similar fall in the share of the sector. This paper tells the first part of the story, while the second part is told in Paldam (2021), which is based on two papers with Erich Gundlach (2012, 2013).

Most of the macroeconomic data needed for the analysis do not exist before 1820. The analysis patches together data from three sources: (1) A new time-series for the church-stock; see Paldam and Paldam (2017). (2) A few commonly accepted facts about Danish history,<sup>2</sup> and (3) some stylized facts from the patterns of development literature.

Many studies have found that the equivalence hypothesis is a good – but not perfect – approximation: It says that long-run time-series patterns are roughly the same as cross-country patterns. In our case, it means that the structure in the economy in Denmark 500 years ago was roughly the same as it was in, e.g., Tanzania only a decade ago.<sup>3</sup>

Three points should be made from the start: (i) A macro perspective is used – it disregards Danish regional differences. (ii) The main data assessed are GDP-shares, which are stable in steady state, and robust to territorial changes. (iii) It is reported precisely how everything is calculated to allow the reader to reassess the results. However, I trust that the results will change only marginally.

Section 2 is an introduction to the pattern of development literature, reporting the stylized facts used in the next sections. Section 3 deals with the Catholic period around 1500, while section 4 deals with the Lutheran period around 1600. Finally, section 5 concludes.

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<sup>2</sup> The main sources for the Danish history used are Olsen (1988, 2005) vol. 5-7, Dansk Socialhistorie vol. 2-4, Kirkens Historie both volumes, Lausten (1987), and the netsource Danmarkshistorien.

<sup>3</sup> Obviously, equivalence does not hold strictly, but it is often possible to adjust. When Denmark year 1500-1600 is compared to Tanzania today, one difference is transport technology: Tanzania today uses trucks and busses, while Denmark 500 years ago used horses, bullocks, and ships. This was much less efficient.

## 2. The patterns of development literature

A large literature going back to Simon Kuznets (1901-85) and Hollis B. Chenery (1918-94) discusses the pattern of economic development. A handful of standard results will be reported in this section. Section 2.1 explains how the results are reached. Section 2.2 looks at the transition of agriculture, while Section 2.3 presents some stylized facts about agriculture and labor. Section 2.4 considers the implications for institutions and beliefs.

### 2.1 *The transition pattern allowing backward projections*

The theory of growth and development is built around the equilibrium concept of the steady state. The key property of the steady state needed for the argument below is that the sectoral shares are roughly constant. The traditional and the modern steady state are the basic ones.

The *traditional steady state* had a low and almost stable technology, giving a low and almost constant production and population. The period covered by this paper is fully within this steady state.<sup>4</sup> The Appendix below shows how the Maddison Project estimates how the macro-data may have looked in this period. The slow progress of technology gave an almost constant *gdp*-level with average growth below 0.2% per year, or 10-20% per century. This gave very small changes in the structure of the economy only. The population had a similarly low growth.

National accounting started between the two world wars. Economic historians have compiled national accounts for a dozen countries back to the Napoleonic Wars. Today national accounting is done for (nearly) all countries, including about 40 countries that are early in the Grand Transition. As the traditional steady state was stable, a backward projection of any time series should converge to a stable level in the traditional steady state. If the backward projection for the time series and of the cross-country pattern give roughly the same result, we have a solid stylized fact. The next subsection argues that the share of agriculture is one such fact.

The long-run growth of *pop* is the difference between high fertility and mortality rates – both were probably about 2%. This implies a Malthusian mechanism (see Galor 2011), allowing a reasonably fast recuperation of the population after a catastrophe such as the Black Death epidemic. It is labor intensive to bring land under cultivation, but mass death due to an

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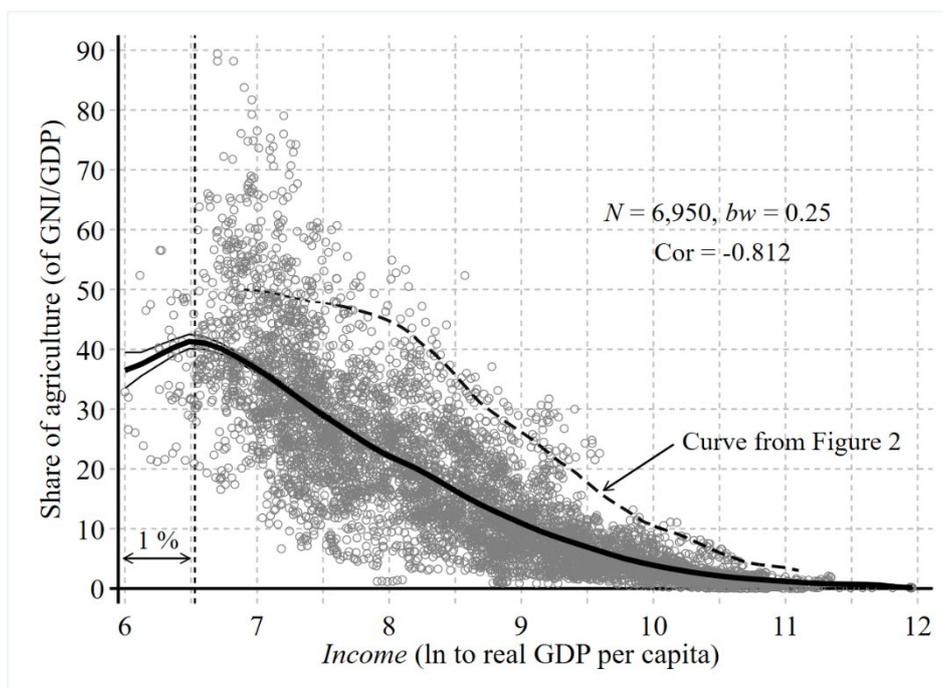
<sup>4</sup> The *modern steady state* has a high and dynamic technology, giving a much higher production and growth. As modern technology is international, the countries that have reached this level converge to the same (high) standard of living. This period is outside the paper. Modern development started a couple of hundred years ago. The process of change between two steady states is termed a transition, so the confluent changes in all socio-political variables that take place between the two basic steady states are the *Grand Transition*.

epidemic or war increases the cultivated land per capita and hence income per farmer, which is likely to decrease mortality temporarily.<sup>5</sup>

## 2.2 Estimating the traditional share of agriculture

Figure 1 shows 6,950 observations for the share of agriculture from the World Bank, combined with income from the Maddison Project (MPD 2020). The data is from 1960-2018. The lowest 1% of the observations give an unclear picture, but before the curve bends, they support the notion that the traditional share of agriculture is about  $45\% \pm 5\%$ .

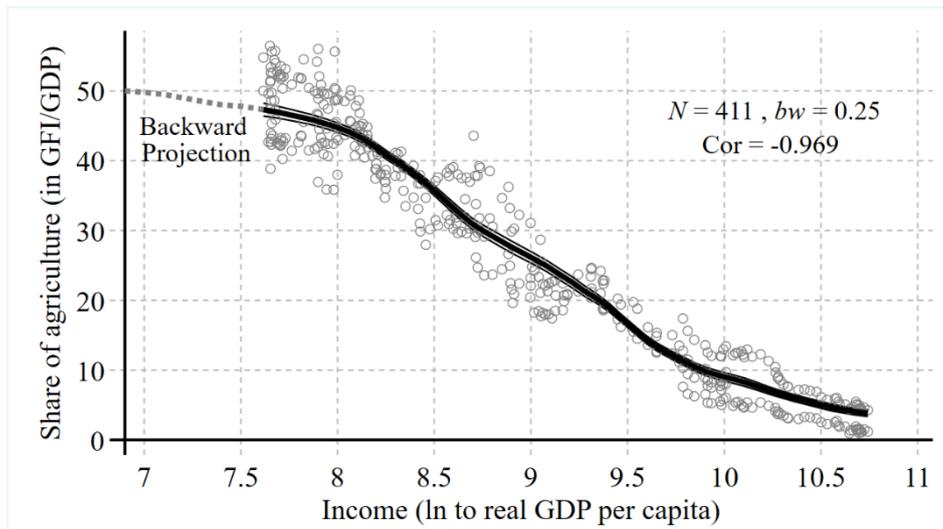
Figure 1. The share of agriculture ‘explained’ by income. 166 countries, 1960-2018



The share of agriculture is ‘agriculture, forestry, and fishing, value added (% of GDP)’ from the World Bank’s WDI (World Development Indicators, Feb 2020). Income is the (natural) logarithm to real GDP per capita from the Maddison Project (MPD 2020). The data is from 1960 to 2018. Only 1% of the data support the curve where it has a positive slope at the start. Most observations with shares below 30 at that section are from Congo (Kinshasa), where people moved to the towns due to endemic civil war. The bold curve is a kernel regression with 95% confidence intervals. The estimate uses the Epanechnikov kernel and bandwidth 0.25. The dashed curve from Figure 2 uses a different definition for the agricultural sector, so it is not fully comparable. The WDI data for the DCs (developed countries) only cover the last 30 years in most cases.

<sup>5</sup> Perhaps the population fell by 25% due to the Black Death in the 1350s. Consequently, it had to increase  $1/0.75 = 1.33$  times to catch up. If the loss of people increased population growth by 0.5 percentage points, it would take 58 years only for the population to increase by 33%, bringing it back to the pre-epidemic level.

Figure 2. The share of agriculture ‘explained’ by income. Denmark, 1820-2018



The data are from Hansen (1972, 1974) – the same data as used by Maddison for the series for Denmark. It is supplemented with data from statistics Denmark Two series are used: ‘production in agriculture’ and ‘gross factor income in agriculture and other primary sectors’. The share is reached by division with ‘gross factor income’, from the same source. Note that the production data are higher, especially at the high-income end.

The data points scatter a great deal, as they include desert countries and city states on the one side, and on the other side countries which are the agricultural hinterland to larger neighbors. Also, some countries, such as Denmark, are net exporters of agricultural products, while others are net importers. Nevertheless, the average (kernel regression) is well determined with 95% confidence intervals that are so narrow that they are only visible for low incomes that are poorly covered by observations.

Figure 2 shows the share of agriculture for Denmark from 1820 to 1975 over the same income data. The time series data show that the Danish share on Figure 2 is higher than the general one from Figure 1, by about 5 percentage points, as it should for an agricultural exporter. It also appears likely that the Danish curve is diverging from the steady state level at about 50% at the start in the traditional steady state. From Figures 1 and 2 it is concluded that the share of agriculture in 1500-1600 in Denmark was  $50\% \pm 5\%$ . This is probably not controversial, and I take it to be a solid foundation on which the analysis can be built.

### 2.3 *The share of landowners such as the Church, and labor*

Another number needed is the net share of income accruing to the landowners when farming is tenured. Danish tenure contracts changed over time and differed regionally. In a comparative perspective, the typical contract is found to allocate about 40% of the product to the landowner; see Binswanger, *et al.* (1995). However, this is the legal contract, and realities are a bit

different. Landowners have always found it difficult to extract the full amount due – and through the centuries, farmers have learned to shirk when reporting. In addition, landowners provided some services to the farmers, and there were monitoring and administrative costs. Thus, the net extraction was probably ‘only’ 25%, of the agricultural production, a number that also covered the land owned by the Church, which was substantial before the Reformation.

In the period considered, the population pyramid did look like a pyramid. Due to the high fertility and mortality, there were many children and few old people. The typical participation rate on the labor market was about 50%, which included many self-employed and their spouses. Thus, when it is found that the Church staff is  $N$  persons, the share of employment is  $N$  over the population  $P$  times the participation rate  $E = N/(0.5 \cdot P)$ .

The wage share was much lower than it is today, but the factor wage share, which includes an imputed wage for the self-employed (including tenant farmers), was probably only a little lower than today. Say it was 70%. If the income of the Church staff is the same as the average person, the share of Church staff in the factor wage share times the GDP is  $0.7 \cdot E$ , but if the salary differs by a factor  $q$ , then the share of GDP becomes  $q \cdot 0.7 \cdot E$ .

#### 2.4 *The stability of beliefs and institutions: King, Church, and feudal nobility*

The concept of the steady state extends to institutions as well; see Paldam (2021). Many writers have noted that the range of traditional political systems is quite narrow. A well-known first approximation is the ***Three Pillars Model***, where the pillars are the hereditary king, the feudal nobility, and the Church, which was also a major landowner before the Reformation.

The kingdom was very stable - about 800 Danish kings have been from the same family (broadly defined). However, the power of the king has kept changing. The Reformation caused a substantial shift of land ownership – and thus power – from the Church to the king.

Feudal systems were also very stable; see the major study of traditional agricultural land ownership systems by Binswanger, *et al.* (1995). In the century after the Reformation, ownership of the old Church land passed from the king to the nobility, consolidating feudalism.

Few countries have had more than one change of religion per millennium. When Denmark changed denomination from Catholic to Lutheran in 1536, it was the first time since the 960s and the last time as of now.

Coalition theory predicts that coalitions between three parties, where either two can dominate the third, are rather unstable. This was indeed the case – occasionally a (mostly unpredictable) ***triggering event*** happened to cause an unruly period where the alliance between the three major players shifted. The change of religion was a large triggering event that came

from abroad and spread rapidly from below. After only 15 tumultuous years, the king legalized the change. In the process, his power increased, and the Church became weaker. Later the feudal structure became stronger. Thus, the analysis deals with a key part in a major upheaval leading to a new power structure, which is the two large shifts in land ownership.<sup>6</sup> No attempt will be made to tell the complex story of the historical events. The paper looks at the background in an economic perspective.

### **3. The size of the Church at the end of the catholic period around 1500**

From now on, the analysis concentrates on the Church share of GDP. Section 3.1 discusses the income of the Church from production and taxes. Section 3.2 turns to the expenditures for the Church itself and for the non-religious services it provided. Section 3.3 summarizes on the wealth and power of the Church and the resentment it created.

#### *3.1 Income of the Church: From production and taxes*

The income from production came from three sources:

- (1) Land-rent: It seems that most historical sources show that the Church had become a main landowner in the last century before the Reformation, as various entities of the Church owned 40% of the land. The largest group of owners was the bishops.

Assuming that the land of the Church was of average fertility, the rule of thumb in section 2.4 means that the agricultural production of the Church-owned land was  $0.4 \cdot 50\% = 20\%$  of GDP. The net land-rents received by the Church were  $0.25 \cdot 20\% = 5\%$  of GDP. Perhaps this is to the high side, but probably by less than 1 pp.

- (2) The Church also sold candles, medical herbs, letters of indulgence, and a few other items. It is unlikely that this amounted to even 1% of GDP. It means that it is safe to set the estimate of the production income of the Church to 5%.
- (3) The Church also received user fees from its schools and hospitals, but as argued below these fees must have been rather small.

The main tax of the Church was the tithe that was levied on agriculture (and fishing).

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<sup>6</sup> Land ownership was a crucial instrument of power, as wars were mainly fought with mercenaries, and land was the main collateral for loans used to pay such soldiers. Thus, big landowners could make credible threats.

The history of this ‘tax’ in Denmark is surveyed in Dahlerup (1982). It appears that the tithe was based on production and not income. If all tithes were paid, it should give the Church a tax income of about  $0.1 \cdot 50\% = 5\%$  of GDP. The rule was that the tithe was divided in three equal parts: The *church-part* was given to building and maintenance of the churches, the *parish-part* was to cover the salaries of the local church staff, and the *bishop-part* was to finance the top hierarchy of the Church. It appears that it covered the money sent to Rome, though the story of ‘Peter’s pence’ is a complex one.

The way the tax was calculated changed frequently, as it was always problematic to collect as much as the Church thought it should receive. The tax was collected locally, and it was a perennial problem to collect the bishop-part. This seems to have been a typical flypaper effect: The local branch of the Church kept most of what they should, and let the higher levels be the residual claimant. Imagine that only 70% was collected net of shirking and administrative costs. Thus, the tithe amounted to a little more than 3.5% of GDP.

The Church also tried to collect money from the rest of the population, and surely got something, notably in the form of inheritance and other gifts. Here little evidence exists, but something was collected, especially by the monasteries. It must have been less than what was collected from agriculture. Thus, I assume that the tax-income of the Church was a bit below 7% of GDP, but then half a dozen Cathedrals were built in the period.

This gives a total of  $5\% + 7\% = 12\%$ , which is my assessment of the size of the Church in the economy. Thus, the Church ran an important sector in the economy.

### 3.2 *Expenditure of the Church: Financing the Church and the three big collective goods*

In 1500, there were a total of 2,100 ( $\pm 20$ ) churches and 100 ( $\pm 5$ ) monasteries in Denmark.<sup>7</sup> Already at that time, not many new churches were built, but one third of the tithe was reserved for the buildings (i.e., about 2-3% of GDP). It covered the costs of maintenance and repair, and a modest building program, which did, however, include a handful of cathedrals.

Most of the 2,100 churches were similar village churches,<sup>8</sup> but town churches differed more, and so did the number of staff. I assess that the average staff was a bit above 4 per church, which includes the top hierarchy associated with the cathedrals. It gives a total number of 8,400. In addition, there is the staff in the monasteries. They had a skew size distribution, but if the size of the staff in the average monastery were 15, that gave a further 1,500 Church staff. Thus,

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<sup>7</sup> The church-data is from Paldam and Paldam (2017a), while the monastery-data is from Kristensen (2013).

<sup>8</sup> From about 1100, churches were very sturdy buildings of stones and bricks. About 1,600 survive to this day.

the total Church staff was probably close to 10,000; used in Table 2 below.

The population in 1500 was app 600,000, according to Maddison, and with a participation rate of 50%, the labor force was 300,000. Hence, the Church employed 3.3% of the labor force. If the Church staff received the average income, that would give a GDP share of  $0.7 \times 3.3\% = 2.3\%$  of GDP.

The priests and monks were committed to a life in austerity, but it is well known that many found it difficult to follow that commitment. Most of the top hierarchy in the Church belonged to the nobility, and thus they had a network connecting them to other leaders of the country. This also meant that they were accustomed to a certain lifestyle. In addition, most bishops lived in substantial residences, looking a lot like the ones of their noble family. Thus, bishops did live in some luxury, and it extended somewhat down the line.

Assume that the Church staff managed to have salaries of, e.g., 1.5 times the average wage, a sum of 3.5% of GDP is reached. Adding the capital wage of 2-3%, this gives about 6.5% of GDP. Rome probably managed to extract  $\frac{1}{2}\%$ , so the total church expenditures were about 7%. This left 5% to other expenditures.

The Big Three collective goods are (i) education, (ii) healthcare and (iii) social protection. In the period discussed, they were dominated by the Church. Thus, the Church had about 5% (of GDP) to spend on the Big Three. A guess is that the 5% were allocated as  $1\frac{1}{2}\%$  to education,  $1\frac{1}{2}\%$  to health, and 2% to alms to the poor. These numbers are about one third of the numbers for LICs today. As regards (i) education and (ii) health, two adjustments should be made: Most of the work was done by staff that is already accounted for, and people paid user costs for schools and hospitals, if they could. However, it is still clear that the total costs of either of these services must have been rather moderate.

Various estimates suggested that literacy rates were low, such as 5%, which included the clerical Church staff and the nobility, where presumably many could read. As few diseases could be cured, the costs of the hospitals must have been low indeed. A survey of the state of the medical knowledge and the modest size of the profession is found in Porter (1997).

### 3.3 *A rich and powerful Church sliding into rent seeking*

Thus, the Church controlled about 12% of GDP, and the staff of the Church was around 3.3% of the labor force, so obviously the Church was a wealthy organization. It showed its wealth in the building of churches, including most of the 10 Danish cathedrals, and it appears that the top clergy did live rather well.

This period saw the Renaissance in Rome, where the Church spent lavishly on buildings, art and other trappings of power and wealth. The top clergy in Rome did behave much more as rich nobility than as leaders of a Church that preached moral restraint and modest living. In addition, some of the devices used to extract funds, such as the sale of letters of indulgence, were seen as excessive, and in no way supported by the Bible. Therefore, it was a period of moral decay for the Church. It did create some resentment, and it was surely a main theme in the propaganda of the reform movement started by Martin Luther in 1517, which soon became a new denomination. In addition, it led to the Counter-Reformation a little later within the Catholic Church.

Table 1. Kings in the period (for the foreign reader)

Name	Lived	Ruled	Start	End
Catholic period before 1536				
(1) Christian 1 <sup>st</sup>	1426 - 1481	1448 - 1481	Appointed <sup>a)</sup>	Died in power
(2) Hans	1455 - 1513	1481 - 1513	Son of (1)	Died in power
(3) Christian 2 <sup>nd</sup>	1481 - 1559	1513 - 1523	Son of (2)	Deposed <sup>b)</sup>
(4) Frederik 1 <sup>st</sup>	1471 - 1533	1523 - 1533	Son of (1)	Died in power
Interregnum, 3 contenders		1533 - 1534	Civil war	Victory of (5)
Protestant period after 1536				
(5) Christian 3 <sup>rd</sup>	1503 - 1559	1534 - 1559	Son of (4)	Died in power
(6) Frederik 2 <sup>nd</sup>	1534 - 1588	1559 - 1588	Son of (5)	Died in power
(7) Christian 4 <sup>th</sup>	1577 - 1648	1588 - 1648	Son of (6)	Died in power

a) Appointed after a search among distant family. b) The deposition was a rather violent and the ex-king fled, and traveled Europe trying in vain to find money to finance an army to reconquer power. He was jailed from 1532, being a fourth 'shadow' contender in the civil war.

#### 4. The size of the Church after the reformation 1550-1650

Section 4.1 gives some facts about the reformation. Section 4.2 considers the path of the church stock over the three centuries surrounding the reformation. Section 4.3 looks at the loss of income for the Church.

##### 4.1 *The Reformation: Fighting the rents*

In the years 1517-36, the Lutheran movement spread rapidly in Denmark, and in 1533 no king could be appointed. From 1534 to 1536, it led to a civil war (the last one in Denmark) between three royal contenders supported by the two denominations, and with interference from the

Hansa League (notably Lübeck), Sweden, and several peasant uprisings.<sup>9</sup> The Reformation started from below in Denmark, but it was taken over by the nobility and one of the royal contenders, who became king. With all the complex and dramatic events, it is not clear that most of the population felt that they have changed religion. After the war, the victorious Lutheran side enacted a set of decrees to root out the Catholic Church:

(i) Most of the top Catholic clergy was jailed, as they had supported the losing side in the civil war.<sup>10</sup> All communication between the Church and 'Rome' was forbidden.

(ii) The parish priests were given three choices: jail, exile, or to convert to Lutheranism and continue in their old job. The great majority took the third option.

(iii) All churches were converted to Lutheran, and chapels to saints were closed.

(iv) All monasteries were closed. In towns, their churches were converted to Lutheran parish churches. Monasteries in thinly populated parts of the country were used as stone quarries or converted to manor houses. Hospitals, schools, and poor houses often continued as lay institutions, financed by the king.

(v) To finance these activities, the king took over the 'bishop-part' of the tithe. This was, in principle, 1/3 of the tithe, and the part had proven most difficult to extract.

(vi) The Church lands were confiscated by the king, making him the largest landholder in the country. The bishops' land was quickly confiscated, the rest more gradually.

#### 4.2 *The church stock: 1400-1700*

Figures 3 and 4 show 5 points:

(1) The stock of churches was steadily growing before the Reformation, at least from 1300, where the stock of churches was 1,940. It rose to 2,100 in 1520, which is by 0.75 churches per year. This increase was almost linear.

(2) The Reformation gave a clean break with this growth, and even caused a fall of 9%. This is the only significant fall during the 715 years where the data are available.

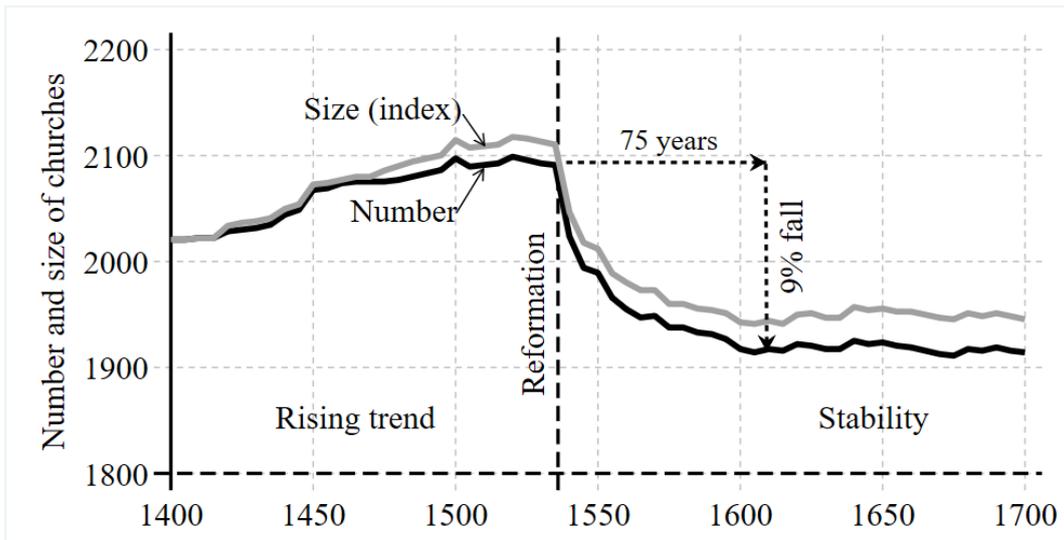
(3) The fall took about 75 years to be complete. If the fall is understood as an adjustment to a new level, it has the form where the fall is big in the beginning and then tapers off gradually to the new level, as expected from the capital adjustment model.

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9. The great mass of (tenant) farmers normally played a small role in the politics of the country, but during the war they emerged as an important factor. However, they did not manage to align themselves with another player, and the royal mercenary army defeated and massacred their armies.

<sup>10</sup> A few years later when the Reformation was consolidated, they were set free, often on the condition that they married. The leniency may have been because the bishops belonged to the nobility.

Figure 3. The church stock, 1400 to 1700



Source (also to Figure 4): Paldam and Paldam (2017a). The size index is done by church types as explained in the source. Village churches were made in a rather fixed format, and the main room rarely changed.

Figure 4. The changes in the church stock 1450-1650

Figure 4a.  
Churches built

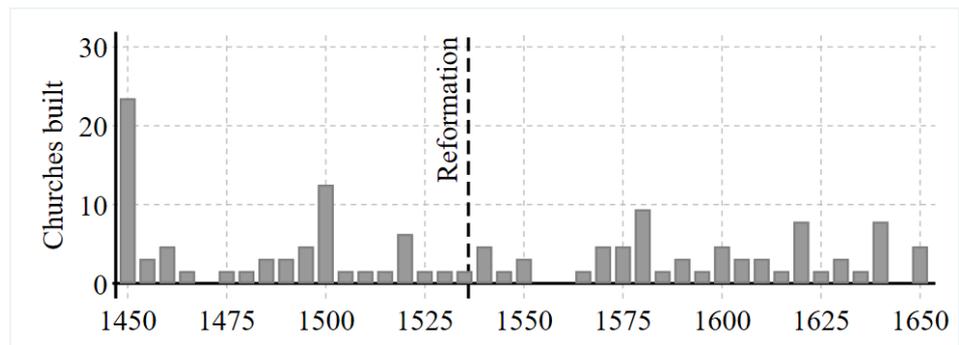
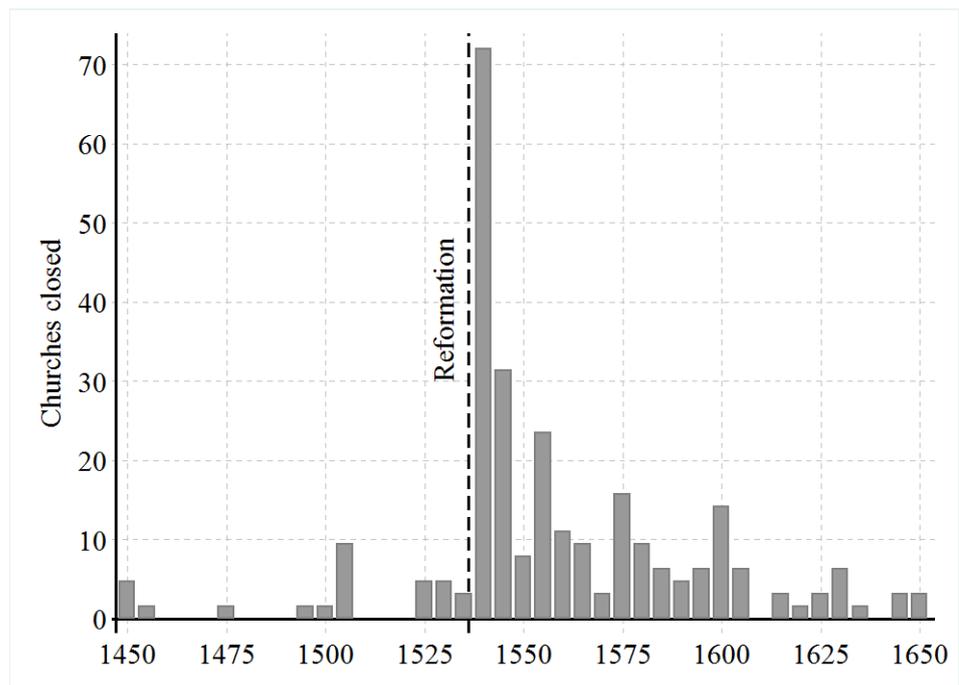


Figure 4b.  
Churches closed



(4) From about 1610, the church stock was constant until about 1860. As seen from Figure 3, the number of churches closed and built were small and rather similar.

(5) The correction for the size of churches is assessed by normalizing the size weighted stock to be the same as the unweighted stock in 1400. Thus, the gap between the two curves on Figure 3 shows the relative movement.

#### 4.3 *Lost and retained income of the Church*

The loss of the income from the Church lands was 5% of GDP, or 40% of the incomes of the Church. When the king took over the bishops' third of the tithe, this was a further loss. The additional loss was probably about 2% of GDP. Thus, it appears that the incomes of the Church fell from about 12% of GDP to 5%. Consequently, the Church had to be downsized.

In addition, Luther stressed that personal belief was much more important than the worldly trappings and power of the Church. This argued for a large reduction in the expenditures of the Church. Notably, Luther argued against saints that acted as middlemen between the individual and God. This theology also caused a downsizing of the Church.

Part of the reduction was automatic: The monasteries and chapels to saints were closed, the top clergy was sacked, and the subsidy to Rome ceased. It appears that these reductions were smaller than the fall in incomes. The Church was further downsized by the 9% reduction in the stock of churches. Also, the staff per church must have been reduced.

This gives two explanations of the downsizing of the Church after the reformation: One is the loss of funds. The other is the change in theology from the church intensive Catholic theology to the less church intensive Lutheran theology. In particular, when the saints were abolished, the number of minor deities that needed services was sharply reduced.

Table 2. An assessment of the Church staff in the years 1500 and 1600

	(1)	(2)
Year	1500	1600
Churches	2,100	1,915
Staff per church	4	3
Monasteries	100	0
Staff per monastery	15	0
Staff in total <sup>a)</sup>	10,000	6,000
Population	600,000	650,000
Labor force (50%)	300,000	325,000
Fraction Church staff	3.3%	1.8%

(a) Half of the Church staff was probably illiterate lay workers.

It is difficult to know what weight to put on the two explanations, and it is possible that the Lutheran Church made a virtue out of financial necessity, stressing that it was the belief of the individual that counted and that one church-service per week was enough. Table 2 assesses the size of the Church staff. Column (1) is the numbers from section 3.3. Column (2) assumes that the number of services is smaller than it used to be, and that schools and hospitals employed more lay people.

With the reduction in churches and in Church staff, which was particularly strong in the top hierarchy, it was probably possible to reduce the costs of Church staff to 2.5% of GDP, and by a reduction in church building, it might have been possible to reduce the Church expenditures to 5% of GDP, leaving a little for alms. Thus, Table 2 suggests how the fall in Church incomes could have been accommodated.

#### *4.4 Some further developments*

The story until now contains a big downsizing of the Church, greatly reducing its economic power, and a corresponding increase in the economic power of the king. Two additional economic factors came into play, both related to war financing.

The first reformed king, Christian 3<sup>rd</sup>, had to finance the costs of the civil war that on the winner's side was largely fought with expensive mercenaries. With the great increase in the king's income from the former Church lands, the financial consolidation was probably accomplished within his time in power. Once the finances of the king were consolidated, the extra incomes of the king allowed him to undertake great projects.

The king who excelled in such endeavors was Christian 4<sup>th</sup>. His many expensive buildings are still national treasure. However, he did also participate in the Thirty Years' War 1618-48, with disastrous results. This caused a big decline in the royal assets, so the king lost most of the land acquired from the Church at the Reformation. The winners were the nobility, making Denmark an unusually feudal country.<sup>11</sup> Nearly all European countries had Feudalism around year 1600. It appears that the fraction of the land under freeholders was unusually low in Denmark. Hansen (1972) finds that in 1700 only 1,700 of 60,000 farmers owned their land.

In Catholic countries, churches were largely owned by the Church. It had adequate funds to maintain the existing churches and to build new ones at a slow, but steady pace. After the big reduction in the income of the Church due to the Reformation and the later reduction in

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<sup>11</sup> The nobility obtained land from the crown in two ways: Some crownland was bought, while other was obtained as forfeit collateral for non-performing royal loans. In addition, some foreign moneylenders became Danish landowners and later entered the nobility.

the incomes of the king, the ownership of most churches and hereby the church-part of the tithe went to the landowners. In practice, most churches became private property.

It appears that the income from owning a church barely covered the costs, and the churches often occupied well-situated land, which represented considerable opportunity costs. Thus, a private owner had a clear interest in closing ‘superfluous’ churches. A Royal permit was necessary to close a church, but the fact that somebody had a strong incentive to apply did mean something. A total of 520 churches were closed between 1300 and 2015. Of these, 180 were due to the Reformation, and about 300 were closed in the period where the churches were private property, but in that period a similar number of churches were built.

## 5. Conclusion

The vastly simplified *Three Pillars Model* sees the hereditary king, the feudal nobility, and the Church as the three main players of traditional society. In this model, the Reformation was a power grab by the first two players for the resources of the third one. The *triggering event* that allowed the grab was the religious turmoil that came from abroad and spread rapidly from below. This led to a complex process that lasted 15 turbulent years.<sup>12</sup>

The outcome of the process was a reduction of the share of the Church in the GDP to less than half. This turned the Church from being a large sector in the economy to becoming a moderately sized one. In addition, the large decrease in the top hierarchy of the Church reduced the links between the nobility and the Church, and the network at the top of the society came to include much fewer Church dignitaries.

The severance of the link to the Pope and his administration removed the possibility of the Church for calling for outside help when disagreements occurred between the Church and the state (i.e., the king). Thus, both the economic and political balance between the Church and the state shifted to the advantage of the latter.

This all caused the Church to be much weaker in the national distribution of power. Furthermore, by the closing of the monasteries started the secularization of education and healthcare. Just after the Reformation, the professional staff in schools and hospitals were the same as before. Thus, the secularization of these sectors took time, but it did happen.

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<sup>12</sup> A similar logic is used in Paldam (2021) to explain the transition in the last two centuries from the three pillars society to democracy. The agricultural transition (from Figures 1 and 2) undermined feudalism, and the religious transition undermined the Church. A well-educated middle class in the towns replaced the two old sectors. This led to democracy, but the process occurred in bounds and leaps caused by exogenous triggering events.

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<sup>13</sup> Danmarkshistorien is a large semi-popular project of the Department of History at Aarhus University, with participation of most faculty. It brings both text, sources, and many illustrations. It is constantly expanded, and it has a large section on the reformation, with links to more material.

<sup>14</sup> Maddison (1926-2010) updated his data until 2010 one month before he passed away. A group of economic historians has continued his project.

## Appendix: Data for *gdp* and *pop* 1500 and 1600

The *gdp* is the GDP per capita in fixed PPP-prices, while *pop* is the population in millions. Table A1 shows a few *gdp* and *pop* data from the MPD 2020 version of the Maddison project, updating Maddison's original data.<sup>15</sup> They are shown for the years 1000, 1500, 1600 and in 1820, where national accounts exist for the countries. Maddison claimed that the growth rate was zero the first millennium, and 0.14% on average over the 820 years from 1000 to 1820. Note that the *gdp* numbers in italics are not updated in MPD 2020. Here the last data given are used after a change of the price index to give the \$2011 prices. The population numbers are all unchanged.

Table A1. Some assessments of historic *gdp* and *pop* from Maddison project

Year	1000	[g% pa] <sup>a)</sup>	1500	[g% pa]	1600	[g% pa]	1820
Part A. Gross domestic product per capita in 1990 international Geary-Khamis \$							
Denmark	<i>1,000</i>	[0.11]	<i>1,700</i>	[0.16]	<i>2,000</i>	[0.02]	2,104
France	<i>1,100</i>	[0.09]	1,694	[-0.05]	1,610	[0.05]	1,809
Italy	<i>1,200</i>	[0.16]	2,703	[-0.12]	2,404	[0.05]	2,665
Netherlands	<i>1,100</i>	[0.15]	2,332	[0.61]	4,270	[-0.16]	3,006
China	1,225	[0.00]	1,207	[0.01]	1,217	[-0.15]	882
India	<i>1,200</i>	[0.03]	1,400	[-0.11]	1,254	[-0.13]	937
Part B. Population in thousands, <i>pop</i>							
Denmark	360	[0.10]	600	[0.08]	650	[0.26]	1,155
France	6,500	[0.17]	15,000	[0.21]	18,500	[0.24]	31,250
Italy	5,000	[0.15]	10,500	[0.22]	13,100	[0.20]	20,176
Netherlands	300	[0.23]	950	[0.46]	1,500	[0.20]	2,333
China	59,000	[0.11]	103,000	[0.44]	160,000	[0.40]	381,000
India	75,000	[0.08]	110,000	[0.21]	135,000	[0.20]	209,000

The annual growth rates, *g*, in the []-brackets are calculated for the years to either side. The data are in constant \$2011. The *gdp* numbers in italics are projected (to \$2011 prices) from the last time they were updated.

Consider  $x_t$  and  $x_{t+N}$  for a variable, such as the *gdp* or *pop*, in the two years  $t$  and  $t+N$ .

The average annual growth rate, *g*, follows from the mathematics of compound interest rates:

$$(1) \quad x_{t+N} = (1 + g)^N x_t, \quad \text{so that} \quad g = (x_{t+N}/x_t)^{1/N} - 1$$

<sup>15</sup> The source for the data is Maddison (2003) and the Maddison project (since 2012). The data reported are from the MPD 2020 version that covers 169 countries to 2018. The *gdp* is measured in fixed PPP-prices, which is 2011 international \$. Note the small differences between the *gdp* levels in the countries listed at the start. Even in 1820, Denmark had only twice the *gdp* of China.

Table A2. Illustrating the robustness of long-run growth rates

From year 1000 to 2010			From year 1000 to 1820		
$gdp_{2010}$	$gdp_{1000}$	$g$	$gdp_{1820}$	$gdp_{1000}$	$g$
<b>42,932</b>	500	0.44	<b>2,104</b>	500	0.18
<b>42,932</b>	1000	0.37	<b>2,104</b>	1000	0.09
<b>42,932</b>	1500	0.33	<b>2,104</b>	2000	0.04

Note: The bolded estimates are the ones of the Maddison Project. They are in constant \$2010.

Once  $N$  is large, (1) gives a narrow range for the assessments of  $g$  as shown in Table A2. The standard of living in Denmark 1000 years ago was probably so low that only a handful of countries have a lower standard of living today – Maddison claimed that  $gdp_{1000} \approx 1,000$  \$.

Table A2 shows how little it matters for the size of the growth rate if the  $gdp$  was \$500 more or less of that.