

GLOBAL ECONOMIC HISTORY SERIES

# The Long Road to the Industrial Revolution

THE EUROPEAN ECONOMY IN A  
GLOBAL PERSPECTIVE, 1000-1800

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BRILL

## CHAPTER ONE

### INTRODUCING THE PROBLEM: THE EMERGENCE OF EFFICIENT INSTITUTIONS IN THE MIDDLE AGES

#### *New Institutional Economics and the Efficiency of Institutions*

Economic historians, inspired by Douglass North and his broad reassessment of new institutional economics, tend to believe that the quality of the institutional framework of a nation or region has direct bearing on its economic performance. As explained in the introduction, the core assumption of this approach is that efficient institutions ('rules that constrain behaviour') reduce transaction costs and thus increase market exchange, specialization, and therefore economic growth. The way to test such a hypothesis would be to develop methods for measuring the efficiency of institutions, and link such measurements to observable economic performance. Much of the work in this field has, however, focused on the supposed efficiency of certain specific institutions, such as merchant and craft guilds, systems of property rights and tenure (how efficient is sharecropping?), or on the efficiency of the commons and their abolition via enclosures. Typically, new contributions to this literature have suggested that institutions that were previously considered 'conservative' and 'inefficient' – such as guilds and commons, manors, or sharecropping – were surprisingly efficient, if the functioning of these institutions were examined more closely. Guilds, for example, took care of the efficient transfer of knowledge and technology between generations (and between regions via wandering journeymen), stabilized labour and product markets, guaranteed the quality of products (necessary for domestic consumption and export), and were an efficient source of taxation for (local) government (Epstein, 1998). Some have argued that this sounds too good to be true, and that revisionism ignores the 'dark side' of institutions such as the guilds – namely, that they excluded outsiders (e.g. women), monopolized markets, and tried to suppress innovation (Ogilvie, 2007).

One of the problems with this approach, which tries to determine how efficient different institutions were, is that all institutions are

embedded in a specific social, political, and cultural context, and therefore are interdependent and interconnected. Moreover, there is a complex relationship between specific institutions and the 'problems' they are supposed to solve: particular institutions (such as, for example, a merchant guild) are often associated with more than one problem, and the solution to one particular problem by a specific institution often has consequences for the way other problems are handled as well (Gelderblom, 2008).

A closely related issue is that it proved very difficult, if not impossible, to measure the effects of individual institutions on transaction costs and performance. The quantitative measures of the success of institutions that have been developed in the past few decades are almost always proxies of the degree of efficiency of markets; they therefore measure the results of a complex set of interrelated institutions that in combination cause markets to perform better or worse. Hence, they do not measure the effects of individual institutions as such. The discussion on the long-term effects of the Glorious Revolution is a case in point: different ways of assessing its impact have resulted in very different measures of its success, or lack thereof (North and Weingast, 1989; see Clark, 2007 for a contrasting view). The point is that the institutions of a given society form a more or less coherent system, which makes it almost impossible to assess the efficiency and growth enhancing effects of individual 'rules of the game'. It seems that, in order to test the links between institutions and performance that are suggested in the theoretical literature, we have to focus on the institutional systems as integrated wholes to try to establish the effects they have on growth, rather than try to establish the effect of any specific institutions.

In the light of the Great Divergence debate we can specify this question to one about the relative efficiency of the set of institutions governing economic life in Europe and Asia. The question is therefore: can we assess the relative efficiency of the institutions of Western Europe with respect to those in other parts of the world (China and Japan, specifically); and, if Western Europe appears to have comparatively high-quality institutions, when did they arise – and why?

The literature suggests a number of ways to assess the quality of the institutional framework of an economy, although the amount of systematic historical research on this issue is surprisingly small.<sup>1</sup> What

<sup>1</sup> See Acemoglu and Johnson (2005) for various indicators of the efficiency of current institutions, which can however not easily be applied to historical research.

we propose here is to develop specific comprehensive measurements to assess the quality of the institutional framework of a society, and use these measurements to determine how efficient institutions in Western Europe were, and how they compared with institutional frameworks elsewhere. There are three groups of elements that can shed light on institutional efficiency.<sup>2</sup>

The first group consists of elements that can measure *the extent to which institutions guarantee property rights and promote trust*:

- The interest rate is probably the classic measure of the extent to which the institutions in a particular society protect property rights (of debtors and creditors) and enhance the amount of trust in a society, and therefore a low interest rate is arguably the best proxy of the quality of the institutional framework (North, 1981; De Soto, 2000; Reis, 2007).

Interest rates are not always easily to observe (due to lack of sources); indirect indicators, which are linked to interest rates, are:

- The skill premium, the difference between the wage of a skilled labourer and that of an unskilled labourer, is closely related to the interest rate; as we will see in Chapter 5, the skill premium is the reward for investment in human capital; this investment in human capital involves not earning an income during (for example) an apprenticeship period, in return for the higher income that is going to be earned after the training period; when interest rates are low, a relatively low skill premium will already be sufficient to make such an investment worthwhile (but, as we will see in Chapter 5, the skill premium also measures the extent of efficiency of labour market institutions); in brief, a low skill premium reflects the trust one can have in getting future returns on skill formation.
- The seasonal variation in grain prices, which, following the seminal paper by McCloskey and Nash (1984), can also be interpreted as a proxy for interest rates (and related storage costs).<sup>3</sup>

<sup>2</sup> A fourth approach to measuring the efficiency of various kinds of institutions also making it possible to distinguish between horizontal and vertical institutions, is developed in Bosker, Buringh and Van Zanden (2008).

<sup>3</sup> The McCloskey and Nash (1984) hypothesis is that the higher the interest rate, the more expensive it will be to store (for example) grains after the harvest, the larger the seasonal variation in grain prices will be; in fact, the price of these grains in month

A second group aims to measure *the extent of market integration* in an economy, the assumption being that efficient institutions reduce transaction costs, and therefore lead to high levels of market integration. Direct measures of market integration are:

- The variability of (annual) prices, reflecting the extent to which markets are able to cushion shocks via trade: generally, there is low variability in market systems with low transaction costs and high volumes of trade, where such shocks can easily be absorbed by trade, and high variability in poorly developed market systems;
- The convergence of prices: the extent of correlation and mutual dependence of markets – high convergence pointing to a highly developed market system and vice versa; Studer (2007) demonstrates in an analysis of grain markets in eighteenth and nineteenth-century India that the different criteria for assessing the efficiency of markets – variability of, and correlation between markets – yield very similar results, indicating that these measures all relate to the efficiency of the underlying institutions.

In practice, most historical studies of the extent of market integration measure the depth and breadth of the market for grain, but similar methods can and have also been applied to financial markets (Neal, 1990, for example, studying the eighteenth century)

It may be possible to add a third group of indicators that measure the level of development, *the 'depth and breadth' of factor markets*. Historically, in most societies members of a household can earn their livelihood by becoming wage labourers or by keeping the market 'at arm's length' via subsistence production. Transaction costs will (partially) determine this decision: when factor markets are weak and unreliable and trust in markets is low, in short, when transaction costs are high, the alternative of subsistence production will be more attractive than in a situation of perfectly working markets which can be relied upon. Therefore, if a large part of the population is active on the labour market, this may indicate that institutions are efficient and transaction costs relatively low. On the basis of a similar logic, the

$t+1$  will be the price in month  $t$  plus the monthly interest rate plus additional storage costs; see also Poynder (1999).

extent of participation in the capital market (via savings or borrowing money) may be a proxy of its efficiency.

Theoretically, all these criteria would be expected to point in approximately the same direction: once institutions are efficient and transaction costs are low, institutional economics predicts low interest rates, high levels of market integration, and dense markets. The factors enhancing exchange also seem to reinforce one another. Economic theory postulates that reputation mechanisms are very important for sustaining exchange – they are a key institutional ingredient in any market economy (Greif, 2006). Reputation mechanisms cause people to behave well (to keep their promises and adhere to their contracts) because they fear being excluded from future transactions if they renege on promises. Such a sanction will depend on the number of transactions that can be expected in the future (from the network in which the actor operates), and on the interest rate (which translates the value of future transactions to their present worth). In short, people will tend to behave well and enhance trust in their behaviour when interest rates are low and the current value of future transactions is therefore high, and when they expect many transactions to occur in the future. The level of markets exchange in general and of interest rates in particular will therefore explain to a large extent (if this theoretical approach is correct) the efficiency of trade networks and the degree of trust on which they are based (see the more detailed analysis in Grantham, 1999). It also follows that there may be multiple equilibria in the long-term move from thin markets and high transactions costs (and therefore high interest rates) towards high levels of market participation and low transaction costs. It has, for example, been observed that South-East Asia seems to have been on a thin markets/high interest rates trajectory for the past few centuries, and appears to be unable to move to another equilibrium (Henley, 2008; Van Zanden, 2004).

An important distinction that can be added, made by Acemoglu and Johnson (2005), is between political (or property right) and economic (or contracting) institutions. Greif (2006) has argued that the dynamic commercial (and urban) development of Western Europe compared to the Arab World was based on the superiority of its institutions regulating market exchange. His views differ from those of North (1981, 1990), who has maintained that it were mainly the political institutions constraining the predatory behavior of states that made Western Europe exceptionally successful. All measures suggested here, to some extent reflect both aspects of the equality of the institutional framework of

a region or country, but the level of market integration (controlled for distance between markets) probably comes closest to measuring the 'horizontal' institutions that Greif thinks are most important, and interest rates, as suggested by North (1990, p. 69), arguably to a large degree reflect long term trust and property rights protection.

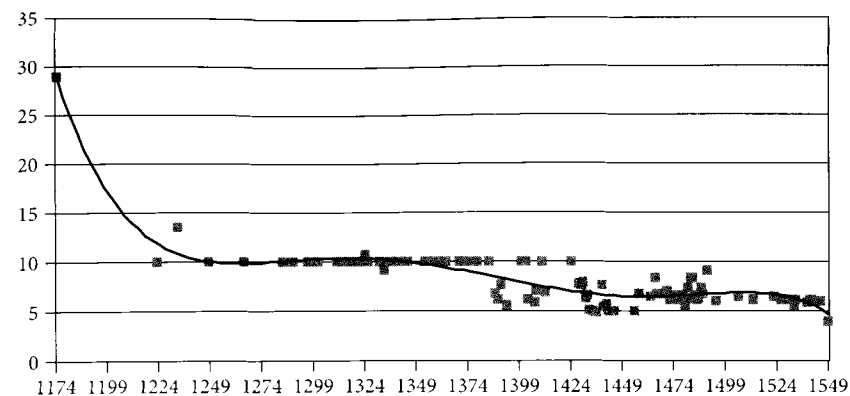
With this list of criteria for institutional efficiency we can try to answer the question: how efficient were European institutions before the Industrial Revolution? And if so, when did this increased efficiency begin? The main argument of this chapter will focus on the first group of criteria, especially on interest rates, as they are the easiest to measure, but other indicators will be used as well.

### *Global Distribution of Interest Rates and Other Measures of Institutional Efficiency*

Interest rates are a good starting point. Studies by Clark (1988, 2007) and Epstein (2000) have demonstrated that in Western Europe interest rates declined significantly during the late medieval period and reached a level of 5 to 6% as early as the fifteenth century. This level of interest is still normal today. These results are consistent with studies that analyse seasonal patterns in grain prices by McCloskey and Nash (1984) and Poynder (1999), which also point to a sharp fall in interest rates (and seasonal variation) in the late Medieval period. In addition, Figure 2 provides the results of recent research on interest rates in the Netherlands by Zuijderduijn (2007), showing the typical long-term pattern of the decline of interest rates in this part of Western Europe (see the almost identical figure in Clark, 2007, p. 169).<sup>4</sup>

The transition to an economy characterized by relatively low interest rates occurred in Western Europe during the fourteenth and fifteenth centuries. But what do we know about interest rates in the rest of Eurasia? Adam Smith was convinced that interest rates in Europe, especially in Great Britain and the Netherlands, were much lower than in China: 'twelve per cent accordingly is said to be the common interest of money in China', he stated, whereas he considered 3 to 4.5 per cent to be normal in Great Britain (Smith, 1776/1976, p. 198). The extreme

<sup>4</sup> The number of observations before 1250 is limited, due to the fact that the capital market was rather thin at that time, but this does not affect the main point of Figure 2, that is that during the 13th century a capital market emerged with already relatively low interest rates.



Source: Zuijderduijn (2007)

Figure 2. Long-term interest rates (on *losrenten*) in Holland, 1174–1550

of the spectrum of interest rates was probably Southeast Asia. Recently a discussion began about the causes of the 'high interest rates/thin capital markets' equilibrium trap, which characterized this region in the seventeenth century – and in which it still seems to be trapped (see Henley, 2008). The 'normal' interest rate found by Boomgaard (1986), for example, in an in-depth study of the capital market in Buitenzorg (near present-day Jakarta) in 1805 was 40 to 50% (also Van Zanden, 2004). In another paper about interest rates for credit transactions of the East India Company in seventeenth-century South and Southeast Asia, he shows that such high rates were not unusual in Southeast Asia, but that in general they were somewhat lower: 24–36% in Jambi (on Sumatra), 18–24% in Banten (on Java), and about 24% in Thailand. In India, the VOC (East India Company) paid or received (the Company was both a debtor and a creditor) 12–18% in Coromandel and Bengal, and somewhat less in Surat (Boomgaard, 1996). At the same time, in the Netherlands the Company was able to borrow at 3.5 to 5%. Other sources confirm that relatively high interest rates were normal in South Asia. Divekar (1989, p. 44), for example, in his study of 'Prices and Wages in Pune Region' quotes sources stating that 24% was considered the usual rate of interest, but that small sums were often borrowed at higher rates (up to 75% for small loans in kind).

But perhaps it is more relevant to look at China, especially the lower Yangtze delta, where, following Pomeranz (2000) and Li (1998) relatively advanced institutions were found. James Shih (1992, p. 29) observed that, during the early Ming period in the lower Yangtze delta, 'customarily,

if one borrowed one shi of rice, one had to pay back two shi after the autumn harvest; if one borrowed money (i.e., silver or copper cash), one had to pay 50 percent yearly interest'.<sup>5</sup> In the same period, the fifteenth century, the normal return on loans among merchants in Suzhou was a monthly 2 percent (Marmé, 2005, p. 145). In the seventeenth and eighteenth centuries, Chinese interest rates had clearly come down from these very high levels. It is an interesting reversal from European patterns, where wealthy merchants were always the source of royal credit, that the great salt merchants of Yangzhou borrowed large sums of money from the Imperial Household Department in Beijing at a 'rock-bottom' interest rate of 10%. (Finnane, 2004, p. 121). The best information on eighteenth-century interest rates is in the study by Paul van Dyke (2005, pp. 154–56) on the Canton Trade, analysing the many credit transactions between European and Chinese merchants in this period. Europeans borrowed money from other Europeans (and sometimes from Chinese merchants) at about 10 to 12% annually, whereas interest rates on loans to Chinese merchants were much higher, at 18 to 36% (or 1.5 to 3% per month for short-term loans). We can conclude that Adam Smith was right: interest rates in China were much higher than in Western Europe, even when they probably showed a declining trend in subsequent centuries.

The available data for Korea point in the same direction; according to Jun and Lewis (2007) the interest rate in eighteenth and nineteenth-century Korea fluctuated from 25 to 50%, with an average of 37%. Japan is probably the major exception in Asia. Studies of the Osaka capital market that emerged in the seventeenth century indicate that even from the start interest rates on credit between the large merchant houses were between 12 and 15% (Crawcour, 1961). Recent research by Saito and Settsu (2005) has shown that the long-term trend in Osaka was also clearly downward: interest rates on loans to daimyo declined from 12 to 13% in the first half of the eighteenth century to about 8% in the first half of the nineteenth century, a decline that was also found in other markets. Although not as low as in Western Europe, these low

<sup>5</sup> Shih (1992, p. 29); before 1367 a 'normal' rate of 4% per month is quoted, although the statutory ceiling was 3% per month (pp. 46, 271, note 44); on pp. 59–60 he also mentions a number of interest rates for late Ming which are lower (24% per year for example).

interest rates point to an increasingly efficient way of organizing capital market transactions.

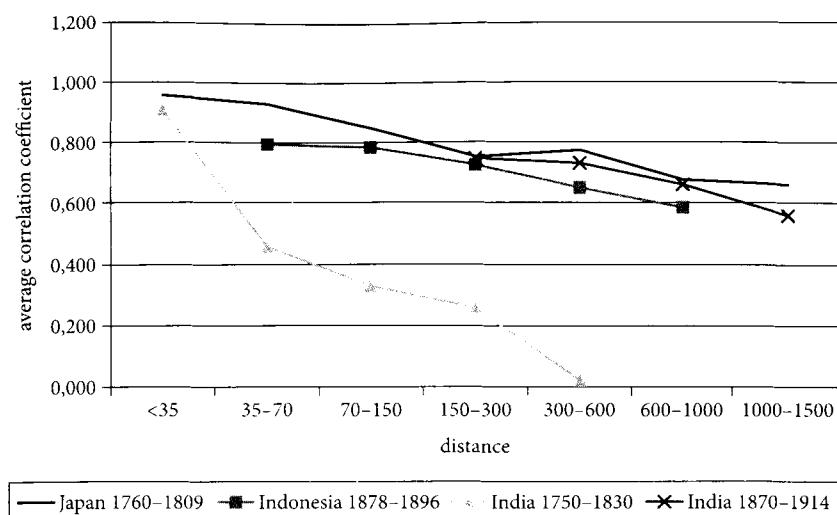
When looked at from this angle, the view that Western Europe had already acquired an institutional framework that was relatively efficient in the Middle Ages – more efficient than institutions regulating the capital market and property rights elsewhere – seems to be confirmed by the evidence on interest rates. The study of the skill premium, which is the focus of Chapter 5 and will therefore only be summarized very briefly here, points in the same direction: from the late Middle Ages onwards the skill premium was quite low in Northwest Europe, much lower than in, for example, Korea, India, or Indonesia. The decline in the skill premium in Europe – which was concentrated in the period between 1350 to 1450 – appears to be concurrent with the decline in interest rate in the post-Black Death years, suggesting a link between the two (although, as Figure 2 makes clear, a large part of the decline of the interest rate occurred already in the twelfth or early thirteenth centuries). Two Asian regions seem to have approached the European level of skill premium: the south of China and Japan probably both had a skill premium (and therefore efficient institutions regulating the supply of skilled labour) comparable to the western European level, although the evidence for Japan is mixed. The North of China (including Beijing) had a relatively high skill premium (see Chapter 5 for details).

A different approach to the same issue – measuring the efficiency of market institutions – is to look at how markets for agricultural products such as wheat or rice actually performed. When transaction costs are low, one would expect high levels of market integration, and, as a result of the fact that local demand and supply shocks can be cushioned by trade between markets, a low volatility of prices. Söderberg (2004), for example, used measures of the volatility of markets to establish that grain markets in North Western Europe in Medieval Europe were much less unstable than those in the Middle East in the same period. In the early modern period some additional increase in market efficiency may have occurred (Persson, 1988; Jacks, 2004), but this has been contested by Bateman (2006), who has pointed out that already in the 15th century levels of market integration were already similar to those attained in the 18th century. If Bateman and Söderberg are correct, we have to go back to the late Middle Ages to find the genesis of the efficient markets characteristic of European economic development.

Recent research suggests that Indonesia (in particular Java) is a case of a rather poorly performing market system (Van Zanden, 2004); rice markets on Java in the first half of the nineteenth century were extremely volatile, which can be linked to the poor quality of institutions and the low level of commercial development of the region. An analysis of seasonal patterns also demonstrated that Javanese markets performed much more poorly than those of Qing China of early modern Europe (Van Zanden, 2004).

In order to add Japan, China and India to this comparison, we follow the lead of Shiue and Keller (2007) and Studer (2008) who have applied a common methodology to measure the degree of market integration in different parts of the world. They measure the correlation coefficients between pairs of markets, and relate them to the distance between them. There obviously is such a relationship, as transport and other transaction costs will increase with distance. By controlling for this, clear patterns of market integration can come to light: Studer, for example, demonstrated that levels of market integration in eighteenth century India were rather low, much lower than the high levels found in early modern Europe and China. Shiue and Keller pointed out that over long distances Chinese markets seem to have been more integrated than European ones, whereas on short distances correlation coefficients between European markets was (slightly) larger. For Japan Iwahashi (1981) has published a dataset for 14 market places between c. 1710 and c. 1860 which make it possible to establish the relationship between distance and correlation coefficients; for Indonesia the first set of similar data relate to 1878–1896.<sup>6</sup> The details of this analysis will be presented in Chapter 9; here we present the most striking results (Figure 3). They demonstrate that in Japan between 1760 and 1809 markets are already highly integrated; the correlation coefficients are comparable and sometimes even higher than those found in Europe and China (for example, on the distance between 150–300 km, European values of the correlation coefficient range from .65 (1770–1794) to .94 (1931–1855), China for 1770–1794 is .74, and Japan is slightly higher at .75) (Studer, 2008, p. 407). Eighteenth century India is the other

<sup>6</sup> The price data have been made available on the website of the Global Price and Income History Group at UC Davis (at <http://gpih.ucdavis.edu/>); I thank Osamu Saito for his kind assistance in interpreting the price data; more details about these data and their analysis will be presented in Chapter 9, where the Indonesian data will also be discussed.



Sources: Studer (2008), Shiue and Keller (2007), and own calculations based on Iwahashi (1981) rice price data in annual Colonial Reports of Indonesia (*Indisch Verslag*, 1878–1896)

Figure 3. Market integration in Japan, Indonesia and India

extreme; at 150–300 km distance the correlation coefficient is only .26. Only in the late nineteenth century, after the transport revolution of railways and steamships, is Indian market integration comparable to that of eighteenth century Japan. In Indonesia levels of market integration at the end of the nineteenth century are still smaller than in Japan in the previous century, which is a striking result. The high level of market development in Japan is confirmed by other evidence. Osaka, the central hub of the commercial network in Tokugawa Japan had already in the late seventeenth century developed a futures market for rice (Takatsuki, 2007). One of the reasons for comparing Japan and Indonesia is that they have a similar geography, making it possible for a large part of the trade to use low cost coastal shipping. This may help to explain why Japan was able to have such a highly integrated market system by the 18th century; in Western Europe levels of market integration were on average much higher in the North-Sea and Baltic region than in the inland zone (Bateman, 2006). The fact that under similar geographical circumstances Indonesia did much more poorly, points to the importance of other factors, such as the efficiency of the institutions regulating exchange.

Estimates of the size and extent of labour and capital markets are more difficult to find and compare internationally. The literature on the development of the labour market in Northwest Europe suggests however that as early as the fourteenth or fifteenth century a large part of the population – ranging from one-quarter to one-half, and in some cases even more – was active in the labour market at least for part of the year (Dyer, 1989; Van Bavel, 2003, 2006). Over the life cycle, the extent of the labour market participation may even have been larger than that; in their teens and (early) twenties much more than half the population engaged in wage labour (or as servants or apprentices), and wage employment was a normal aspect of the life cycle for almost everyone living in either the countryside or the towns of England and the Low Countries. Chapter 4 discusses this feature of the labour market of the North Sea region in more detail, linking it to the demographic pattern in this part of Western Europe, which was characterized by small nuclear families. We have no similar studies for early modern China, India, Japan, or Indonesia, but the general impression that emerges from the relevant literature is that wage labour was much less common there (Saito, 2005b: for Japan; Boomgaard, 1990, 2005: for Southeast Asia). The only estimate in the literature is that in late Ming (sixteenth century) China, perhaps 1% of the rural population engaged in wage labour – a figure that is very different from the 30 to 60% estimated for England and the Netherlands (Xu et al., 1999, p. 37).

The conclusion that emerges from this survey of the various measurements of institutional efficiency is that from the late medieval period Western Europe already had a relatively efficient set of institutions, which led to low transaction costs, large-scale involvement of households in factor (and product) markets, and a high degree of market integration. In particular, the very low interest rates suggest that property rights were well respected, and that a relatively high level of trust was common in Western Europe, which was especially important for the development of labour and capital markets. The comparison of levels of market integration suggests that Europe did not perform better than Japan and China in that respect. The relative advantage of Europe was therefore probably related to the quality of its 'vertical' institutions, regulating the relationships between state and citizens; 'horizontal' contracting institutions may have been equally efficient in eighteenth century China and Japan. Acemoglu and Johnson (2005) have pointed out that for the explanation of recent economic performance these

vertical institutions seem to be much more important than horizontal institutions, a conclusion consistent with recent economic historical research (Bosker, Buringh and Van Zanden, 2008). Viewed from this perspective, it should come as no surprise that this part of the world was able to generate long-term economic change to an extent that was probably unknown in other parts of the world as predicated by new institutional economics. In other words, the genesis of 'modern economic growth' in Western Europe was not accidental, but the result of the relatively efficient institutions that were characteristic of the region from at least the fifteenth century onwards.

By all measures the institutional efficiency of Western Europe contrasts sharply with the poor performance of institutions in south and south-east Asia (India and Indonesia in particular), where markets were much less integrated, interest rates were high, and also the skill premium was much higher than anywhere else. Before 1850 labour markets are relatively marginal, even in the more densely populated regions such as Java (Boomgaard, 1990); parts of India are the exception here, because we do find relatively high levels of wage labour in a few areas of the subcontinent (Lucassen, 2005).

This survey also suggests that the only regions that compare well with Western Europe in terms of skill premium, and in particular in the degree of integration of rice or grain markets were, unsurprisingly, Tokugawa Japan and Qing China. From the (late) seventeenth century onwards, both regions showed similar signs of institutional maturity, although in some respects – for example, their participation in the labour market – they remained significantly different from Western Europe. Moreover, since (at least) the same level of institutional maturity had already been realized by Western Europe in the century following 1350, this implied that Europe had a head start of at least a few hundred years. Looking at interest rates and capital market efficiency alone, the leading position of Western Europe was completely unchallenged: no part of the world had interest rates as low as 3 to 5%, as were by then usual in seventeenth and eighteenth-century Netherlands and England.

The question that is addressed in Part I is why, as early as the fifteenth century, institutions in Western Europe were notably efficient. When exactly did these relatively efficient institutions emerge? The century after the Black Death of 1347/48 is perhaps the obvious candidate, because the decline in interest rates from about 10–12% to 6% occurred



at that time (Figure 2). This period has therefore so drawn the attention of economic historians (Clark, 1988, 2007; Epstein, 2000; Zuijderduijn, 2007); Clark (2007, pp. 171–175) has, for example, speculated about a rather sudden change in time preference in this period. Our global overview of interest rates suggests, however, that the pre-Black Death level of 10% was already quite low (in the Yangtze Delta, for example, interest rates were 24% or more). Moreover, the decline between 1350 and 1450 can to a large extent be explained by factors related to supply and demand, which brought interest rates closer to the minimum that reflected transaction costs. The first stage of the fall in interest rates, which occurred well before 1300, was more fundamental and was related to important changes in the institutional structure of European medieval society. These changes also facilitated the second stage of decline after 1350, as will be explained in chapter 4, which deals with institutional change in the late Medieval Period.

That the decline in interest rates after 1350 may be caused by changes in demand and supply is clear from a brief review of these factors. The period before the Black Death of 1348, or perhaps before the Great European Famine of 1315–17, which was probably the turning point in many parts of Western Europe, was one of rapid population growth and strong economic expansion. Investment activity was extremely high for both religious and economic reasons. This was the period during which the great reclamations of agricultural land occurred, and the large forests that still covered substantial parts of Europe before 1100 disappeared, in which the basic infrastructure of roads and bridges in Europe was constructed, in which cities emerged and their walls and churches were built, and in which many thousands of fortified castles sprang up in the countryside. This spectacular investment boom ended in the first half of the fourteenth century, as is clear from the number of church building projects started in England in these years (from Dyer, 1998, p. 102). Moreover, the process of urbanization – one of the driving forces behind the investment boom – began to slow during the thirteenth and fourteenth centuries (see chapter 2).

The Black Death of 1347–49 suddenly changed the parameters of this economy. Investment activity dropped dramatically, perhaps for lack of funds but also because there was no longer any need to invest in new buildings or infrastructure. Because the population declined by one-third (ranging from perhaps 20% in the Low Countries to perhaps as much as one-half in England), and capital stock was unaffected by these changes, the ratio between available capital and population

changed suddenly. The demand for capital fell dramatically, but real incomes went up, which may have increased savings per capita.<sup>7</sup> At the same time, demographic changes, resulting in the emergence of the nuclear household and the European Marriage Pattern, also enhanced savings (Chapter 4). In sum, the strong decline in population from 1350 to 1450 led to an increase in savings per capita and a decline in investment, both favouring reductions in interest rates. The halving of interest rates in this period can thus be explained by changes in supply and demand. As a result, Western Europe, which had been a capital scarce and labour abundant economy before 1315, now became an economy with low interest rates and high real wages.

What follows from this interpretation of the decline in interest rates from 1350 to 1450 is that the most important institutional changes, which helped bring along the very low levels of interest rates characteristic of post 1450 Western Europe, may already have occurred before 1300. As Figure 2 suggests, the first phase of the decline in interest rates took place during the twelfth and thirteenth centuries, when rates fell from levels that were ‘normal’ in the world economy at the time (about 30% and more) to the 10–12% that was characteristic for pre-1300 Western Europe. It is to the medieval foundations of this development, which were laid during the centuries from 950 to 1300, that we now turn for an explanation of why Western Europe in the centuries before 1300 managed to develop a set of institutions that were more efficient than those found elsewhere.

<sup>7</sup> Income redistribution favoring low income earners may however have cancelled out some of this effect: real wages, for example, approximately doubled, whereas incomes from land and capital fell relative to other sources of income.

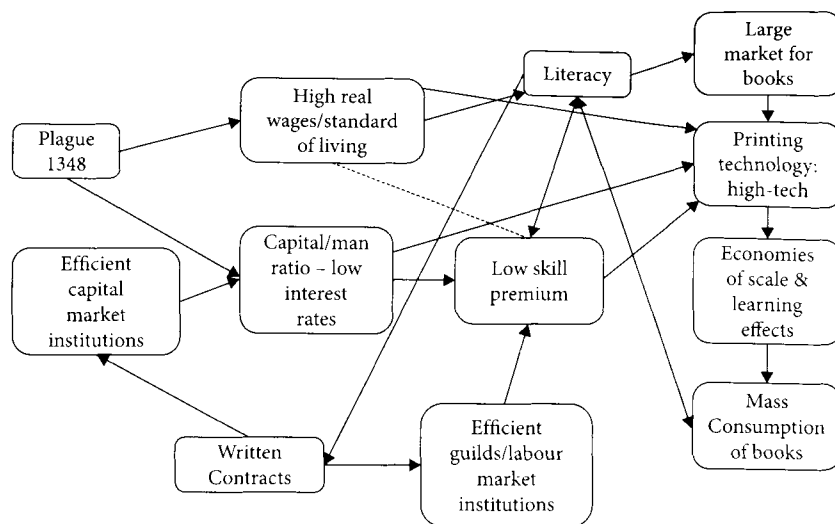


Figure 10. The causes of the high level of human capital formation in Early Modern Europe

Countries and Great Britain. Southern Europe and parts of Central Europe dropped behind after the sixteenth century, and Eastern Europe continued to lag throughout. Only parts of the northern periphery of Europe, which had been marginal during the Middle Ages – Sweden and Scotland – showed signs of catching up, especially in the eighteenth century. The hypothesis formulated in Part II, that from the fifteenth century onwards, the North Sea region invested more heavily than other areas in human capital, will be verified here. We will try to show that this region produced and consumed more knowledge (on a per capita basis) than other parts of Europe or Eurasia, and that a low skill premium and a high level of book production per capita are strongly related to economic performance. In fact, this higher level of human capital formation can be used to ‘predict’ the ‘Great Divergence’ of the nineteenth century.

## CHAPTER FIVE

### THE HUMAN CAPITAL OF COMMON WORKMEN EUROPEAN SKILL PREMIUM IN A GLOBAL PERSPECTIVE

#### *Introduction: What the Skill Premium Can Tell Us*

Relative prices are the DNA of an economy. They are basic units of information that both reflect and define its structural features. They tell us about relative scarcities, and are the incentives that guide economic behaviour. In particular, in the period before the mid nineteenth century, when other sources of information (such as historic national accounts) are difficult to obtain and subject to large margins of error, relative prices and wages are crucial sources of information about the structure of the economy and its level of development.

The study of relative prices should therefore help us understand the backgrounds and dynamics of Western Europe in the centuries before the Industrial Revolution. As already mentioned in the introduction to this book, a team of scholars led by Peter Lindert has been assembled to find out if the study of relative prices and wages can contribute to the discussion about the ‘Great Divergence’. The first results of the ‘global history of prices and incomes’ presented in Buenos Aires in 2002 suggested that in the early modern period the structure of relative prices in northwest Europe may have been distinctive. It was argued that capital goods and knowledge intensive products were relatively inexpensive in this part of the world, that interest rates were relatively low there, whereas agricultural products and foodstuffs (and land) were relatively expensive (Lindert et al., 2002). So, perhaps from the late medieval period onwards, Western Europe had a comparative advantage in ‘high tech’ products in combination with a well-developed capital market.

This chapter investigates one aspect of this hypothesis: the remuneration of human capital. It tests whether Western Europe really had a comparative advantage in knowledge-intensive sectors by examining the long-term development of the skill premium in different parts of Europe and the most developed parts of Asia. It focuses on one particular skill premium that we know a great deal about: the difference in daily wages between skilled craftsmen (carpenters and masons) and

unskilled labourers in the construction industry, and offers some additional information on the skill premium in other trades.

Why study the relative wages of carpenters and masons – apart from the obvious reason that we know a great deal about the remuneration of this profession? One advantage in focusing on the construction industry is that technological change was relatively slow there, so the skills acquired by those craftsmen did not change much over time. Their skills were also very similar across the world, although some variation did occur, of course.<sup>1</sup> It can also be argued that carpenters and masons had very strategic skills. They were the builders and often the designers of capital goods: of houses, mills, ships, carts, and a large variety of other constructions made of wood and stone (see, for example, Goldthwaite 1990, p. 125 ff.). The relative price of their skills must therefore have affected the relative price of capital goods, and thus the profitability of investment. Moreover, it will be argued that studying this segment of the labour market helps us understand the conditions for human capital formation in the economy as a whole, and that the skill premium of construction workers can be used to develop and test hypotheses about the relative efficiency of institutions in general. Finally, the construction industry was organized in guilds in many parts of Europe. It has been argued in the past that the European guilds retarded economic development because they tried to monopolize markets and limit entry to the profession they controlled. More recently, their role has been reassessed, and the guilds are now seen by many scholars as relatively efficient ways to collectively manage the skills of a profession and transfer this human capital to subsequent generations (cf. Epstein, 1998). If the critics of the guild system are right, the skill premium (the relative pay of master craftsmen with respect to unskilled labourers) would be expected to be higher in regions and cities where guilds were strong, and lower outside these regions, which would be proof that indeed guilds restricted economic development by artificially keeping skills scarce. Comparing regions with and without guilds, comparing Western Europe, where guilds were very important, with other parts

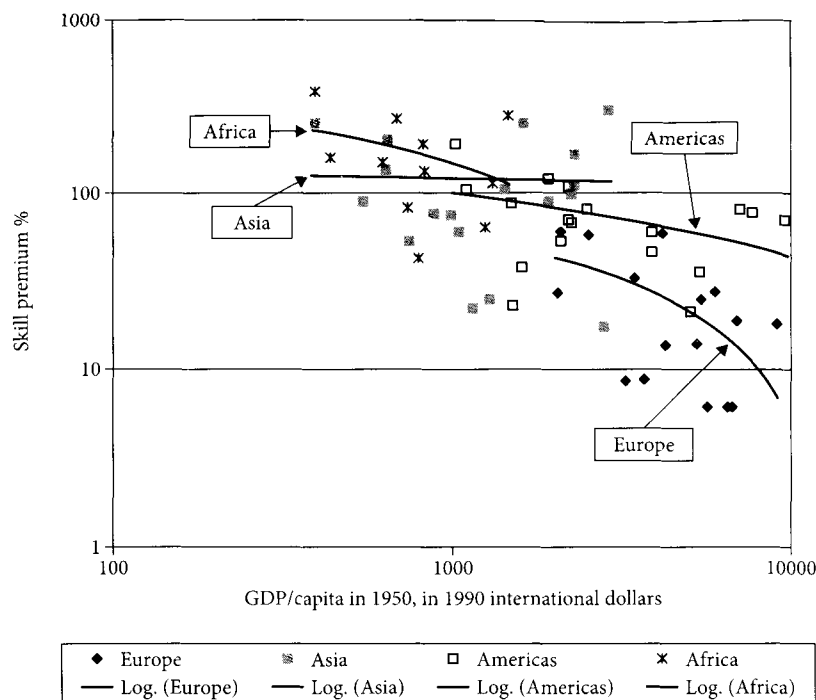
<sup>1</sup> See Van Dyke (2005, p. 62) for an example in which captains of the ships of the Dutch East India company hired, when arriving in the port cities of Asia, 'indigenous' carpenters and other craftsmen to repair and maintain their ships, indicating that their skills could easily be used for that purpose and were to a large extent interchangeable with the skills of European craftsmen.

of Eurasia where they did not occur, can help to solve the debate on their functioning.

*The Skill Premium in the Mid-Twentieth Century*

The starting point of this inquiry is the hypothesis that a low skill premium reflects efficient institutions that produce high levels of human capital formation (see also Chapter 1). But demand may also play a role; an increasing skill premium may in certain circumstances also be indicative of a growing demand for highly skilled labour. There are a number of reasons to assume that the kind of evidence that will be presented here is more indicative of supply side factors: the type of labour (construction) and the time dimension (the relevant data covers many centuries, during which the skill premium perhaps tends to converge towards its long-term level, dominated by the actual costs of 'producing' the skills). That supply factors dominate the skill premium is also suggested by an examination of similar data from the mid twentieth century. Since the 1930s, the ILO has published data from the October census in its annual publication on international labour statistics, which is an inquiry that is very similar for all countries involved. It yields data on wage levels for various occupations. For 1950 the number of countries covered by this census was sufficiently large to enable studying the variation of the skill premium in construction on a global scale. Freeman and Oostendorp (2001), analysing those data for a more recent period, found a strong negative correlation between GDP per capita and various measures of the extent of variation in wages (or wage rates). A similar relationship between GDP and skill premium is evident from Figure 11, which only uses the information on the skill premium in construction, rather than the much broader sample of industrial wages used by Freeman and Oostendorp. It shows that in 1950 the skill premium ranged from almost 400% in Ethiopia (GDP per capita less than \$400) to 6% in Denmark and Norway (GDP per capita about \$6000). This suggests that the very partial measure of the skill premium used in this paper – the difference between skilled and unskilled wages in construction – reflects the same kind of forces as the more complex, integral measures of wage dispersion analyzed by Freeman and Oostendorp (2001).

Figure 11 also includes trend lines for various regions. These show that the relationship between GDP per capita and skill premium is not



Source: see the text

Figure 11. The relationship between GDP per capita and the skill premium of building craftsmen (c. 1950)

exactly the same for all regions. Wage inequality in the Americas (there was no difference in this respect between north and south), Asia, and Africa is higher than in Europe. Regressions with the data, where skill premium is the dependent variable and GDP per capita the independent variable, confirm this picture: dummies for Europe consistently have a negative sign (and are highly significant), whereas dummies for the other continents have a positive sign. This shows that the skill premium was lower in Europe than in the rest of the world, even than North America; for example, the skill premium for the United States, the country with the highest GDP per capita, was still 71%.

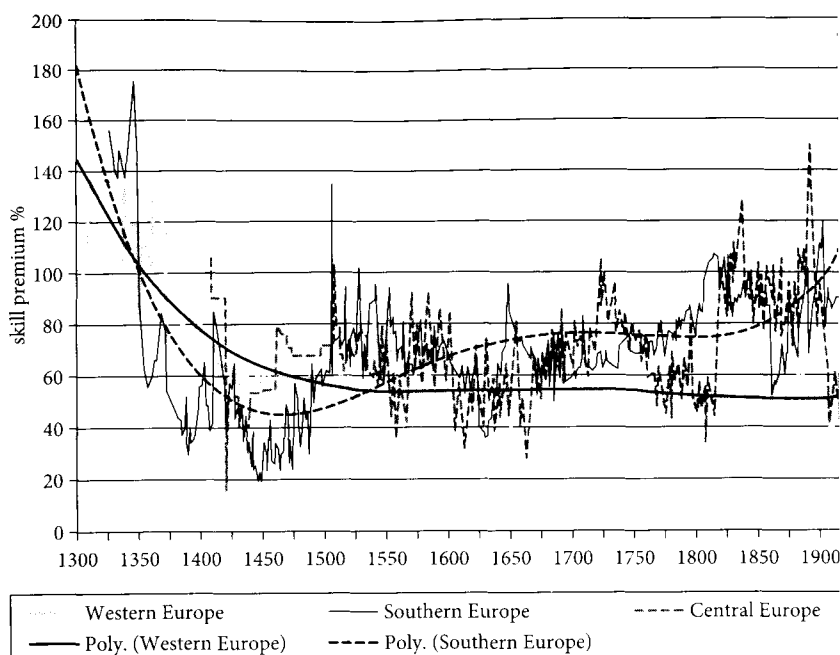
The standard explanation for the negative link between wage inequality and level of economic development is that the supply of human capital increased more rapidly than did demand for it in the process of modern economic growth, as would be expected on the basis of new growth theory. The evidence suggests that a low skill premium is good

for economic growth, a result that has also been confirmed by Davin Chor (2005), who studied the association between real wages, the quality of institutions, and the skill premium in early modern Europe.

Western Europe around 1950 seems to be a bit of an outlier, however. It is unlikely that levels of human capital formation in the US and Canada, for example, were lower than in Western Europe; the data about levels of schooling suggest the opposite (Barro and Lee, 2000). Institutions, including perhaps the higher levels of unionization in Europe, may explain the fact that the skill premium became relatively low there. It is, however, to the historical roots of this very low skill premium that we now turn.

### *Europe 1300–1914*

The work by Allen (2001) and Özmucur and Pamuk (2002) on wages for construction workers in European cities over the long term makes it relatively easy to construct time series for the skill premium in this industry from 1300 to 1914. The series have been clustered in several groups that represent different regions and patterns. Table 6 shows the estimates for individual cities, while Figure 12 presents the average skill premium for three such regions: Western Europe (Ghent/Antwerp, Amsterdam, Oxford, London, and Paris), Southern Europe (Florence, Milan, Naples, Valencia, Saragossa/Madrid, and Istanbul), and Eastern Europe (Danzig, Cracow, and Warsaw). The regions not presented in Figure 12 are Northern Europe (series for Scotland and Sweden, both starting in the sixteenth century) and Central Europe (Strasbourg, Augsburg, Leipzig, and Vienna). The clustering of the series is somewhat ad hoc – other classifications are possible as well (for example, Leipzig also fits in the Eastern European group) – but it generally reflects the different patterns than can be found. Moreover, all observations are subject to some margin of error and not completely free from biases. Although labourers and carpenters are relatively standard professions, some variation does occur. Sometimes Allen uses the wages of masons or other craftsmen, and there is probably some regional variation in the type of unskilled labourers included in the data: are they masons' assistants or unskilled labourers? As the data from several cities show, the structure of summer wages may be slightly different from that of winter wages. By clustering observations from a number of cities in a particular region, part of the variation resulting from these measurement



Sources: see Table 6

Figure 12. The skill premium of craftsmen in construction in western, southern and central Europe, 1300–1914

problems can be disregarded, but not all. For example, it is striking that the lowest skill premiums are found not only in Western and Central Europe, but also in Valencia and Naples; I have not yet been able to find good explanations for the low skill premiums there (see Table 6).

An additional problem is that the time series for different cities do not always cover the same period. For the fourteenth century no series for Central, Eastern, and Northern Europe are available; for Southern Europe in the fourteenth century we have only data on Florence and Saragossa. But from the fifteenth century onwards data become more abundant, and we are on firmer ground, although there continue to be gaps in individual series (Table 6 gives an overview of the availability of the series for the different cities per 50-year period).

Figure 12 shows that during the first half of fourteenth century the skill premium in parts of Europe was relatively high, from 100 to 150% of the wage of an unskilled labourer. From the evidence available for England, it appears there may have been an increase in wage inequality

Table 6. The skill premium of construction workers in Europe, 1300–1800 (averages per fifty-year period)\*

|                        | 1300–49    | 1350–99   | 1400–49   | 1450–99   | 1500–49   | 1550–99    | 1600–49    | 1650–99    | 1700–49    | 1750–99   |
|------------------------|------------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|-----------|
| London                 | 123        | 104       | 62        | 60        | 60        | 50         | 58         | 51         | 40         | 55        |
| Oxford                 | 109        | 92        | 52        | 50        | 52        | 44         | 48         | 50         | 47         | 52        |
| Ghent/Antwerp          | 210        | 93        | 74        | 69        | 73        | 76         | 67         | 67         | 67         | 67        |
| Holland/<br>Amsterdam  | 100        | 88        | 70        | 66        | 48        | 51         | 45         | 40         | 31         | 29        |
| Paris                  | 100        | 60        | 60        | 60        | 59        | 63         | 61         | 60         | 59         | 64        |
| <b>Western Europe</b>  | <b>128</b> | <b>88</b> | <b>64</b> | <b>61</b> | <b>58</b> | <b>57</b>  | <b>56</b>  | <b>53</b>  | <b>49</b>  | <b>53</b> |
| Strasbourg             | –          | 66        | 63        | 42        | 44        | 61         | 36         | 103        | 51         | 56        |
| Augsburg               | –          | –         | –         | –         | 62        | 37         | 42         | 36         | 45         | 46        |
| Leipzig                | –          | –         | –         | –         | –         | 76         | 71         | 82         | 68         | 62        |
| Vienna                 | –          | –         | 66        | 53        | 51        | 46         | 28         | 48         | 53         | 60        |
| <b>Central Europe</b>  | –          | <b>66</b> | <b>64</b> | <b>47</b> | <b>52</b> | <b>53</b>  | <b>44</b>  | <b>67</b>  | <b>54</b>  | <b>58</b> |
| Florence               | 115        | 59        | 42        | 53        | 86        | 99         | 112        | –          | –          | –         |
| Milan                  | –          | –         | –         | –         | –         | –          | 84         | 97         | 91         | 89        |
| Naples                 | –          | –         | –         | –         | 95        | 58         | 44         | –          | 45         | 48        |
| Valencia               | –          | 37        | 31        | 36        | 55        | 31         | 23         | 49         | 49         | 49        |
| Saragossa/<br>Madrid   | 219        | 53        | 67        | 18        | –         | 100        | –          | –          | 100        | 100       |
| Istanbul               | –          | –         | –         | 70        | 80        | 70         | 52         | 54         | 55         | 83        |
| <b>Southern Europe</b> | <b>167</b> | <b>50</b> | <b>47</b> | <b>44</b> | <b>79</b> | <b>72</b>  | <b>63</b>  | <b>67</b>  | <b>68</b>  | <b>74</b> |
| Gdansk                 | –          | –         | –         | –         | 49        | 124        | 78         | 82         | 79         | 41        |
| Cracow                 | –          | –         | 56        | 82        | 100       | 80         | 25         | 44         | 47         | 32        |
| Warsaw                 | –          | –         | –         | –         | –         | 43         | 80         | 64         | 180        | 116       |
| <b>Eastern Europe</b>  | –          | –         | <b>56</b> | <b>82</b> | <b>90</b> | <b>84</b>  | <b>61</b>  | <b>63</b>  | <b>102</b> | <b>63</b> |
| Edinburgh              | –          | –         | –         | –         | –         | 133        | 116        | –          | 131        | 83        |
| Stockholm              | –          | –         | –         | –         | 67        | 103        | 195        | 111        | 74         | 17        |
| <b>Northern Europe</b> | –          | –         | –         | –         | <b>67</b> | <b>118</b> | <b>151</b> | <b>111</b> | <b>103</b> | <b>50</b> |

\* defined as the difference between the wage of a skilled labourer (mostly a carpenter) and an unskilled labourer, divided by the wage of the unskilled labourer. For example, 100 means that the carpenter earns twice the wage of the unskilled labourer.

Sources: Allen (2001), which gives a series of unskilled and skilled construction workers. I used the underlying series available on <http://www.economics.ox.ac.uk/Members/robert.allen/WagesPrices.htm>, and made a few corrections for the 1540s (England) and the 1620s (Germany), when in periods of currency devaluation Allen did not always deal with the two series of labourers and craftsmen in a consistent way. Similar series were constructed for Istanbul: Özmucur and Pamuk (2002); Holland from 1347 to 1500: Van Bavel and Van Zanden (2004); Saragossa in the fourteenth and fifteenth centuries: Palacios (1994, pp. 362–3); Scotland/Edinburgh: Gibson and Smout (1995); Sweden/Stockholm: Jansson et al. (1991).

in the first decades of the fourteenth century, and that in the 1330s (after the great European famine of 1315–1322) there was a decline.<sup>2</sup> The Saragossa series peaks in the 1310s, but in Florence and the Low Countries the decline of the skill premium begins after 1348. It then declined until the middle of the fifteenth century, when a level of about 50 to 60% was reached.

This decline from 1348 to 1450 is one of the most striking development that needs to be explained, especially since in large parts of Europe – in the Western and Central regions – there followed a period of more than 450 years in which the skill premium remained remarkably stable.<sup>3</sup> In the other parts of Europe – in the South and Poland – there was a tendency for the skill premium to slowly rise again, however. To some extent the skill premium in these ‘peripheral areas’ seemed to change with the rhythm of population growth, increasing during the sixteenth century, stabilizing in the seventeenth century, and increasing again in the eighteenth and nineteenth centuries (I discuss this in detail below). The ‘little divergence’ between northwestern Europe and the rest of the subcontinent that starts in the early modern period can still be found in the twentieth century data: in 1936/37, according to the ILO data, the difference between the wages of carpenters and unskilled labourers was on average 56% in six East European countries (range: 28 and 95%), 45% in three Southern European countries (25 to 64%), and only 22% in four Western European countries (12 to 28%) (calculated from ILO Yearbook, 1938).

Central Europe, for which no data for the period before 1400 are available, follows the same pattern as Western Europe: the skill premium stabilizes there at low levels of 40 to 60%. A radically different pattern is found in the North, in Scotland and Sweden. There the first data are for the middle of the sixteenth century; they show a skill premium that is much higher than in the rest of the continent and fluctuates wildly, from 100 to 125% in both Edinburgh and Stockholm. This pattern remains unchanged until the second half of the eighteenth century: in the 1750s the skill premium in Edinburgh was about 100%, after which it declined to 33% in the 1770s and 1780s (Cullen, Smout and

<sup>2</sup> Clark (2005), for a slightly different timing of the decline of the skill premium in England; Phelps, Brown and Hopkins (1981, p. 8) indicate that the decline after 1350 had already been noted by Beveridge and Postan.

<sup>3</sup> Phelps, Brown and Hopkins (1981, pp. 8–12); after 1914 it declined to an even lower level, to about 25% in 1936; from the ILO Yearbook 1936.

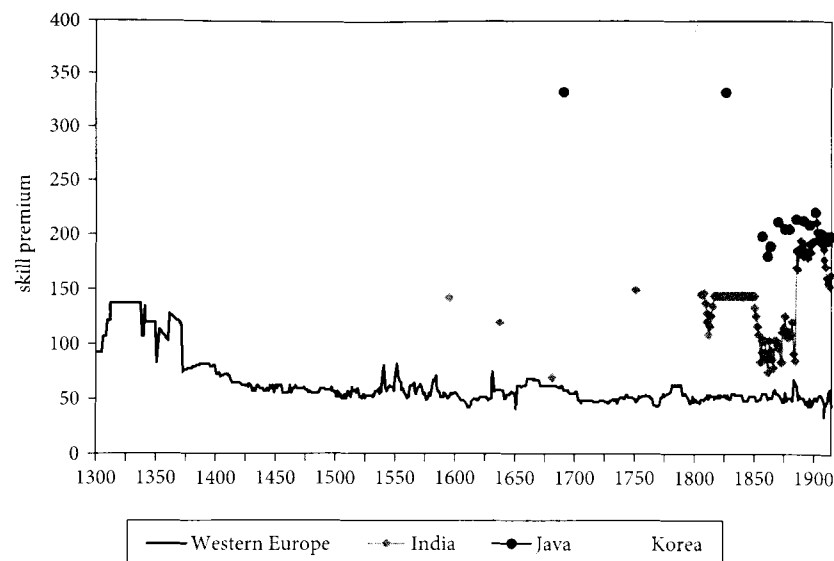
Gibson, 1988, p. 115); similarly, in Stockholm it was still 100% in the 1700s, but less than 40% after 1725. Northern Europe clearly catches up quickly in the eighteenth century.

### *Outside Europe*

For other parts of Eurasia – India, Japan, Korea, China, and Indonesia – it is also possible to find similar data on the structure of wages for construction activities, which are presented in Figure 13. For India the data go back to the famous report on the state of the Moghul Empire in 1595, Abul Fazl’s *Ain-i-Akbari*, which provides a detailed list of the wages paid to various groups of workers and shows a much higher skill premium than in Europe (which is confirmed by other data for seventeenth and eighteenth-century India). The eighteenth and nineteenth-century observations for Indonesia and Korea suggest similarly high levels. Russia fits in the same picture; the data published by Hellie (1999, pp. 413–74) for the seventeenth century point to a 100% (carpenter/unskilled labourer) to 167% (mason/unskilled labourer) skill premium. For the Middle East (Egypt and Iraq) some wage data have been published by Ashtor (1969, pp. 64, 224–5), which go back to the eighth–thirteenth centuries, all indicating a skill premium of about 100%. The oldest is from Baghdad in 762–766, where a day labourer earned 2 to 3 *habbas* and a master mason 5.

The general picture appears to be that outside Western Europe the skill premium measured in this way was much higher than around the shores of the North Sea, but there are a few important exceptions. Japan is a difficult case. A few observations can be derived from Saito’s study of wages and economic development. These point to a fairly high level: a typical observation is that in 1802/04 a day labourer in Kyoto earned 0.92 monme per day, while the wage of a carpenter in the countryside (in Kami-Kawarabayashi) was 2.6 monme and that of an Osaka carpenter 4.3 monme per day (Saito, 1978).<sup>4</sup> But records from the Dutch East India Company ships that visited Nagasaki in the seventeenth and eighteenth centuries show a smaller skill premium of slightly less

<sup>4</sup> Nishikawa (1978, pp. 80–1) provides wages for skilled and unskilled workers in salt making in Choshu in the 1840s, which indicate a similar skill premium (4.6 monme for a skilled workers against 1.6 monme for an unskilled worker and .8 monme for an unskilled female labourer).



Sources: Broadberry and Gupta (2006): for India; Van Zanden (2003): for Indonesia; Van Leeuwen (2007): nineteenth-century India and Indonesia; Jun and Lewis (2007): for Korea; the underlying data are available on <http://www.iisg.nl/hpw/data.php#korea>

Figure 13. The skill premium of craftsmen in construction in Western Europe, India, Java and Korea, 1300–1914

than 100%.<sup>5</sup> Moreover, in the 1870s and 1880s, when national statistics become available, the skill premium is relatively low and comparable to levels in Western Europe (Van Leeuwen, 2007, appendix on wages and prices).

The most significant exception to the rule that the skill premium was quite high outside Western Europe, was southern China. A set of government regulations for wages of unskilled and skilled labourers in the north, in Beijing, in the seventeenth and eighteenth centuries point to a skill premium of 100%, similar to what was found in other parts of Asia (Moll-Murata, 2005; Moll-Murata, 2004).<sup>6</sup> The most detailed, empire-wide regulation of wages and prices for public works, dated from 1769, the *Wuliao jiazhi zeli*, shows that there existed signifi-

<sup>5</sup> Archive East India Company, National Archive The Hague, no. 756, 1306–1354; the datasets of prices and wages in Nagasaki will be made available on [www.iisg.nl/hpw](http://www.iisg.nl/hpw).

<sup>6</sup> Moll-Murata (2004); this latter paper presents regulations of wages of construction workers in Beijing for 1659, 1665, 1723, and 1736, all showing the same skill premium of 100%.

cant regional variations in the skill premium: in the North the 100% skill premium is confirmed, but in the South the skill premium was comparable to Western Europe (25–67%) (see Allen et al., 2005 for a detailed analysis of these wage data). The countrywide average of less than 40% was largely influenced by the much more densely populated south (Table 7). Although this source is not without problems, the skill premium that can be derived is probably fairly accurate; it is confirmed by other data based on actual wage payments, such as those of the East India Company ships entering the port of Canton (Allen et al., 2005; Van Dyke, 2005). Therefore, the South of China appears to be the only region outside Western Europe with a very low skill premium, which points to high levels of human capital formation there.

### *Explanations: Human Capital as an Investment and its Link to Interest Rates*

These data raise a number of questions about the remuneration for human capital in different parts of the world. The first and perhaps most striking development is the sudden, spectacular decline in the skill premium in the century following the Black Death. The result was that during the Renaissance – from 1400 to 1550 – the skill premium was exceptionally low. The stability of the skill premium in Western Europe from 1450 to 1914 is the second striking phenomenon: how is it possible that in those four-and-a-half centuries the relative pay of craftsmen was ‘frozen’ at such a low level? The divergence of the south and the east in the centuries after 1650 (or perhaps 1450?) is perhaps the third remarkable development. What are the connections here to the development of real wages and the ‘little divergence’ that were analyzed in Part II? Finally, why was the skill premium in Western Europe so much lower than elsewhere, with the significant exception of southern China?

According to standard economic theory, the skill premium is the remuneration from investment in human capital, for not earning an income during the period in which an apprentice was being trained and for paying the fees to the master craftsman who trained the apprentice. Therefore, one possible approach is to argue that the skill premium is in the long term determined by: (1) the cost of the training, such as number of years needed for acquiring the specific skills (the unearned wage income during these years, the fees paid etc.), (2) the interest

rate linking higher future earnings to the present, and (3) the likelihood of earning a higher income after completing the training period, along with the number of years the skill premium can be expected to last (which may be related to life expectancy). This may seem a very modern idea, and the approach may perhaps be slightly anachronistic, but it can already be found in Adam Smith (as so often), who wrote of the skilled labourer that 'the work which he learns to perform... must be expected, over and above the usual wages of common labour, will replace to him the whole expense of his education, with at least the ordinary profit of an equally valuable capital.... The difference between the wages of skilled labour and those of common labour is founded upon this principle' (Smith, 1776/1976, pp. 203–4).

The outlines of the apprenticeship system in Europe are well known, and seem not to have changed fundamentally throughout the period under study (Epstein, 1991; Humphries, 2003). Therefore, it is possible to roughly simulate the relationship between the 'equilibrium' skill premium and the return on human capital, which will be related to the interest rate. The following assumptions are used in this simulation:

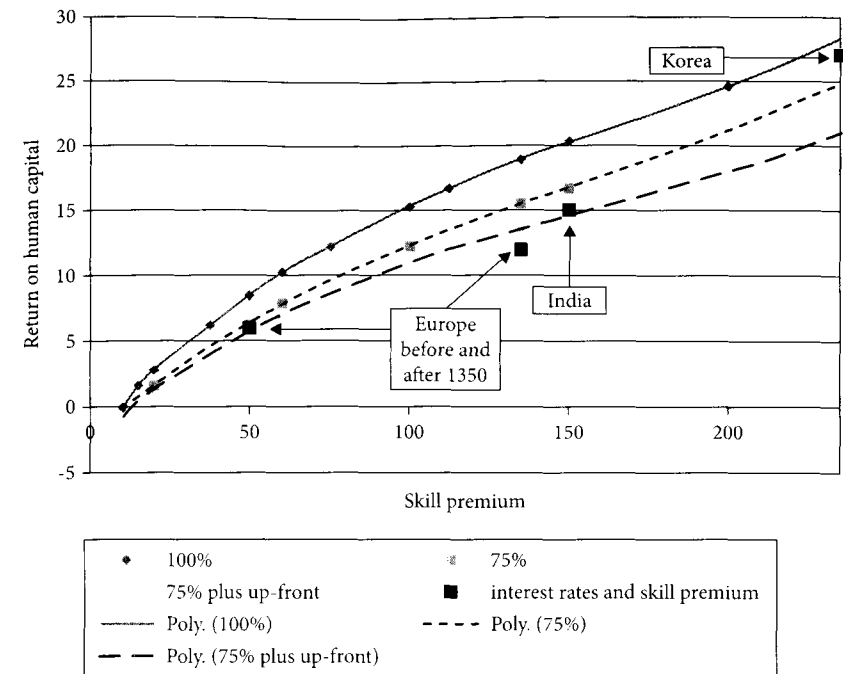
- a 7 year-apprenticeship period – the standard in English contracts – from 14 to 21 years old (Humphries, 2003, p. 75);<sup>7</sup>
- the unearned income for an apprentice is estimated at 20% of the annual wages of an unskilled labourer at age 14, increasing from 40% (at 15 years), to 60% (16 years), 70% (17), 80% (18), 90% (19), to 100% at 20;<sup>8</sup>
- after completing an apprenticeship, skilled craftsmen will earn the higher wage for a period of 45 years, from 21 to 65;<sup>9</sup>

Three variants have been calculated: the first is based on the assumption that an apprentice has a 100% likelihood of becoming a craftsman after finishing his seven years of training; the second variant assumes

<sup>7</sup> Also Epstein (1991, p. 142), who gives a 7-year apprenticeship period for carpenters in thirteenth century Genoa, but shorter periods for masons (5 or 6 years).

<sup>8</sup> These rough estimates are based on two sources: Scholliers (1959) and Impens (1965), who give the wage profile of printers in Antwerp (Plantin) in the sixteenth–eighteenth centuries; Johnson (2003) gives the age profile of textile workers in England in the first half of the nineteenth century.

<sup>9</sup> Relaxing the assumption of a working life of 45 years does not affect the experiment much, as later years hardly have any effect on the return on investment in human capital, in particular not when interest rates are high.



Sources: see the text

Figure 14. Modelled relationship between skill premium and return of human capital; three variations

this likelihood to be 75% and that there is a 25% chance he will only earn the income of an unskilled labourer; the third variant additionally assumes that the apprentice has to pay a premium of 50% of the annual wage of an unskilled labourer up front. Figure 14 shows the relationships between skill premium and return on capital invested in training derived from these assumptions. It shows, for example, that a decline in skill premium from 135% (in 1325) to 60% (in 1450) would be consistent with a decline in the return on human capital from 19% to 10% in the first variant, from about 15.5% to 8% in the second variant, and from almost 14% to 7% in the third. Also added to Figure 4 are the very rough estimates of interest rates and skill premiums for several countries for the early modern period (explained in detail in Chapter 1).

Given the fact that carpenters or masons acquired the same skills before and after the Black Death, the most straightforward explanation



for the post 1350 decline in the skill premium for construction is that interest rates in Europe declined greatly in this period. This induced households to increase their investment in human capital, which led to the change observed in the skill premium. The fall in the skill premium occurred in various parts of the continent, which is consistent with the fact that throughout Europe interest rates seem to have halved in the century or so after the Black Death (see Chapter 1).

The returns on investment in human capital estimated in this way are somewhat higher than the interest rates on capital; the latter are related to the segments of the capital market in which land was (or could be) used as collateral. Obviously, investment in human capital was riskier than investment in land, but this risk premium was – if we are to believe these calculations – surprisingly low in early modern Europe. Significantly, McCloskey and Nash (1984) also found a more radical decline in interest rates on rural capital markets in their study of the seasonal variation in grain prices. The evidence presented here and in their study perhaps indicates that the spread of interest rates between ‘formal’ and ‘informal’ capital markets was also declining in the century after 1350.

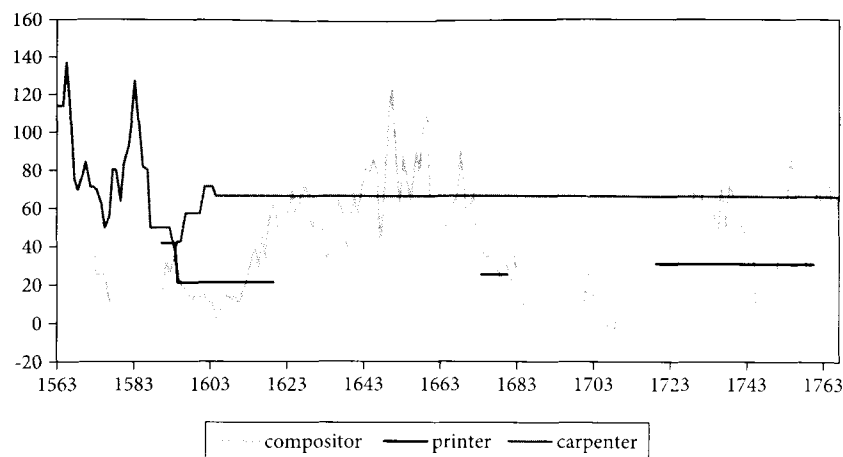
What is also striking is that in Western Europe both interest rates and the skill premium remained roughly constant after 1450, and certainly did not rise again to the pre-1350 level, in spite of a strong growth in population and a subsequent decline in the land/man ratio in the centuries after 1450. In fact, population growth after 1450 was particularly rapid in the Netherlands and England, where the skill premium remained frozen at the 50–60% level. This means that the explanation for the fall in interest rates and the associated skill premium that focuses on the decline in population after 1348 as the determining factor must be incomplete. The evidence suggests that at the same time changes in the institutional setting of capital markets and/or in the savings behaviour of households occurred resulting in a long-term increase in the supply of savings and a stabilization of interest rates in the very long run. In Chapter 4 a possible explanation has already been suggested: it was the rise in the European Marriage Pattern that caused these qualitative changes in institutional setting and savings behaviour. Further proof of this is that in the North Sea area in the centuries after 1450, interest rates and skill premiums did not increase again but continued to be low and perhaps even declined slightly during the eighteenth and nineteenth centuries, distinguishing this region from

the more ‘peripheral’ parts of the continent.<sup>10</sup> That the demographic downturn after 1348 was perhaps of secondary importance – and only helped to attain a new equilibrium in the capital market characterized by low transactions costs, high savings, and low interest rates – can also be argued on the basis of the Netherlands, where a long-term *expansion* in the (urban) population from 1350 to 1500 coincided with a decline of the skill premium (from about 100% in the 1340s to 40 to 50% in the early 1500s) and a similar fall in interest rates (Van Bavel and Van Zanden, 2004; Zuijderdijn, 2007).

The question remains, of course, why the Dutch Golden Age, or the Industrial Revolution did not lead to a strong increase in this particular skill premium? Part of the answer is that the skill premiums may indeed have gone up, but it was in other segments of the labour market. De Vries and Van der Woude (1997, pp. 632–4), Van Zanden (1995), and Williamson (1985) found evidence of increases in the skill premium in other sectors of the labour market, especially with respect to highly skilled employees. These reflected bottlenecks in the supply of skilled labour, the result of accelerations in economic growth, and the transformation of economic structures.

Should we conclude then that the stability in the skill premium of carpenters and masons was exceptional? To test the hypothesis that the low skill premium for construction workers reflected the much broader phenomenon of a relatively flexible supply of skilled labour, I also collected wage data on another group of highly skilled craftsmen, the compositors and printers working in the printing industry following the invention of movable type in the 1450s. These printers can be seen as the ICT workers of the late medieval and early modern period, operating and developing the new techniques of mass production of information. Book production grew dramatically in Europe from the 1470s onwards, and the demand for their skills must have been increasing very rapidly. But this did not lead to ‘excessive’ wage levels. The very detailed wage data available for the large Plantijn firm in Antwerp for the period 1560–1800 show that in this booming centre of the printing industry, wages for these highly skilled and literate workers were at best at the same level as those of skilled construction workers, and often

<sup>10</sup> Epstein (2000, pp. 60–63); and Clark (2007, pp. 167–175) speculate about these changes but do not give adequate explanations.



Sources: Scholliers, 1959; Impens, 1965; Allen, 2001 database

Figure 15. Skill premium of printers, compositors and carpenters in Antwerp (Plantijn), 1563–1766

substantially lower (Figure 15).<sup>11</sup> Because many printers were recruited from abroad, especially from Germany, this must have been indicative of wage trends elsewhere.<sup>12</sup> This again points to the relative flexibility of the supply of skilled labourers in early modern Europe and suggests that the low skill premium in the construction industry may be indicative of the efficiency of the training system in general.

Can interest rate differentials also explain the gap in wage inequality between Europe and the rest of Eurasia? Evidence that interest rates in Europe were lower than elsewhere on the Eurasian continent is fragmentary, but as we saw in Chapter 1, the general tendency from the late Middle Ages onwards was that capital markets in Europe were more efficient than elsewhere, with the possible exception of eighteenth and nineteenth-century Japan. Figure 14 shows that, assuming the costs of training young apprentices were similar everywhere, the large differences in skill premiums between the rest of Eurasia and post-1348 Western Europe can be explained by this gap in interest rates. With

<sup>11</sup> See also the classic study of the management and the labour relations at this printing firm, Voet (1972, p. 431), who concluded that the wage of the Plantin workmen 'approached and often even exceeded those of master craftsmen'.

<sup>12</sup> Printers and carpenters were paid a daily or weekly wage, compositors a piece wage, which explains the differences in behaviour of these series.

the notable exception of China, where interest rates were high but the skill premium was lower than in the rest of East and South Asia, the efficiency of capital market institutions seems to explain the price of human capital. The case of Japan, where both the interest rate and the skill premium probably declined in the eighteenth and nineteenth century, also fits well in such an interpretation.

### *The Efficiency of Training Institutions*

Interest rates are only part of the explanation, however. The efficiency of institutions regulating the training of apprentices also plays a role. We can distinguish two different ways to organize such training: in large parts of the world the family or the clan played a central role, and skills were transferred from fathers to sons or other members of the (extended) family. In fact, in parts of Asia, being a craftsman was largely hereditary. In the countryside surrounding Pune (in southern India), for example, the village craftsmen or 'balutedars worked as hereditary village servants', who, in return for a share in the harvest, 'rendered service to the cultivators throughout the year' (Divekar, 1989, pp. 44–45). In Song and Yuan (and Ming) China the state defined craftsmen as a separate social class, which was taxed separately, often in the form of regulated labour services (of a couple of years or months in Beijing, working for the imperial household). This tax burden was hereditary, and based on the assumption that the father would be succeeded by another family member after his death. This system changed under the Qing: they abolished the hereditary corvée duties for artisans, who from 1661 onwards were included as ordinary households in the land tax registers. This 'meant that their occupation was no longer hereditary by legal obligation' (Moll-Murata, 2005, p. 14). The long tradition of forced labour by craftsmen under the Song, Yuan, and Ming, however, and the strong claims the state had on the work of these craftsmen, makes it more difficult to interpret the low skill premium found in parts of China during the Qing, however.

In contrast to these relatively closed systems in which the family played a central role, Western Europe had a formal system of apprenticeship – organized by guilds or similar institutions – and in principle open to all. Guilds or guild-like institutions existed in other parts of Eurasia as well, especially in the Middle East, but also in Qing China after the state ceased to regulate the supply of skilled labour in the late

seventeenth century. But it was only in the nineteenth century that those guilds began to play a role comparable to some European guilds; in the eighteenth century most guilds were set up by merchants from a certain province trading in a distant city (see Moll Murata, 2006). Similarly, guild-like structures appeared in Tokugawa Japan, but their effects on the training of apprentices were probably rather limited (Nagata, 2006). Still, it is striking that in the three regions that (probably) had the lowest skill premium, institutions such as guilds existed (or appeared) which regulated the training of apprentices.

This suggests that having a guild system in place may have had advantages. The contract between an apprentice and his master was complex, involving various remunerations for services over a long time period (Humphries, 2003; Epstein, 2001). Apprentices may have feared that paying for training up front would not ensure the quantity and quality of training necessary to become a skilled worker or an independent craftsman. Masters may have feared that after an apprentice had been a net liability for his household in the first years of the contract, he would leave before becoming a net source of income in the second half of his term.<sup>13</sup> Since the master controlled access to the ranks of skilled craftsmen, apprentices may have also feared he would renege on his promises (Humphries, 2003, pp. 81–2). By definition, these ‘incomplete’ contracts may therefore have resulted in underinvestment in human capital. Efficient levels of human capital formation required a certain amount of reciprocity and trust between both parties and/or third-party involvement, i.e. institutions to guarantee fair execution of the apprentice contract.

In Europe guilds traditionally regulated the training of apprentices; in England the state also began to regulate apprenticeship (from 1563 onwards), but this was entirely based on the rules already applied by the craft guilds (Humphries, 2003). This meant that guilds operated as a third party monitoring the apprenticeship contracts. The exceptionally low skill premium of post-1450 Europe is therefore a testimony to the efficiency of the guilds (and, in England, of the additional institutional guarantees provided by the national organization for the apprentice contract). If the guilds had been less efficient, if they had functioned as cartels of skilled labour effectively restricting entry to the ranks of

<sup>13</sup> See Epstein (1991, pp. 102 ff.): almost all contracts contained clauses forbidding the apprentice to leave before the contract expired.

craftsmen, the skill premium would have been much higher (or, for Figure 14, the gap between the return on human capital and the interest rate on the capital market would have been much higher). There were many regional variations in the power of guilds, however; their influence in England, for example, seems to have declined during the eighteenth century, perhaps also because the state took over part of their role, but they remained quite important in the Low Countries. But on a global scale it appears that guilds and low skill premiums coincided, a conclusion relevant for the ongoing debate about the relative efficiency of the guilds in early modern Europe. Although in the past the literature was very critical of the role of guilds, more recent research suggests that their role was much more positive, especially in the organization of training (Epstein, 1998; Epstein and Prak, 2008). This global comparison of the skill premium suggests that there may be some truth in a reassessment of the guild system.

#### *The Link to Agricultural Labour Markets*

The existence of guilds could not guarantee the long-term stability of the skill premium at the 50 to 60% level that was typical of fifteenth-century Europe, however. The example of Italy, where guilds were relatively powerful (Mocarelli, 2006), demonstrates this clearly (see Figure 12). More generally, in Southern and Eastern Europe, where guilds often did regulate labour markets, the skill premium appears to have been more flexible than in the northwestern part of the subcontinent. Long-term trends in the skill premium in the South and East point to an association with population growth: the skill premium increased in the sixteenth century, followed by convergence to the Western European average in the seventeenth-century ‘crisis’, which was again followed by an increase of skill premiums in the South and East in the eighteenth and nineteenth centuries (Figure 12).

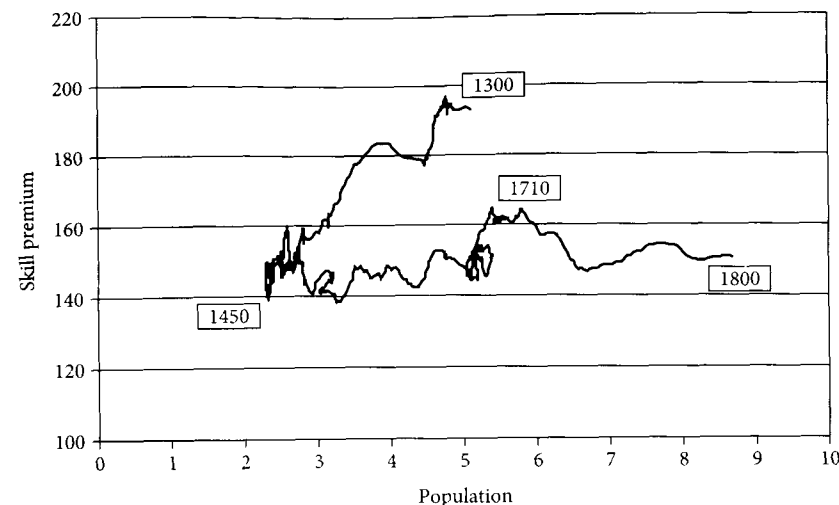
The two different patterns can best be observed in the two regions for which we have the longest time series: England and northern Italy (Florence before 1618, Milan afterwards). As Figure 16 shows, in England the relationship between population and skill premium fundamentally changed in the fifteenth century; whereas the decrease in population and the decline in skill premium operated approximately in tandem before 1450, a clear ‘de-linking’ occurred thereafter. In (northern) Italy no such de-linking occurred (Figure 17): the situation in 1600 shows almost the

exact same pattern as in 1350. The Florentine skill premium returned to more than 100%, and the Italian population also increased to the pre-Black Death level of about 12.5 million. After 1620 a stagnation in population growth (which stabilized at slightly more than 13 million) was accompanied by a small decline in the skill premium (to about 80%); the real de-linking seems to have occurred in the eighteenth century, when rapid population growth no longer led to a further increase in the skill premium (of Milanese workers).

Why was the Italian skill premium so sensitive to population growth? Part of the explanation may be that the wages of unskilled labourers were linked to agricultural labour productivity, which tended to correlate with the size of the population. Such a link between rural and urban labour markets for unskilled labourers is a well-known theme in the literature on pre-industrial labour markets. In Japan, India, and Indonesia, unskilled labourers were basically *agricultural* labourers – ‘coolies’ was the term used in southeast Asia – who engaged in construction and other urban activities on a part-time basis. In the Japanese labour market the links between the urban market for unskilled labourers and the situation in agriculture were also strong: unskilled labourers in cities earned about the same wage as ‘male springtime farm workers’; the urban-rural wage gap was relatively small, at least for unskilled labourers (Saito, 1978, p. 88; Saito, 2005b).

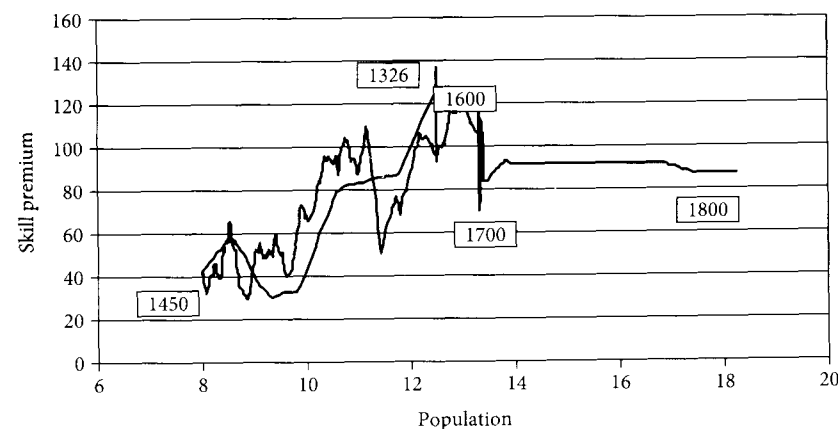
The same link between the wages of agricultural workers and unskilled workers in the construction industry can be found in Western Europe. In the sixteenth and seventeenth centuries agricultural wages in Holland were roughly on a par with those of unskilled workers in the building industry (Van Zanden, 2002a). Similarly, from 1300 to 1700, nominal wages in English agriculture were at the same level as the wages of unskilled labourers in construction (Clark, 2005).

The connection between population growth and the skill premium can to some extent be explained in this way: wages of unskilled workers reflected labour productivity in agriculture, which in the long run was linked to population growth. The rapid demographic expansion in the sixteenth century triggered a strong decline in rural real wages, but the urban sector could to some extent protect itself against these trends. In the North Sea region real wages in agriculture did not decline as much as in Southern and Eastern Europe because of growth in agricultural productivity. Moreover, labour markets were better integrated, and wages in agriculture paralleled the wages of craftsmen in the construction industry. The de-linking of population growth and the skill



Sources: see Table 6

Figure 16. Skill premium (nine-year moving average) and estimates of English population (in millions), 1300–1800



Sources: see Table 6 and Malanima (1998)

Figure 17. Skill premium (nine-years moving average) in Florence/Milan and estimates of the population of Italy (in millions), 1326–1800

premium, therefore, points to fundamental changes in the economies of northwestern Europe, and shows that labour markets there were better integrated and less segmented than in the Southern and Eastern parts of the subcontinent. Thus, the skill premium also appears to reflect the extent of segmentation of the labour market: in a very fragmented system, where craftsmen are able to monopolize local labour markets and the wage gap between countryside and town is large, there is generally a high skill premium, but in highly integrated labour markets wage inequality will tend to be relatively low.

This can be illustrated by an extreme example of a labour market with a low level of integration, eighteenth and nineteenth-century Ireland. Like much of the Celtic fringe, Ireland had not fully participated in the big boom of the high Middle Ages; it did not undergo the thorough restructuring in the institutional framework of its economy and society that occurred elsewhere (and to the extent such institutions were introduced, they were largely restricted to the English minority that dominated the towns). In the eighteenth century we find an extremely high skill premium there, ranging from 100% in Dublin to 200% in the countryside; by all standards Ireland is a clear outlier, with a much lower level of human capital formation than the rest of Western Europe, which is confirmed by Mokyr's work on age heaping that shows similar low levels of numeracy and literacy (Mokyr, 1985).<sup>14</sup> One of the factors behind the enormous spread in wage levels was the wage gap between town and countryside, another feature of a poorly integrated economy: in eighteenth-century Dublin, for example, craftsmen earned a wage that was often double the wage of similar workers in rural Kilkenny, and the urban-rural wage gap for unskilled and semi-skilled labourers was even larger (all Irish wage data are from Kennedy and Dowling (1997)). What is even more striking is that the skill premium went up between 1700 and 1850, whereas for the same period in Scotland it declined significantly, to converge to the English level. In Dublin it increased from 100% from 1700 to 1760 to 140% from 1836 to 1850; in rural Armagh it increased from 155% in the 1740s to 200% in the 1840s. These are levels comparable to those in east and southeast Asia

<sup>14</sup> Mokyr (1985); there are many other signs that the market economy was not functioning well: interest rates in the countryside were very high, property rights to land unclear, markets were performing poorly generally.

but very unlike the rest of Western Europe.<sup>15</sup> The analysis presented here suggests that this pronounced increase in the skill premium, which was unique to eighteenth and early nineteenth-century Ireland, was linked to a stagnant, or perhaps even declining, labour productivity in agriculture, induced by strong population growth.<sup>16</sup>

### *Effects on Economic Growth*

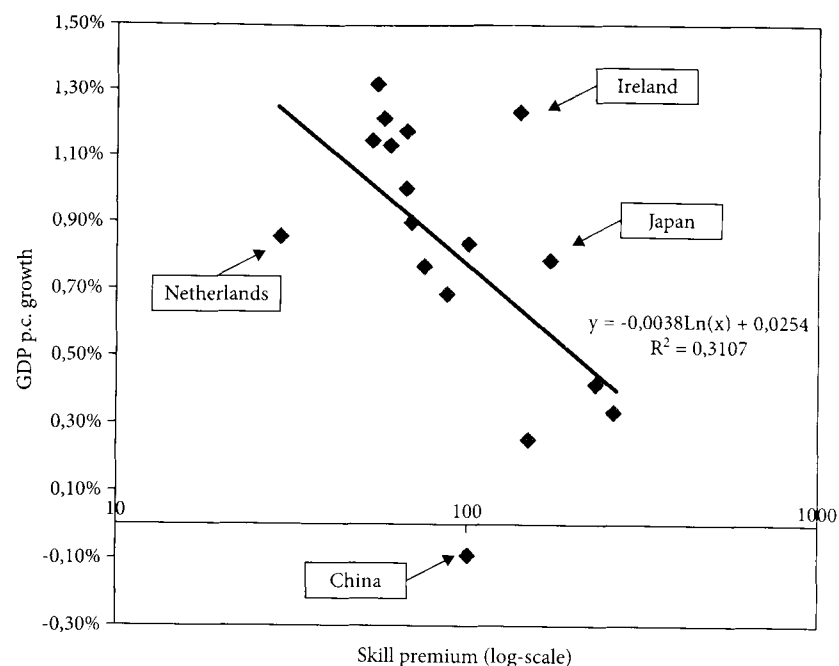
New growth theory postulates that human capital formation is one of the determinants of long-term economic growth. If this is correct, the varying conditions for human capital formation, reflected in the differences in the skill premium analyzed in this chapter, should have affected long-term economic growth. I have already referred to the paper by Davin Chor (2005), who demonstrates that such a link existed in early modern Europe: cities with efficient institutions resulting in low skill premiums had higher levels of real wages, a clear indicator of their relative success. Thus, the skill premium helps explain the 'little divergence' that occurred in Europe from 1400 to 1800.

Do these differences in the price of human capital also help explain the 'Great Divergence' of the nineteenth century? We can test this in two ways. Figure 18 shows the relationship between the average skill premium (in the capital city) in the period 1750–1820 and the growth of GDP per capita in the nineteenth century (the period 1820–1913) according to Maddison's (2001) estimates. Because the 1820 estimates of levels of GDP have been subject to much debate – the revisionists claiming that the gap between Europe and China was much smaller than estimated by Maddison – I also compared the absolute level of GDP per capita in 1913 to the skill premium in the period 1750–1820 (Figure 19).

In both cases we find a clear relationship between growth/level of GDP and the skill premium, confirming the hypothesis that a low skill premium leads to rapid economic growth, or that the efficient institutions reflected in a low skill premium enhance economic development. The link to the 1913 level of GDP per capita is closer than it

<sup>15</sup> See also Cullen, Smout and Gibson (1988, p. 113), who find skill premiums as high as 300% in rural Ireland in this period, and Mokyr (1985, pp. 226–7).

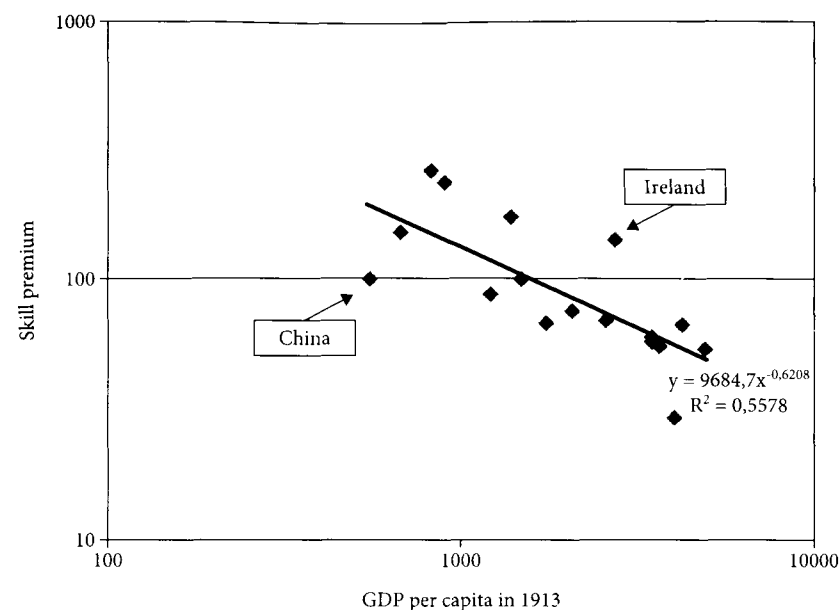
<sup>16</sup> Similarly, the fact that the skill premium in late Tokugawa Japan fell may also be related to the almost stationary population, but this is speculative.



Sources: See Tables 6 and 7, Figure 13, Kennedy and Dowling, 1997, and Maddison, 2001

Figure 18. The average skill premium of construction workers between 1750 and 1820 and GDP per capita growth in 1820-1913

is to growth in the nineteenth century. There are a number of outliers in Figure 18: China, the Netherlands, and Ireland, which reversed its development path following the famine of the 1840s, 'explaining' why its performance cannot be predicted on the efficiency of its institutions in 1800. Japan also has a slightly higher rate of growth than might be expected on the basis of its skill premium in 1800, but I used the high 1804 estimate of the skill premium by Saito here, which is perhaps not representative of the national average. China is the underperformer in the nineteenth century by these standards. It is the only country with a declining GDP per capita, according to Maddison, in combination with a relatively low skill premium; it continues to be an enigma. I used the estimates for Beijing (of a 100% skill premium) rather than the countrywide estimates, because for other countries we also used data related to their capital cities. Using the much lower countrywide estimates presented in Table 7 would make the underperformance of China even more dramatic. Growth in the Netherlands was relatively



Sources: See Tables 6 and 7, Figure 13, Kennedy and Dowling, 1997, and Maddison, 2001

Figure 19. The skill premium in 1750/1820 and GDP per capita in 1913 (log-scale)

slow because it started from a high level.<sup>17</sup> The Dutch anomaly disappears in Figure 19; China remains the most significant outlier in the latter figure.<sup>18</sup>

### Conclusion

This chapter develops the argument that the skill premium measured in this relatively straightforward way – as the difference between the wages of carpenters and masons and those of unskilled labourers in construction – can be considered a good proxy of the quality of the institutional framework of an economy. That it exemplifies institutional efficiency follows from the analysis of the main factors determining level and development:

<sup>17</sup> Cf. Van Zanden and Van Riel (2004) for an interpretation of its slow performance in the nineteenth century.

<sup>18</sup> Fukao et al. (2007); Chinese GDP per capita in 1913 is perhaps underestimated.

Table 7. Nominal wages of construction workers in '1769' according to the *Wuliao jiazhi zeli* (in tael per day)

|                                  | Unskilled | Skilled | Skill premium | N = | Population<br>(millions in 1787) |
|----------------------------------|-----------|---------|---------------|-----|----------------------------------|
| <b>Manchuria and Mongolia</b>    |           |         |               |     |                                  |
| Heilongjiang                     | .100      | .191    | 91            | 2/6 |                                  |
| Jilin                            | .095      | .160    | 68            | 6   | 1.0**                            |
| Liaoning                         | .057      | .100    | 75            | 13  |                                  |
| Xinjiang                         | .097      | .110    | 13            | 3   | ?                                |
| <b>The North</b>                 |           |         |               |     |                                  |
| Rehe*                            | .066      | .120    | 82            | 7   |                                  |
| Beijing*                         | .077      | .141    | 83            | 24  |                                  |
| Tianjin/Baoding*                 | .071      | .112    | 58            | 34  | 23.0***                          |
| Hebei*                           | .054      | .081    | 50            | 82  |                                  |
| Gansu                            | .044      | .054    | 23            | 48  | 15.2                             |
| Shanxi                           | .054      | .073    | 35            | 85  | 13.2                             |
| Shaanxi                          | .044      | .050    | 14            | 74  | 8.4                              |
| Shandong                         | .045      | .061    | 36            | 50  | 22.6                             |
| <b>Middle</b>                    |           |         |               |     |                                  |
| Henan                            | .037      | .039    | 5             | 106 | 21.0                             |
| Jiangsu                          | .040      | .051    | 28            | 63  | 31.4                             |
| Zhejiang                         | .040      | .060    | 50            | 63  | 21.7                             |
| Hunan                            | .039      | .050    | 28            | 10  | 16.2                             |
| Sichuan                          | .048      | .062    | 29            | 47  | 8.6                              |
| Yunnan                           | .048      | .068    | 42            | 84  | 3.5                              |
| <b>South</b>                     |           |         |               |     |                                  |
| Fujian                           | .030      | .050    | 67            | 9   | 12.0****                         |
| Taiwan                           | .030      | .050    | 67            | 1   |                                  |
| Guangdong                        | .040      | .050    | 25            | 89  | 16.0                             |
| Average (unweighted)             | .053      | .081    | 53            |     |                                  |
| Average (weighted by population) | .044      | .060    | 36            |     | 214                              |

\* part of the province of Zhili (there is a separate regulation for Rehe)

\*\* Manchuria as a whole

\*\*\* Zhili as a whole

\*\*\*\* including Taiwan

Source: Allen et al. (2005); population: Wang (1973).

- *The level of interest rates*, as paid by or used as a shadow price by (urban) households: it is generally accepted that interest rates are good indices of the quality of the institutional framework of an economy, but they are difficult to measure in a standard way. We found a strong correlation between the skill premium and the interest rate, both across time (in Western Europe from 1300 to 1914) and across regions (comparing Western Europe with, for example, Korea, India, and Indonesia) that is consistent with standard human capital theory. The south of China appears to be exceptional in this respect, because interest rates were fairly high there, but the skill premium of construction workers was perhaps even lower than in Western Europe; Japan, where both interest rates and the skill premium probably declined in the (late) eighteenth and nineteenth centuries, does seem to fit the general patterns, however.
- *The efficiency of institutions for the formation of human capital*, and the absence or presence of formal or informal barriers to entry in these professions: a high skill premium indicates that the efficiency of these institutions was not very high and/or that strong barriers to entry existed. The data suggest that skill premiums in Western Europe were not inflated by conservative guilds; on the contrary, it appears that in regions with guilds, the skill premium was lower on average than elsewhere (it is perhaps no coincidence that in China and Japan, too, guilds became increasingly important in the eighteenth and nineteenth centuries).
- *The degree of integration of rural and urban labour markets* (and within the urban sector, of the markets for skilled and unskilled workers): fragmented labour markets tended to result in large skill premiums, and well integrated, efficient markets in low levels in the skill premium.

Thus, a low skill premium reflects the fact that households have access to relatively efficient labour and capital markets, and that institutions for the formation of human capital are working well. A low skill premium also seems to point to relatively high levels of investment in human capital, which according to endogenous growth theory, will result in long-term economic growth. One of the links is possibly that the skill premium of carpenters and masons, because they are the designers and makers of capital goods, affects the relative price of these capital goods. In addition, this link also suggests that a low skill premium will

contribute to economic performance. The differential growth in the economies of early modern Europe appears to confirm this hypothesis: growth after 1450 was especially strong in the North Sea region, where the skill premium was permanently low. But even more striking are the strong correlations between international differences in the skill premium in 1800 and growth in the nineteenth century. Therefore, the skill premium is not only a measure of the quality of the institutional framework of an economy, but also appears to be a predictor of growth in the long run.

## CHAPTER SIX

THE PHILOSOPHERS AND THE REVOLUTION OF  
THE PRINTING PRESS*Introduction*

The price of the skills of common workmen – prescriptive knowledge in Mokyr's terminology – was relatively low in Western Europe in the centuries before the Industrial Revolution. But would it also be possible to measure the price of the knowledge of 'philosophers and men of speculation', of Mokyr's propositional knowledge? And what do we know about the long-term development of literacy, which forms a crucial link between the two elements of the knowledge economy? Economists who model the emergence of the Industrial Revolution have identified the growth and productivity of the sector producing 'theoretical' knowledge as one of the key elements in generating a cumulative process of knowledge creation and human capital formation (Cervelatti and Sunde, 2005). Is it possible to test these ideas and measure the cost and production of this kind of knowledge in a way similar to the one we used for pricing the skills of common workmen?

Chapters 2 and 3 identified key moments in the history of the system of knowledge production in Western Europe: the growth of the monastic movement and the establishment of universities in the high Middle Ages were crucial steps in the developing 'knowledge economy'. In combination with other developments, such as the growing importance of the written word in place of memory as the most reliable sources of information, this sparked a very significant expansion in the demand and supply of propositional knowledge, as can be seen from the growth of book production and consumption during the high Middle Ages.

Here we take up the story of the growth and accumulation of knowledge and try to measure the output and cost of propositional knowledge, focusing on book production. Books and journals, which only started to appear in the seventeenth century, were the most important carriers of knowledge in the period before the Industrial Revolution – besides the scholars who wrote them. As in the previous chapter, where data on the skill premium from different parts of Europe were analyzed in