

The London School of Economics and Political Science

*The organisation of work and wages in the London building
trades in the long eighteenth century*

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the London School of Economics for the degree of Doctor of
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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work. I acknowledge the help of Annette Mackenzie in proofreading.

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I declare that my thesis consists of **76, 553** words.

Judy Stephenson, September 29th, 2015.

Acknowledgements

This thesis was researched and written under some challenging circumstances. In mid-2012, with two small children, about to be a single parent, and in a financially precarious position I hardly looked like a good bet to complete a thesis, let alone make any sort of contribution. In such a situation, sometimes the outcome is as dependent on luck as dedication. I got lucky on a number of counts.

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Abstract

The wage data that economic historians rely on for calculating key economic indicators and living standards across Europe are all derived from records of building craftsmen and labourers' pay. Existing series suggest wages in London were substantially higher than in other European centres from 1650 to 1800, and current accepted theories ascribe Britain's early industrialisation to the products and incentives of this wage structure.

But the period after the Restoration was one of prodigious building in London, and of organisational change in the construction trades. This thesis examines the contractual and organisational context in which building craftsmen and labourers operated and shows that the nature of the 'day rates' used to construct wage series in London and England has been misunderstood. As a result, wages and real wages have been overstated for England throughout the long eighteenth century.

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Introduction.

One of the key arguments in the economic history of Western Europe today is that Britain was a 'high wage' economy in the early modern period. A large body of work from diverse authors that seeks to explain the divergence in economic growth across the globe - and northern and southern Europe - from 1650 onwards accepts Britain's high wages as fact.¹ This fact is built on comparative wage series that primarily use the pay per day of building craftsmen and labourers.²

The level of pay in Britain in the early modern period matters, because one of the most influential and widely accepted explanations for Britain's early industrialisation holds that high wages *caused* industrialisation, because alongside cheap coal they incentivised owners of capital and producers to substitute labour with mechanisation. London's wage earners had a special role to play, as their high wages pulled migrant workers to the city and developed supply chains for increased consumption. London's long history of coal use had advanced the coal industry in Britain.³

But Britain's wages have not always been viewed as high. As Wallis recently noted, economic historians have long held widely diverging beliefs about the nature of labour in Britain.⁴ Until the late 1990s, many theories about Britain's development centred on low

¹ Robert C. Allen, "The Industrial Revolution in Miniature: The Spinning Jenny in Britain, France, and India," *The Journal of Economic History* 69, no. 04 (2009), pp. 715-729; R. C. Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War," *Explorations in Economic History* 38, no. 4 (2001), pp. 411-447; Robert C. Allen, "Engels' Pause: Technical Change, Capital Accumulation, and Inequality in the British Industrial Revolution," *Explorations in Economic History* 46, no. 4 (2009), pp. 901-927; Jan L. Van Zanden, "The Skill Premium and the Great Divergence," *European Review of Economic History* 13, no. 1 (2009), pp. 121-153; Jan L. Van Zanden, "Wages and the Standard of Living in Europe, 1500-1800," *European Review of Economic History* 3, no. 02 (1999), pp. 175-197; S. Broadberry and B. Gupta, "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800," *Economic History Review* 59, no. 1 (2006), pp. 2-31; R. C. Allen, "Why the Industrial Revolution Was British: Commerce, Induced Invention, and the Scientific Revolution," *Economic History Review* 64, no. 2 (2011).

² Agricultural wage series from Robert C. Allen, *Enclosure and the Yeoman* (Oxford: Clarendon Press, 1992). Gregory Clark, "The Long March of History: Farm Wages, Population, and Economic Growth, England 1209-1869" *Economic History Review* 60, no. 1 (2007). pp.97-135. Comparative work for urban centres has been taken from building craftsmen's wages only.

³ John U. Nef, *The Rise of the British Coal Industry* (London: Routledge, 1932). Robert Allen, *The British Industrial Revolution in Global Perspective, New Approaches to Economic and Social History* (Cambridge ; New York: Cambridge University Press, 2009). pp.80-105, 128, 138-145.

⁴ Patrick Wallis, "Labour Markets and Training," in *The Cambridge Economic History of Modern Britain. Volume 1. 1700-1870*, ed. Roderick Floud, Jane Humphries, and Paul Johnson (Cambridge University Press, 2014).pp.178-210.

wages and a flexible labour force.⁵ Moreover, there has been dissent about the interpretation of pre-industrial Britain as characterised by high wages. Methodological, theoretical and historical challenges have questioned how high wages fitted with the large qualitative evidence of low living standards, the relevance of a male breadwinner family, and the mechanism of capital's decision to substitute.

A number of criticisms have been levelled against Allen's argument. Humphries has argued that the high wage account of the industrial revolution relies on a model of a male breadwinner family that does not reflect the structure of household labour or needs in the pre-industrial period.⁶ She provided an alternative account of the incentives for key innovations as not labour saving, but skill saving, where cheap female and child labour facilitated mechanisation and organisational changes.⁷ Humphries viewed the labour market of the eighteenth century as a dual one, incorporating skilled men on the one hand, and unskilled men and women and children on the other. The changes in organisation and workshop production enabled the substitution of the latter for the former.⁸ Essentially, Humphries argues that the wages that Allen used did not produce the living standards he claimed, and that cheap labour was always present in Britain. However, she accepts that skilled wages were probably high.⁹ Margaret Jacobs has pointed out that the cost not of labour, but power – that of coal or horse power – was the cost economised on by business throughout the eighteenth century.¹⁰ McCloskey has summarised many theoretical arguments about the incentives of substitution.¹¹

At the same time, questions about the value of real wages have been raised from other directions. The usefulness of the real wage, based on the same nominal builders' day rate figures, as a basic economic indicator is currently being debated.¹² Broadberry et al, in

⁵ Joel Mokyr, "Dear Labor, Cheap Labor, and the Industrial Revolution," in *Favorites of Fortune : Technology, Growth, and Economic Development since the Industrial Revolution*, ed. Patrice L. R. Higonnet, Henry Rosovsky, and David S. Landes (Cambridge, Mass: Harvard University Press, 1991).pp.177-201

⁶ Jane Humphries, "The Lure of Aggregates and the Pitfalls of the Patriarchal Perspective: A Critique of the High Wage Economy Interpretation of the British Industrial Revolution," *The Economic History Review* 66, no. 3 (2013); pp.696 – 698.

⁷ Ibid, p.709.

⁸ Ibid, p.711.

⁹ Ibid, pp.694, 697.

¹⁰ Margaret C. Jacob, *The First Knowledge Economy : Human Capital and the European Economy, 1750-1850* (Cambridge, UK: Cambridge University Press, 2014).pp. 4 – 6, chapter 2, esp.pp. 61 – 65.

¹¹ Deirdre N. McCloskey, *Bourgeois Dignity : Why Economics Can't Explain the Modern World* (Chicago: University of Chicago Press, 2010) pp. 188 – 9, (quotes Jacobs above) pp.346 – 7.

¹² See Tim Leunig, "Understanding the English Economy 1381–1869: Editor's Introduction," *Explorations in Economic History* 50, no. 1 (2013).pp. 1-3, Stephen Broadberry, Bruce M. S. Campbell, and Bas van Leeuwen, "When Did Britain Industrialise? The Sectoral Distribution of the Labour Force and Labour Productivity in

revising GDP estimates for England in the long run have argued that the use of real wages to determine broader economic trends is flawed, showing the wide gap between the real wage as calculated on building workers, and output.¹³ Indeed, since John Hatcher took apart all the assumptions about wage earning in England in the fifteenth century, there has been an overhanging query about the usefulness and representativeness of the data we have.¹⁴

In the midst of this debate it is often overlooked that there has been no new primary research into London earnings since Jeremy Boulton published a wage series for seventeenth-century London in 1996.¹⁵ In doing so he commented on the “worrying” ... “fragility” of existing data for the early modern period.¹⁶ Donald Woodward’s seminal study of building craftsmen in Northern towns has been absorbed into the synthesised wage series, but his cautions that the employment practices and welfare of labourers and craftsmen were distinct from each other have not been taken up.¹⁷ Moreover, despite an important paper by James Campbell in 2005 suggesting that recorded wages for the building trades at key London sites included substantial profit and mark-up, the series that use such records have not been modified, rather they been used over again to support the story that Britain’s wages were higher than those elsewhere.¹⁸

This thesis presents new evidence of nominal earnings for building workers in London for the period prior to industrialisation, from the Restoration to the 1790s. It shows they were lower than previously thought, and that there was significant variation. It argues, using mostly the records of mason contractors, that the section of the building trades from which wages were extracted were characterised by large firms of contractors who undertook work

Britain, 1381–1851," *Explorations in Economic History* 50, no. 1 (2013).pp.16-27, Gregory Clark, "1381 and the Malthus Delusion," *Explorations in Economic History* 50, no. 1 (2013).pp.4-15.

¹³ Stephen Broadberry et al., *British Economic Growth 1270 -1870* (Cambridge University Press, 2015).pp.247- 265

¹⁴ John Hatcher, "Unreal Wages: Long Run Living Standards and the "Golden Age" of the Fifteenth Century.," in *Commercial Activity, Markets and Entrepreneurs in the Middle Ages: Essays in Honour of Richard Britnell* ed. Ben Dodds and Christian D. Liddy (Boydell Press, 2011).pp.1-24

¹⁵ Two recent additions to wage history both exclude London data. Jane Humphries and Jacob Weisdorf, "The Wages of Women in England, 1260–1850," *The Journal of Economic History* 75, no. 2 (2015).pp. 405-447, Jacob F. Field, "Domestic Service, Gender, and Wages in Rural England, C.1700–1860 1," *Economic History Review* 66, no. 1 (2013).pp. 249-272

¹⁶ Jeremy Boulton, "Wage Labour in Seventeenth-Century London," *Economic History Review* 49, no. 2 (1996).p. 268.

¹⁷ Donald Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750* (Cambridge: Cambridge University Press, 1995).pp.3-4.

¹⁸ James W.P. Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction," in *L'edilizia Prima Della Rivoluzione Industriale. Secc.Xiii-Xviii*, ed. Simonetta Cavaciocchi (Prato: Istituto Internazionale di Storia Economica, 2005).pp.313-346.

from the lowest to the highest degrees of specialisation for a fixed price. The building craftsmen and labourers of extant wage series were employed by them - and they did *not* receive the rates previous historians have recorded. It concludes that the existing nominal wage series for craftsmen and labourers in the building trades are too high by at least twenty per cent in the long run. A figure of almost thirty per cent can be substantiated for some years.

The thesis proceeds and presents evidence in the following manner. The first chapter reviews the sources, methodology, findings and associated literature of existing wage data series for London and England for the period 1650 to 1800 and outlines the argument. Chapter two discusses what is known of the extent and scope of the market for building in London 1650 -1800, gives an exposition of the players within it, and provides biographical and other information about the contractors who were responsible for the vast majority of public works, with a discussion of the sites that wage data sources come from.

Chapter three examines the contracting system under which craftsmen and labourers worked using evidence from both contractors' and institutions records. Chapter four calculates operating margins for contracting firms in the long eighteenth century for the first time. Chapter five takes the concepts of the operating models and margins discussed and begins to look at pay in the context of the skill deployed on actual sites, and the means and characteristics of pay generally on sites in London in the period under discussion, utilising case studies from the Office of The King's Works, Middle Temple, and that of Andrews Jelfe, mason contractor for Westminster Bridge. Chapter six examines the largest project that direct, actual, pay records exist for, based on a contractor's own books; that of William Kempster's for St. Paul's Cathedral. Chapter seven looks at pay in the long run on the biggest maintenance site of the period - London Bridge, and Chapter eight examines the hours and days of work at these sites. Chapter nine summarises the findings, examines the implications for the study of wages in London and England 1650 – 1800, and concludes the thesis.

Chapter 1. The study of London construction workers' earnings in historical perspective.

1.1. A history of London construction worker's wage series in economic history.

This section plots the development of the wage data that has since been used to determine living standards, GDP, and growth rates for early modern England.¹ If wages and prices of the early modern world are, as Van Zanden put it, the “DNA” of the economies of the past, there are two purposes for the construction of nominal and real wage series.² The first is to observe the trends of earnings, income or living standards over time; the second is to be able to compare regions or states and their relative economic circumstances. For example, Van Zanden himself used the differential between the day rates of skilled workers and labourers across many European countries to calculate a skill premium, which he used as a proxy for the institutions of economic development. To be used in this way, the requirements of the components of wage series is that they must be representative of the average wage for a category of skill, and that they must be drawn from similar samples or sources and levels of skill in each region or country.

In England the seminal contribution to historical wages and prices was made by J.E. Thorold Rogers in the late nineteenth century. Rogers sourced the price of goods, commodities, materials, produce and labour across the United Kingdom over six centuries.³ Since the work of Rogers, wages in England have been collected broadly in two categories. Those of rural and agricultural wages have been compiled by William Beveridge, Arthur Bowley, Robert C. Allen, Gregory Clark and Joyce Burnette.⁴ For urban and non-agricultural workers, because the records of large building projects are usually well archived and the skill and activities of builders were assumed to be reasonably uniform across Europe, builders' pay became the proxy for the average workers' earnings for historians writing from

¹ Luis Angeles, "Gdp Per Capita or Real Wages? Making Sense of Conflicting Views on Pre-Industrial Europe," *Explorations in Economic History* 45, no. 2 (2008).pp.147-163

² Van Zanden, "The Skill Premium and the Great Divergence."p.121

³ James Edwin Thorold Rogers, *A History of Agriculture and Prices in England: 1259-1793* (Oxford: 1866).

⁴ William Henry Beveridge, *Prices and Wages in England : From the Twelfth to the Nineteenth Century* , Volume 1., 1st ed. (London: Cass, 1965); William Beveridge, "Wages in the Winchester Manors," *The Economic History Review* 7, no. 1 (1936).pp.22-43,A. L. Bowley, *Wages in the United Kingdom in the Nineteenth Century : Notes for the Use of Students of Social and Economic Questions* (Cambridge: Cambridge University Press, 1900). Allen, *Enclosure and the Yeoman*; Clark, "The Long March of History: Farm Wages, Population, and Economic Growth, England 1209–1869 "; Joyce Burnette, *Gender, Work and Wages in Industrial Revolution Britain, Cambridge Studies in Economic History* (Cambridge ; New York: Cambridge University Press, 2008).

the late nineteenth century onwards.

Rogers' data for the building trades in Southern England came from the colleges of Oxford and Cambridge. Rogers had few London sources. He presented his data in commodity sections, as nominal figures. No attempt was made to standardise measures.

It was not until the work of Arthur Bowley at the end of the nineteenth century that the data was analysed to examine the trends and changes in earning rates over time. Bowley extolled the rich implications of the law of one price, or in this case, wage:

...in spite of this apparent want of connection between the wages of one class of men and another there are very distinct causes which make the following law hold: - at the same time and in the same place the wages for equal effort of men of the same capacity are equal to one another ; or more generally, the wages throughout the country of equal degrees of skill are equal at any given time. If this is so we shall find it useful to watch the change of the rate paid for a certain degree of skill even though the number of persons paid at this wage may be a very small proportion of the total number doing similar work.⁵

Bowley's data for the nineteenth century utilised data from agriculture, printing, shipyards and the navy, textile, mining and iron industries, with a special study of building trades.⁶ From 1770 he took rates from Rogers, building price books and the McCulloch Trade Directory (which reported Greenwich Hospital price rates), for London.⁷ However, his major contribution was probably his considerations on methodology. He said that the most natural method would be to calculate the total paid in wages and divide by the number workers. However, given that this data was not readily available, he advocated two simpler methods. Firstly, he suggested using modal wages, the observation of the most common or prevailing wage rate. Secondly, he proposed the calculation of the wage of a median worker. Both methods assume that the distribution of wages is in a regular or standard distribution. Bowley considered that building craftsmen - bricklayers, masons, and carpenters - and their labourers would be a good and representative trade for wage observation because the

⁵ Bowley, *Wages in the United Kingdom in the Nineteenth Century : Notes for the Use of Students of Social and Economic Questions*. Section III, esp. p.18. Section XII.

⁶ Ibid. Section IV, VIII, XI, XII, XIV, XVI,

⁷ Ibid. Section XII, and A. L. Bowley, "The Statistics of Wages in the United Kingdom During the Last Hundred Years. (Part Viii.) Wages in the Building Trades," *Journal of the Royal Statistical Society* 64, no. 1 (1901).pp.102-112.

technological basis for the trade had not changed in the early modern period.⁸ After some empirical testing of existing data taken from the likes of Eden's 'State of the Poor' and McCulloch's statistics, Bowley decided that the rate of change of pay in the building trades, specifically bricklaying as the most representative, would 'serve as an indication' of rates of change elsewhere, based on a consideration that there had been no technological change to the business of bricklaying over the centuries.⁹

Since Bowley, historians have consistently used builders for providing the average, representative, urban, skilled manual trade throughout the ages. Twentieth-century economic historians, especially Phelps Brown and Hopkins, confirmed the role of builders in giving us the prices and wages of the past. Even though historians have since thrown doubt on the historical validity of the law of one wage,¹⁰ it is acknowledged that builders are not a "perfect" representation of the median wage,¹¹ and that the quirks of the building industry and the fortunes of construction affect relative wages, building day rates continue to be assumed to be comparable and representative,¹² largely because it is widely believed that there were few skill or technological changes in the industry.¹³

1.2. Compiled series.

Since Bowley's study was produced, there have been two types of series published on taken wages: original compiled nominal wage data taken from archival sources, and calculated real wage series. Despite the reach and influence of the latter, there are a surprisingly small number of the former. For London in the eighteenth century, only four series of nominal

⁸ Bowley, *Wages in the United Kingdom in the Nineteenth Century : Notes for the Use of Students of Social and Economic Questions*. page 58 – 59, Frederick Morton. Eden, *The State of the Poor* (Cambridge University Press, 2011); J. R. McCulloch, *A Dictionary, Practical, Theoretical and Historical of Commerce and Commercial Navigation, 1789-1864* (London: Longmans, 1880).

⁹ Bowley, *Wages in the United Kingdom in the Nineteenth Century : Notes for the Use of Students of Social and Economic Questions*. pp. 59 – 63. He cautioned that the rates in building trades had been steady where other trades rising in 1877 – 91, but still felt that bricklayers and other building trades were indicative in the long run, p.63.

¹⁰ Woodward, *Men at Work*, p. 3. Labour market frictions and non-competing groups were directly addressed by Peter H. Lindert and J.G Williamson, "The Structure of Pay in Britain," *Research in Economic History* VII (1982). pp. 1-54.

¹¹ Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." p. 414, Van Zanden, "Wages and the Standard of Living in Europe, 1500–1800." p.175. Peter H. Lindert and Jeffrey G. Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look," *The Economic History Review* 36, no. 1 (1983). pp.1-25

¹² Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." p.414.

¹³ Van Zanden, "The Skill Premium and the Great Divergence." p.122.

wages have been produced: those of B.L Hutchins, Elizabeth Gilboy, Leonard Schwarz and Jeremy Boulton.¹⁴ Hutchins' figures have never been widely used, although they were from the Office of the King's Works. The other three have been used by multiple authors and they form the bulk of the series constructed for international comparison that was formed by Robert Allen in 2001 and that constructed by Greg Clark in 2005.¹⁵ The series for London for the period prior to 1609 comes from Steve Rappaport.¹⁶

The main sources and chronological coverage of the three best known, and used archival based series created for London 1650 -1800 are illustrated in Figure 1.1. They are all studies of building craftsmen and labourers in London. Schwarz's sources replicate one part of Gilboy's. Boulton's data provides the only sources on earning between 1650 and 1721. All subsequent authors draw on these data.

How these sources were used by authors since is as follows: Allen in his 2001 comparative wage study used Schwarz, Boulton, and Gilboy for London.¹⁷ For South East England, he used Phelps Brown and Hopkins.¹⁸ Phelps Brown and Hopkins in their seminal 1955 examination of wages had used Gilboy and data from Thorold Rogers, published in 1866. In fact, Rogers did not have significant amounts of London data. A few years later, Deane & Cole's 'British Economic Growth' also used Gilboy.¹⁹ Other more recent studies have used the same sources. Van Zanden's papers on wages and skill use wages taken from John Chartres 1986 study on living standards, which is in turn a moving average of Gilboy's 1934

¹⁴ B. L. Hutchins, "Notes Towards the History of London Wages," *The Economic Journal* 9, no. 36 (1899).pp.599-605, B. L. Hutchins, "Notes Towards the History of London Wages," *The Economic Journal* 10, no. 37 (1900).pp.103-104, Elizabeth Gilboy, *Wages in Eighteenth Century England* (Cambridge: Harvard University Press, 1934). L. D. Schwarz, "The Standard of Living in the Long Run: London, 1700-1860," *The Economic History Review* 38, no. 1 (1985).pp.23-41, Boulton, "Wage Labour in Seventeenth-Century London."

¹⁵ Gregory Clark, "The Condition of the Working Class in England, 1209-2004," *Journal of Political Economy* 113, no. 6 (2005).pp.1307-1340, Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." Data set for this available at R.C. Allen, "Prices and Wages in London & Southern England, 1259-1914," in *Consumer price indices, nominal/real wages and welfare ratios of building craftsmen and labourers, 1260-1913* (International Institute of Social History, 2013).
<http://www.iisg.nl/hpw/data.php#europe>.

¹⁶ Steve Lee Rappaport, *Worlds within Worlds : The Structures of Life in Sixteenth-Century London*, *Cambridge Studies in Population, Economy, and Society in Past Time* (Cambridge: Cambridge University Press, 1988).

¹⁷ Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." Appendix 1, p.345.

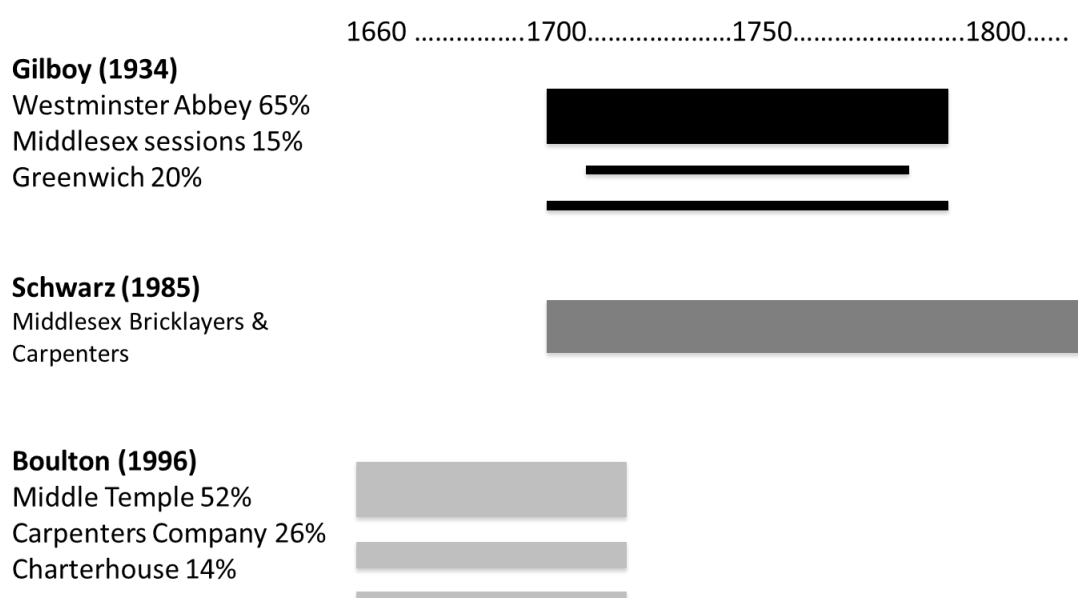
¹⁸ E. H. Phelps Brown and Sheila V. Hopkins, "Seven Centuries of Building Wages," *Economica* 22, no. 87 (1955).pp.195-206.

¹⁹ Phyllis Deane, *British Economic Growth, 1688-1959 : Trends and Structure*, ed. W. A. Cole (Cambridge: Cambridge : Cambridge University Press, 1962).

data.²⁰ Broadberry & Gupta's 2006 article comparing wage levels between England and Asia used Gilboy as well as Allen's 2001 revision of Gilboy's material.²¹ Botham & Hunt's 1987 paper on wages used Gilboy, while referring briefly to Schwarz, as did Feinstein in his 1998 paper on living standards.²² Lindert & Williamson's earlier 1983 work on living standards also used Gilboy.

The dominance of these three wage series, and particularly that created by Elizabeth Gilboy, is clear. However, what were the sources and methodology that lay behind the generation of these original data series?

Figure 1.1. Summary of eighteenth century London compiled wage data.



Sources: (Boulton 1996, Gilboy 1934, Schwarz 1985)

²⁰Van Zanden, "Wages and the Standard of Living in Europe, 1500–1800." J.Chartres, 'Food consumption and Internal Trade' in A. L. Beier and Roger Finlay, *London 1500-1700 : The Making of the Metropolis* (London: Longman, 1986). pp.168-195

²¹ Broadberry and Gupta, "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800."p.12

²² Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain During and after the Industrial Revolution," *The Journal of Economic History* 58, no. 3 (1998).pp.625-658F. W. Botham and E. H. Hunt, "Wages in Britain During the Industrial Revolution," *The Economic History Review* 40, no. 3 (1987).pp.380-399

1.3. Gilboy's sources, methodology, and findings.

Elizabeth Gilboy was a Harvard economist. She is known for developing a theoretical and historical perspective on demand and consumption as causal factors in economic growth.²³ In 1930 she came to England to research her study of 'Wages in England in the Eighteenth-century' for her doctoral studies. She toured the whole country and gathered data for building craftsmen and labourers. Her London sources were Westminster Abbey, Greenwich Hospital, and the Middlesex and Surrey Sessions, and from those sources her data was taken from account books and bills. From these she took day rates for craftsmen and labourers in all the building trades in London from 1700 to 1787. Her published data showed a very high degree of uniformity in the wage figures presented.²⁴ She noted that "the stability of wage rates over a considerable number of years was shown by the figures for any one place throughout the century, and consequently the lack of continuity does not invalidate the course of the rates"²⁵. Interpolating data based on the previous year Gilboy calculated the mean "a simple arithmetic average" of the figures she found for each year and in some cases the mode.²⁶ The number of samples observed in any given year ranged from 1 to 30.²⁷ Given the uniformity of rates recorded, the methodology probably did not add any serious bias to the series.

She noted that the course of wages for labourers was a gradual increase to 1734 and then a stable position.²⁸ Craft wages did not rise at this time but varied before 1734. She wrote about craftsmen as a cohesive group and the wage rates as something they received from the market, for instance:

paviours .. rates increased to 3s.4d. in 1763. The plumbers got 2s, 6d from 1700 to 1707 without a break. The bricklayer's rates rose more sharply on the whole.

²³Elizabeth Gilboy, "The Propensity to Consume," *Quarterly Journal of Economics* Vol. 53, no. No 1 (1938).pp.120-140, Elizabeth Gilboy, "Demand as a Factor in the Industrial Revolution," in *Facts and Factors in Economic History. Articles by Former Students of Edwin Frances Gray* (Cambridge, Mass: Harvard University Press, 1932).

²⁴ Gilboy, *Wages in Eighteenth Century England*.p.8.

²⁵ Ibid.p.250. also see note p.13 "There can be little error in the assumption that the rates remained the same when the data are missing. The stability of the rates is evident from the Abbey figures."

²⁶ Ibid. p.13

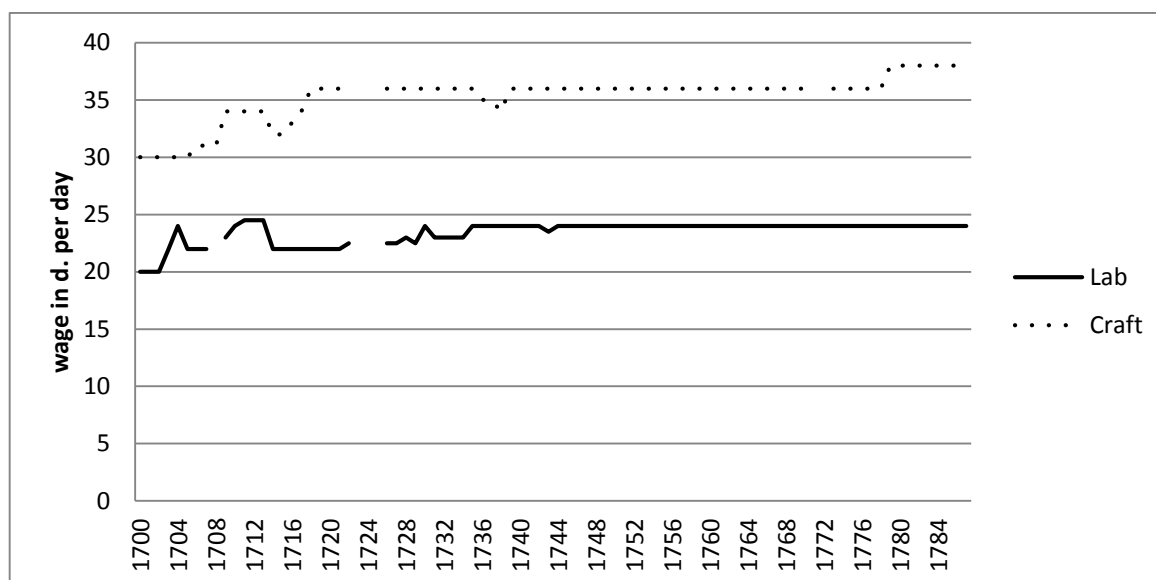
²⁷ Ibid. p.251

²⁸ Ibid. p.9

Although there was a sharp temporary increase to 3s. in 1704 the rate dropped back to 2s.8d. in 1706, and then went permanently up to 3s. in 1718.²⁹

Gilboy's sources give her data a very large bias to projects designed and managed by Sir Christopher Wren; these were large, fine, stone-built, publicly-funded projects, with a high degree of specialist skill such as stone carving. Given this, it is hardly surprising that the wages she found look comparably high when set against other series. She found a craftsman's rate of 3s. a day from 1718 to 1776, as can be seen in Figure 1.2.

Figure 1.2. Gilboy's wage series for London 1700 – 87.



Source:(Gilboy 1934)

Gilboy was clear that the wage series that she reported was for journeymen's wages, yet she did not discuss levels of skill fully, declaring that the issue could not be worked out through the account books themselves.³⁰ Her appendix, however, did list craftsmen's and labourers' day rates by trades. The series showed that a prevailing rate of 36d. a day for craftsmen in 1720 declined somewhat in the late 1730s, but returned to previous levels and remained broadly constant until 1778. Gilboy reported a 24d. per day rate for labourers from 1736 to the end of her series in 1787.

²⁹ Ibid. p.9

³⁰ Gilboy, *Wages in Eighteenth Century England*.pp. 15 – 17.

1.4. Schwarz's sources, methodology, and findings.

Leonard Schwarz, known for his research on all aspects of work in London in the eighteenth century, published a new series in 1985. He raised the question of representativeness of builders again, but reassured his readers that not only did Lindert & Williamson find them to be so, but Campbell's *London Tradesmen* also put them in an average position.³¹ The discussion accompanying the series stated that the movement of wages in this period should be related to that of other large cities.³² Schwarz used bricklayers' and carpenters' bills retained in the Middlesex Sessions Papers as his source. No specific bills or sites or names were given by him with the data. Nor did he give the number of observations. He did not state whether his figures were means, medians or modes but the text suggests that they may have been modes.³³ He found that London rates differed from Greenwich ones sometimes.³⁴

Schwarz's series was sometimes more than 10 per cent lower than Gilboy's series. I have represented it here by calculating a mean average of the two bricklayers' and carpenters' rates Schwarz gives, see Figure 1.3. He found a 9.5 per cent decrease in bricklayer's real wage from 1750 to 60, and a 14.2 per cent decrease from 1760 – 70. Much of his attention in the analysis is given over to the difference between the price series of Phelps Brown and Hopkins and Lindert & Williamson.³⁵ He also rehearsed Woodward's argument about income from allotments and other employment.³⁶ Schwarz's series also show a rapid increase in the nominal wage after 1792. Overall, like Gilboy, Schwarz observed stability or stagnation in wage rates over the long term, with no meaningful increase in day rates between 1736 and the late 1770s. From 1700 to the late 1780s he showed an overall increase of roughly twenty per cent for craft and labour.

³¹ Schwarz, "The Standard of Living in the Long Run: London, 1700-1860." p.26-27 citing Lindert and Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look."

³² Schwarz, "The Standard of Living in the Long Run: London, 1700-1860." p.25

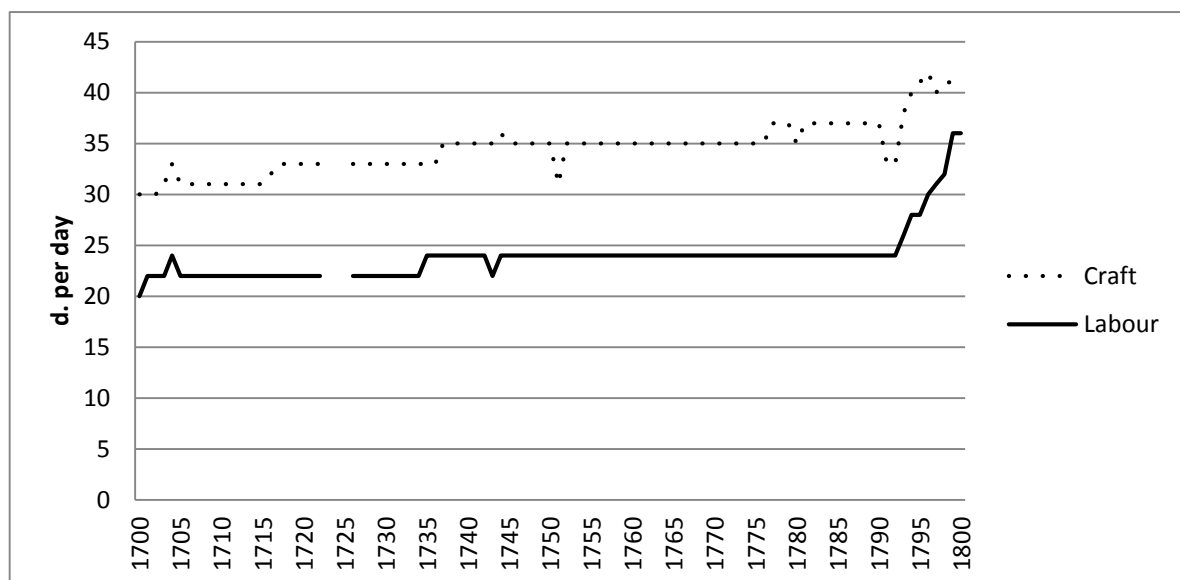
³³ Ibid. page 26, "the relatively small number of bills..." The source is just given as MJ/SP. I surmise they are modal figures from the following – which is all that is given on methodology; "Even for the years before 1820 bills could not always be found, necessitating careful judgement when filling the gaps. Figures for these years have been interpolated, using previous trends and builders' price books as a basis for estimation and are incorporated in the series presented".

³⁴ Schwarz, "The Standard of Living in the Long Run: London, 1700-1860." page 26

³⁵ Ibid. page, 27 citing Lindert and Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look."; Brown and Hopkins, "Seven Centuries of Building Wages."

³⁶ Ibid, page 33. Donald Woodward, "Wage Rates and Living Standards in Pre Industrial England," *Past & Present* No 91 (1981).

Figure 1.3. Schwarz's Craft and Labour wage series for London 1700 - 1800



Source:(Schwarz 1985)

1.5. Boulton's sources, methodology, and findings.

Published in 1996, Jeremy Boulton's series for craftsmen's wages between 1609 and 1721 in London was wholly explicit about methodology, while the sources (bills again) were far more wide ranging than either Gilboy or Schwarz had used. Boulton drew on material from the Middle Temple, the Carpenters', Stationers', Tallowchandlers', Drapers', Grocers', Bakers' and Cooper's Companies' warden's accounts, as well as from Charterhouse, St Thomas's Hospital, and St Martin in the Fields. The bulk of his data was from Middle Temple.

Boulton is the only scholar to have acknowledged the significant variation in rates. He included scatter diagrams to show that there was a wide range of wages. His methodological approach was to use the modal rate for each year:

“The approach adopted here has been to eliminate, as far as possible, subjective judgement as to the prevailing rate and for every year, where possible, the modal rate has been selected as the wage prevailing in any one year. Such a treatment has the

advantage that stability is not built into the system (the result of selecting a 'prevailing' rate), but is clearly still at the mercy of the distribution of rates encountered in the manuscript material, of skill and status differences within crafts, and of changing rates between summer and winter."³⁷

He excluded from his series rates for those labelled as apprentices, journeymen, workmen, lads, and boys. For this reason Boulton's series could be seen as a proxy for master's rates. In the 1640s the range of day rates was from 14d. to 36d. per day for labourers, and from 15d. to 35d. for craftsmen, In the 1700s the range was from 12d. to 26d. for labourers and 30d. to 36d. for craftsmen. Boulton's data showed a narrowing of the range for both labour and crafts in the 1700s and 1710s. Figures 2, and 3 in his paper shows that the modal figures also have significant variability compared to the stability seen in Gilboy and Schwarz's data.³⁸ His series also shows a narrowing of the skill premium, the difference between labourers and craftsmen wages, between the 1690s and the mid-1710s.

Boulton cautioned against using the series as proxy for income in many ways. He showed that masters earned not only their day rate, but their apprentice's pay and a mark up on materials.³⁹ He cited a carpenter's bill that showed a mark-up being taken on labourers pay.⁴⁰ He also speculated that perquisites increased the take home income of some men.⁴¹ Boulton warned that institutional rates might be lower than the bills for private work that he collected.⁴² Despite these comments, it is the day rates that Boulton recorded that have made their way into the real wage calculations of subsequent historians.

³⁷ Boulton, "Wage Labour in Seventeenth-Century London." p. 275.

³⁸ Ibid. pp.277-8.

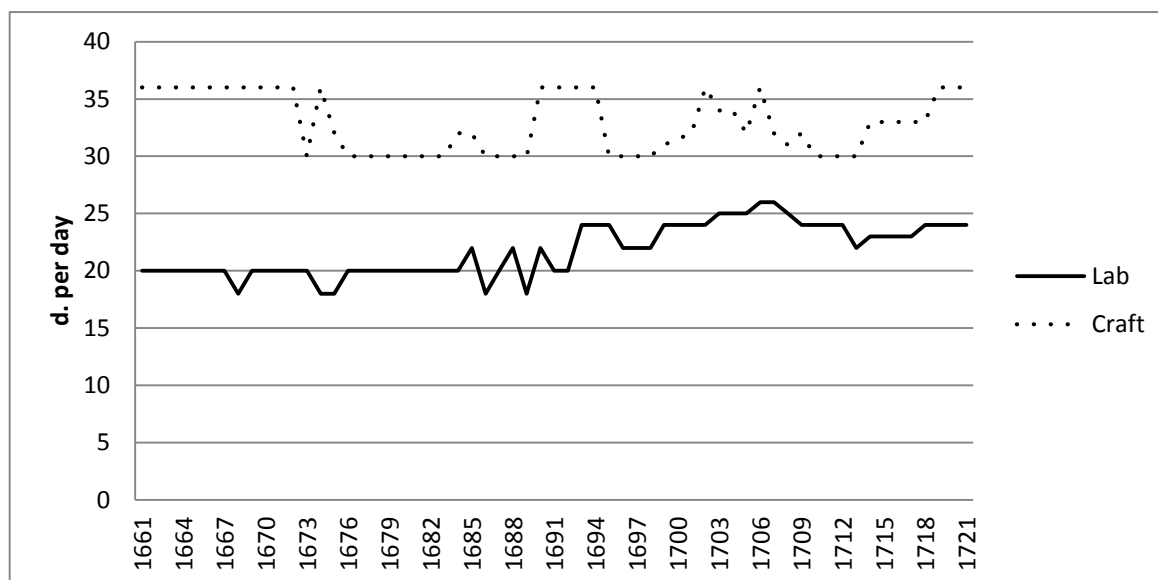
³⁹ Ibid. p. 271.

⁴⁰ Ibid. p. 271, note 23.

⁴¹ Ibid. p. 271.

⁴² Ibid. p.274 274.

Figure 1.4. Boulton's wage series for London 1661- 1721



Source: (Boulton 1996)

1.6. Associated series: Rappaport's sources, methodology and findings.

The data for London for the period immediately prior to the Restoration, and prior to the start of Boulton's data series, comes largely from Steve Rappaport's real wage and price series for the period 1490 – 1609. Rappaport's data was extracted from London livery companies' bills and books. He showed a decline in real wages over the sixteenth century of over thirty per cent. The decrease is less than that found by Phelps Brown Hopkins, and Rappaport maintains that living standards did not decline by anything like as much as a third due to increased family income, and effective substitution.⁴³

In terms of nominal wages, Rappaport found a doubling of day rates from the mid-1540s to the mid-1570s and afterwards another twenty five per cent increase at the end of the century to 1609. However, the failure of builders' wages to keep up with price inflation is a phenomenon that has been seen elsewhere. Blonde and Hanus showed that not just income,

⁴³ Rappaport, *Worlds within Worlds : The Structures of Life in Sixteenth-Century London*. pp.123 – 161
Rappaport only provided nominal data in index form.

but the relative status of building craftsmen declined in the sixteenth century in the Low Countries.⁴⁴ Rappaport also found an oversupply of skill, and unemployment in London throughout the Tudor period.⁴⁵

Rappaport's methodological approach and analysis had two distinctive elements. Firstly Rappaport's sources were for skilled and semi-skilled craftsmen, not unskilled men. His unskilled series included assistants and servants and only "sometimes" labourers.⁴⁶ He noted, "It would be incorrect to infer from the accounts that semi-skilled and unskilled workers were paid the same wage".⁴⁷ But unskilled wages were not collected. Due to this approach it is highly likely that Rappaport's median wages for semi-skilled workers are higher than wages would have been for 'labourers'. Nonetheless, in the series constructed by Allen in 2001, the semi-skilled rates are treated as labourers' wages.⁴⁸ Rappaport found that some men were given food and drink as well as a money wage, but it is not frequent enough for his series to include it.⁴⁹

Rappaport noted that variation in wages presents a challenge to a representative series, but in his series "with the exception of a few years ... when fractional wages were used in the series to express what clearly was a gradual increase from one level of wages to the next, median wages were used in most years."⁵⁰ Since the highest and lowest wages "differ by little more than pence" an arithmetic mean would probably not be very different.⁵¹

1.7. Outside of London: Northern England.

Outside of London, Donald Woodward produced the widest ranging study of craftsmen and labouring men in England, examining a series of Northern towns over the 300 years to 1750. The bulk of his data is from the sixteenth and seventeenth centuries.

⁴⁴ Bruno Blonde and Jord Hanus, "Beyond Building Craftsmen. Economic Growth and Living Standards in the Sixteenth-Century Low Countries: The Case of 'S-Hertogenbosch (1500–1560)," *European Review of Economic History* 14, no. 02 (2010).pp.179-207

⁴⁵ Rappaport, *Worlds within Worlds : The Structures of Life in Sixteenth-Century London*.p.110

⁴⁶ Ibid.p.128

⁴⁷ Ibid.p.128

⁴⁸ Allen, "Prices and Wages in London & Southern England, 1259-1914."

<http://www.iisg.nl/hpw/data.php#europe>

⁴⁹ Rappaport, *Worlds within Worlds : The Structures of Life in Sixteenth-Century London*.p.129.

⁵⁰ Ibid. p.129

⁵¹ Ibid. p.129

Woodward's taxonomy of skill is utterly different to Rappaport's, as he treated labourers as a standalone group with their own work, as well as that of acting as auxiliaries to craftsmen on building sites.⁵² The implication of this categorisation should provide some challenge to the skill premium; if the market for labourers and the market for craftsmen are sometimes different markets then the premium for skill will not be directly attributable to the market in which they both operate. Woodward showed large variations in wages and day rates in the towns he studied. However, Woodward's observation about labour markets, and his previous point, that building craftsmen's total wages or income could not be determined by day rates alone, were largely ignored by those who construct the long term series, and indeed is not taken into account in the Van Zanden thesis.⁵³

1.8. Outside of London: Southern England.

Of all English wage series it is the building wage series for England outside of London that has the weakest empirical basis. It was constructed by Phelps Brown and Hopkins in 1955. They describe sources as follows:

“Until 1700 we have depended on Thorold Rogers. He drew chiefly on the college and estate accounts in the muniment rooms of some of the Oxford and Cambridge colleges, and the farm bailiffs' rolls and monastic accounts in the Public Record Office. Of his builders' wages, some 40 or 50 per cent come from Oxford itself, down to 1620; the other main region of origin is the southern counties, of which fourteen provide entries, the most represented being Bucks, Hants, Sussex, and Kent. Cambridge contributes substantially throughout, and when the entries from Oxford fall off after 1620 it is Cambridge, and Eton, that take up the running. For the most part, the entries for craftsmen come at the rate of fifteen or more a year; but except for 1580-1620, those for building labourers are much fewer-more like three a year. There is a great falling off in entries of all kinds after 1660.” ...⁵⁴

“From 1700 we could look ahead to the 1890s, when the wage reports of the Board of Trade begin. Our guides through the years between are Dr. Elizabeth Gilboy and

⁵² Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*.p.3, and Introduction generally. chapter 4 describes the work of labourers outside of the building industry pp.116-167.

⁵³ Van Zanden, "The Skill Premium and the Great Divergence."

⁵⁴ Brown and Hopkins, "Seven Centuries of Building Wages."pp.196-7.

Sir Arthur Bowley: but Dr. Gilboy's entries from Oxford are not continuous, and fade out in the 1770s, and in the nineteenth century Bowley's best series is for London.

Dr. Gilboy, however, has a long run for Maidstone, and we know that the Maidstone rates were the same as the Oxford rates in the first half of the eighteenth century and again in the 1890s: so we took the Maidstone series as representative of Oxford from the 1730s till it ends with the century.”⁵⁵

In other words, Phelps Brown and Hopkins' wage rates for South East England in the eighteenth century come from an interpolated series of Maidstone and Oxford day rates recorded by Elizabeth Gilboy. Gilboy placed Maidstone in the 'London metropolitan area', but Oxford without. It should be noted that the Maidstone wage Figures were taken from the 'Kent session rolls', and were ten per cent higher than those recorded for Oxford for many of the years.⁵⁶

1.9. Comparison of the series' findings: biases and differences.

As the three original data sets are frequently used together to form long run series are they really comparable? What are the possible biases in each? One of the concerns that Phelps Brown and Hopkins had about Rogers's figures was that he had always selected the highest or summer rates. But none of these three series give seasonal variations, so any upward bias on that basis in these series is not a risk.⁵⁷ There are, however, other important biases, anomalies and problems of representation that the respective sources and methodologies give the series.

First of all, the skill levels for different groups of craftsmen are *not* consistent between these series. This is a particular issue for 'labourers'. Rappaport recorded the wages of those he described as being semi-skilled, labourers who were assisting craftsmen. But Boulton and Gilboy both recorded labourers *and* labourers assisting craftsmen. Schwarz only recorded the wages of bricklayer's labourers, so his figures are probably comparable to Rappaport's data. It is clear that the level of skill of those referred to under the category of 'labourers' is highly variable. Yet those who derive real wage series from the data use the term

⁵⁵ Ibid. p.200

⁵⁶ Gilboy, *Wages in Eighteenth Century England*.p.55 and Appendix II Table V and Table VII.

⁵⁷ Brown and Hopkins, "Seven Centuries of Building Wages."pp.196-7

‘unskilled’.⁵⁸ This matters when it comes to the representativeness of figures, and it matters for comparison, and it matters for the use of the data in living standards calculations. Robert Allen uses the wages of ‘labourers’ to claim that in the core, high wage cities of north western Europe including London, even unskilled workers earned enough to afford a ‘respectability basket’ standard of living.⁵⁹ If such labourers were *semi-skilled* as Rappaport says, then this use of the data gives a misleading picture of the living standards of working Londoners.

In terms of comparison, by way of example, the wages in Allen’s ‘Amsterdam’ datasets are for ‘on-ge-school’ or unskilled wages, and it is not readily clear what the comparable skill level in England might be.⁶⁰ Similar concerns apply to craftsmen’s wages. If we extend the comparison with the Netherlands, craftsmen’s wages for Amsterdam for the same period came from de Vries and Van der Woude’s 1978 studies, and they are mostly for building craftsmen working at wharves and shipyards all over the Dutch republic; they were not like Gilboy’s subjects, who were working on carved stone on important architectural monuments right in the centre of the nation’s biggest city.⁶¹ Boulton recorded only the day rates of craftsmen and he excluded journeymen. Gilboy understood herself to have recorded journeymen. Schwarz did not elucidate on the matter of skill level but just gave two categories, craft and labour. Gilboy’s data was hugely biased to highly skilled prestigious projects, whilst Schwarz’s data will probably have captured more everyday kinds of workmanship, which may explain the slightly lower rates that he found.

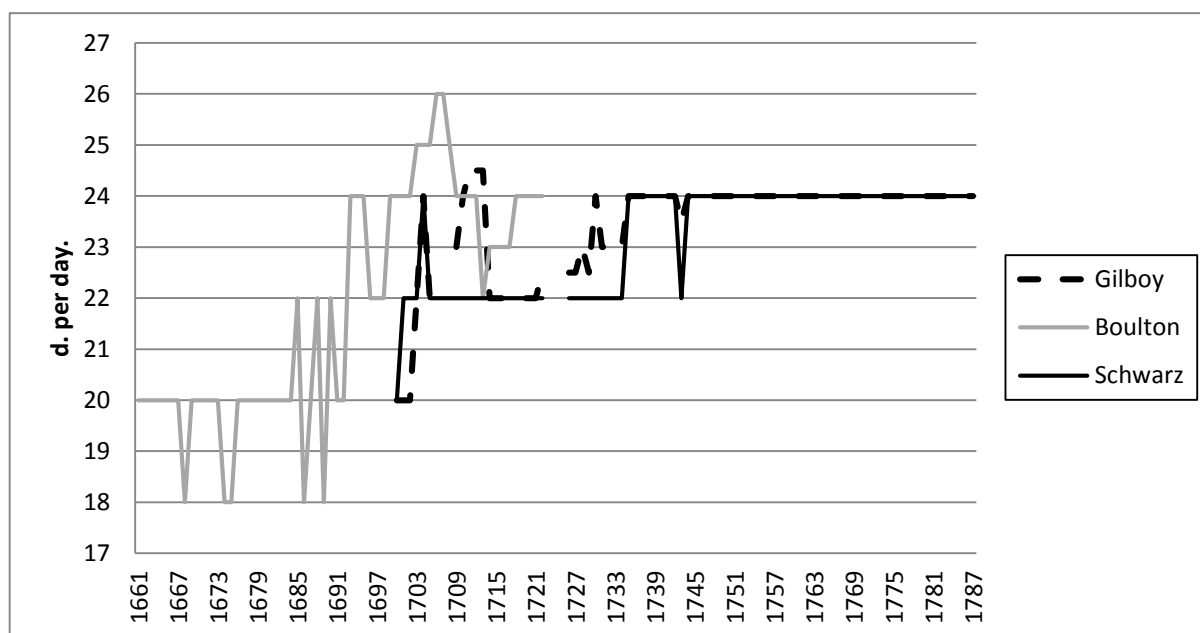
⁵⁸ Lindert and Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look." p.17, Allen, "Why the Industrial Revolution Was British: Commerce, Induced Invention, and the Scientific Revolution." p. 363, Allen, *The British Industrial Revolution in Global Perspective*.pp. 44- 45

⁵⁹ Allen, *The British Industrial Revolution in Global Perspective*.p.45.

⁶⁰ Allen, "Prices and Wages in London & Southern England, 1259-1914." notes 4,5. Jan de Vries, "An Inquiry into the Behaviour of Wages in the Dutch Republic," *Acta historiae neerlandicae* Volume 10. Leiden, 1978. (1978).pp.79-93.

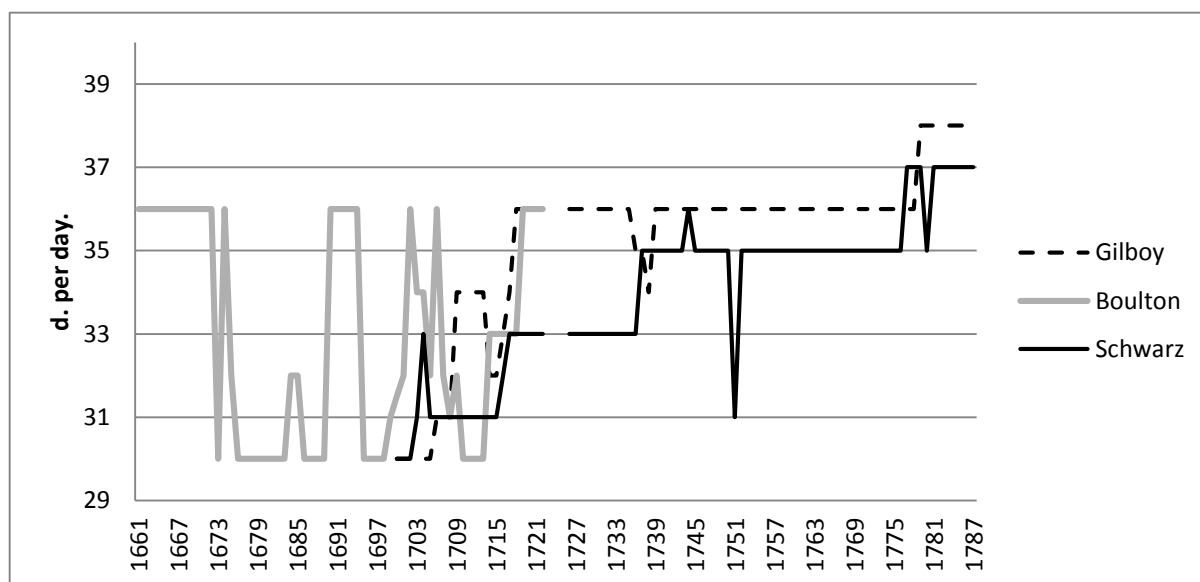
⁶¹ de Vries, "An Inquiry into the Behaviour of Wages in the Dutch Republic."pp.79-93.H. Van der Wee, " Prices and Wages as Development Variables " *Acta historiae neerlandicae* 10 (1978).pp58-78, later compiled in Jan de Vries and A. M. van der Woude, "The First Modern Economy Success, Failure, and Perseverance of the Dutch Economy 1500 -1815," (Cambridge: Cambridge University Press, 1997).pp.607-664

Figure 1.5. Comparison of three series, labour d. per day.



Sources: (Boulton 1996, Gilboy 1934, Schwarz 1985) as per text.

Figure 1.6. Comparison of three series, craftsmen d. per day.



Sources: (Boulton 1996, Gilboy 1934, Schwarz 1985) as per text.

The second area for concern is that of how movement in rates has been interpreted. As intimated above some of Gilboy's narrative implies that any increase in nominal amounts recorded represents a raise in wage rates generally, (although, in other parts of her text the influence of contracts in holding rates down is discussed).⁶² The whole premise for Schwarz's series was that market rates in large cities were related.⁶³ Boulton asserted the need for better wage rates in order to understand supply and demand in the labour market too. Generally the assumptions that have underpinned the collection of rates have been that the rates represent expansion and contraction in the labour market.

However only Boulton and Gilboy provided a view of the underlying data, and it differs substantially. Gilboy's data is highly uniform; her series show the same exact figures year after year.⁶⁴ Boulton shows large variance in rates recorded every year.⁶⁵ Due to the variance in Boulton's data and the lack of a trend it cannot be ruled out that rate movements represent payments for different levels of skill, rather than different market rates for the same work, in the earlier period. By choosing modes for each year the rates may have been biased by a particular level of skill being more contracted for than others, just as the greater uniformity in rates recorded by Gilboy and Schwarz could be a product of their narrower source base.

If one of the purposes of wage series is to observe *trends* in those market rates, the overall picture of turning points is somewhat confused for the period. Only Boulton has any meaningful data for the late seventeenth century, which shows a general trend upwards for labourer's day rates, but craftsmen's rates fluctuating between 30d. and 36d. a day for the same period, (Figures 1.1.e and f). Gilboy and Schwarz both show some similar fluctuations in the early 1700s, Gilboy notes a general increase from 1718, and a marked stability in rates from the mid-1730s, and a marked increase for craftsmen from the 1770s.⁶⁶

So the third issue that must be recognised when dealing with these series is that of their representativeness. The series are all a product of the day rates found in bills to large institutions in London. There are very few private sources.⁶⁷ There is no allowance for

⁶² Gilboy, *Wages in Eighteenth Century England*. pp.9-12, 46, also underlined in the discussion in Brown and Hopkins, "Seven Centuries of Building Wages." "when the labour market was settled" and "rates moved".p.196

⁶³ Schwarz, "The Standard of Living in the Long Run: London, 1700-1860."pp.24-27

⁶⁴ Gilboy, *Wages in Eighteenth Century England*.pp. 254-261.

⁶⁵ Boulton, "Wage Labour in Seventeenth-Century London."pp.277-8

⁶⁶ Gilboy, *Wages in Eighteenth Century England*. pp.11-13

⁶⁷ Boulton's is the only to possibly have some private work within, but his largest source is Middle Temple.

varying rates of skill that underlie the figures. Blondé and Hanus recently published some strong empirical evidence showing that the status and income of building craftsmen declined compared to other groups in the Low Countries in the sixteenth century.⁶⁸ It would be very easy to put this alongside various literature from architectural historians who claim that artisan masons, carpenters and bricklayers lost agency and income as the construction industry moved to architect-led design and project management, to argue that a similar trajectory was experienced in England.⁶⁹ The data sources used in s-Hertogenbosch are not replicable in England anywhere, so this remains a thesis that cannot be quantitatively proved.

Finally, serious uncertainties persist about how to convert day rates into weekly or annual earnings. In today's world, contemporary statisticians use average weekly earnings as nominal earnings.⁷⁰ The most obvious commonality between all the original data series examined here is that they use day rates as a proxy for earnings. Many authors have commented on the problem of using these due to the difficulty of knowing numbers of days worked. Obviously, if skill rather than market forces explain some of the variation in rates then there is a big problem with comparability, but there also exists the further possibility that some persons may have worked at different wage levels during a year. Due to the lack of any other data the problems of a day rate have been glossed over with the observation that there has been consensus about pre 1800 wage rates.⁷¹

Figures 1.7-1.12. show how the three series described above relate to the long run data which Allen has compiled for London as part of his international comparison. Allen's fifty year moving average understates, if anything, the day rates of building craftsmen recorded in the original archival series. Despite this Allen used the series to show that English labour was more expensive than that anywhere else, and he advanced a factor price theory about why industrialization happened in England first based on these 'high wages'.⁷² Converting

⁶⁸ Blonde and Hanus, "Beyond Building Craftsmen. Economic Growth and Living Standards in the Sixteenth-Century Low Countries: The Case of 'S-Hertogenbosch (1500–1560)."

⁶⁹ Howard Montagu Colvin, *A Biographical Dictionary of English Architects, 1660-1840* (London: Murray, 1954).pp.4-11, John Summerson, *Architecture in Britain 1530 - 1830* (London: Pelican 1983). chapter 6. E McKellar, *The Birth of Modern London* (Manchester: Manchester University Press, 1999).pp.71 – 113.

⁷⁰ See <http://www.ons.gov.uk/ons/rel/elmr/an-examination-of-falling-real-wages/2010-to-2013/index.html>

⁷¹ Allen, "Engels' Pause: Technical Change, Capital Accumulation, and Inequality in the British Industrial Revolution."pp.418-435.

⁷² Allen, *The British Industrial Revolution in Global Perspective*; Robert C. Allen, "The High Wage Economy and the Industrial Revolution: A Restatement," *The Economic History Review* 68, no. 1 (2015); Allen, "The Industrial Revolution in Miniature: The Spinning Jenny in Britain, France, and India."

these nominal wages to grams of silver per day he showed that labourer's wages in London were higher than anywhere else in Europe after 1625, and that compared to the costs of capital or energy labour in England costs more than anywhere else.⁷³ His explanation for industrialization was that the difference in the factor prices incentivized owners of capital to substitute energy powered mechanization for labour, and that's why it happened in England before anywhere else.

Allen's moving averages are always on the lower end of Boulton's figures after 1650. The large variation in rates shown by Boulton in the 1690s is missing. In Allen's data only the turning points at the beginning and end of the 1660s, 1736, 1773 and 1794 are shown; the 1660s bringing about a twenty percent increase then decrease in the 1690s, followed by sixty years of stagnation and another twenty per cent increase in the mid-thirties, followed by another increase of eighteen percent in the 1770s and a rise of over twenty five per cent throughout the 1790s.⁷⁴ Allen's series shows the rate increasing for craftsmen about twenty years after Gilboy's did, in 1736, and rates are lower than Schwarz's until 1736, but then higher. Allen's craftsmen's series creates significant turning points that were not as pronounced in the archival series. For labourers his figures are more similar to them, (although again Boulton's 1690s rates are smoothed out), and follow the more gradual trends both Gilboy and Schwarz show.

Figure 1.7. Allen & Gilboy, London craftsmen d. per day.

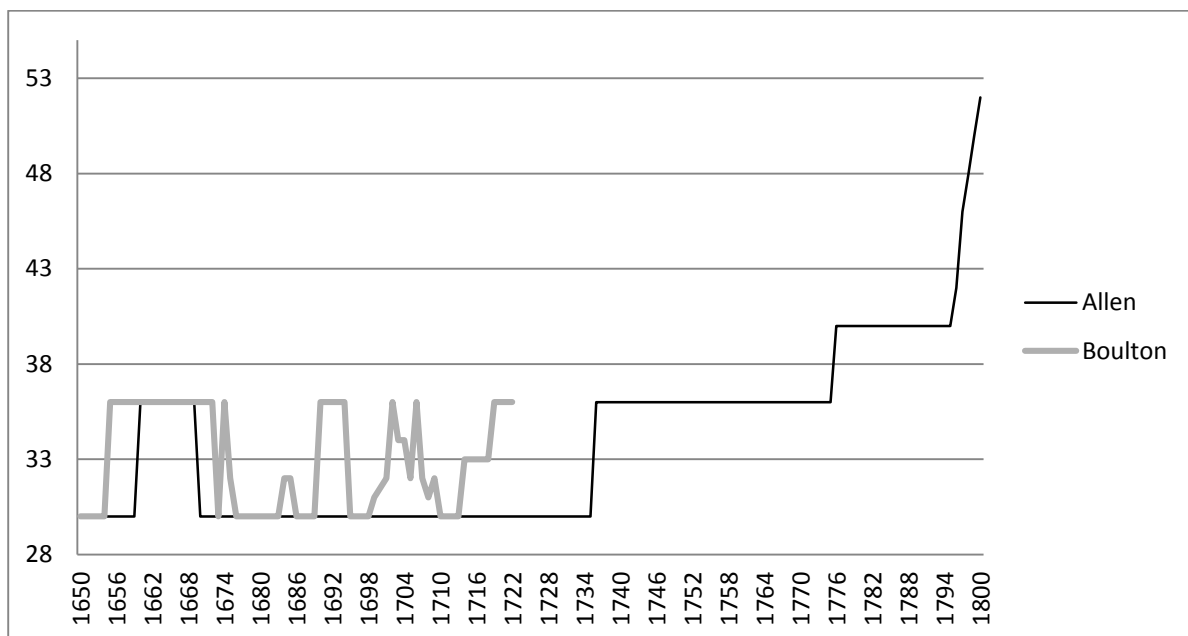


⁷³ Allen, *The British Industrial Revolution in Global Perspective*. pp.34, 139 – 40.

⁷⁴ The high price of labour in the 1690s is frequently mentioned, see, John Hatcher, "Labour, Leisure and Economic Thought before the Nineteenth Century," *Past & Present* 160, no. 1 (1998).pp.64-115.

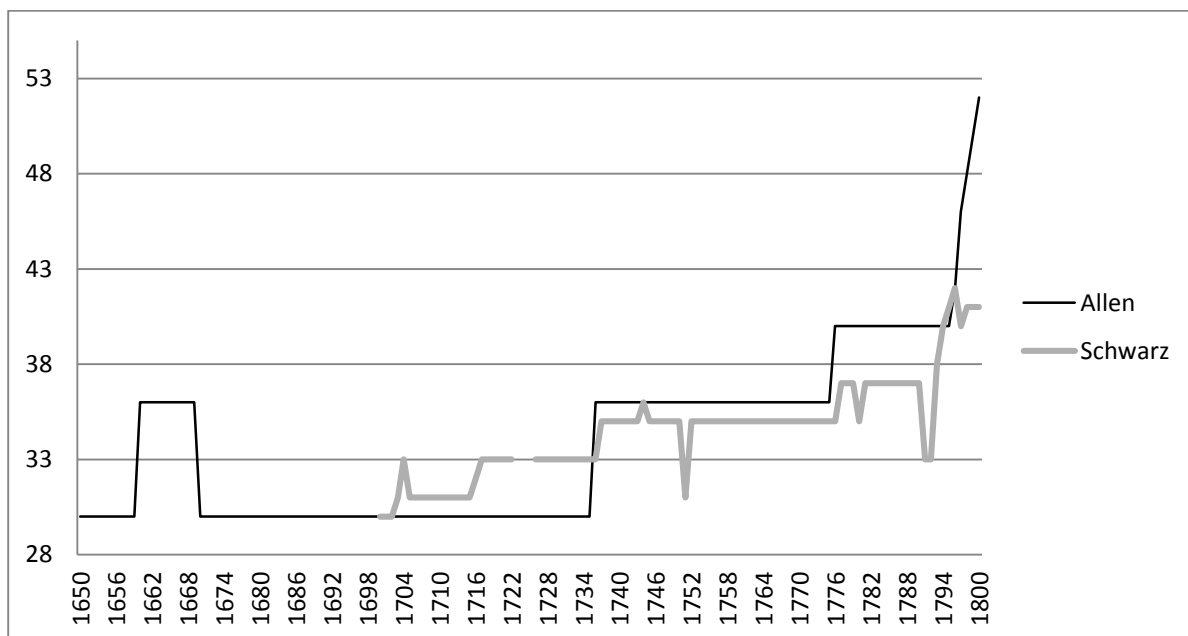
Sources:(Allen 2001, Allen 2013, Gilboy 1934)

Figure 1.8. Allen & Boulton, London craftsmen d. per day.



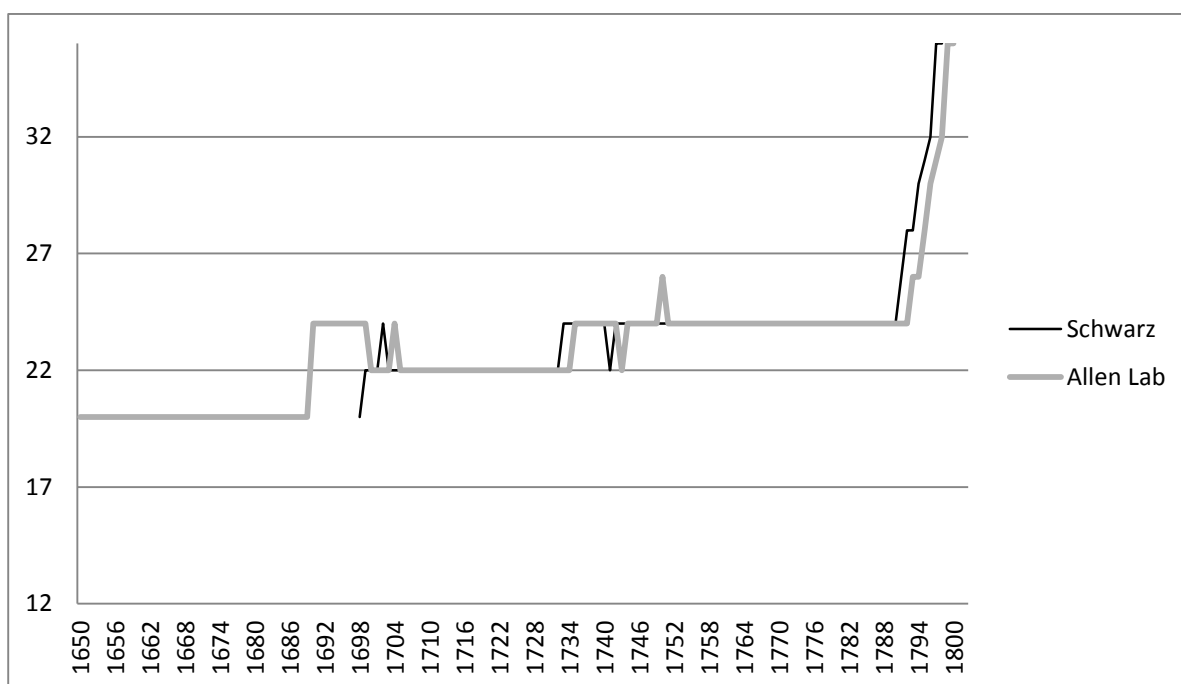
Sources: (Allen 2001, Allen 2013, Boulton 1996)

Figure 1.9. Allen & Schwarz, London craftsmen d. per day.



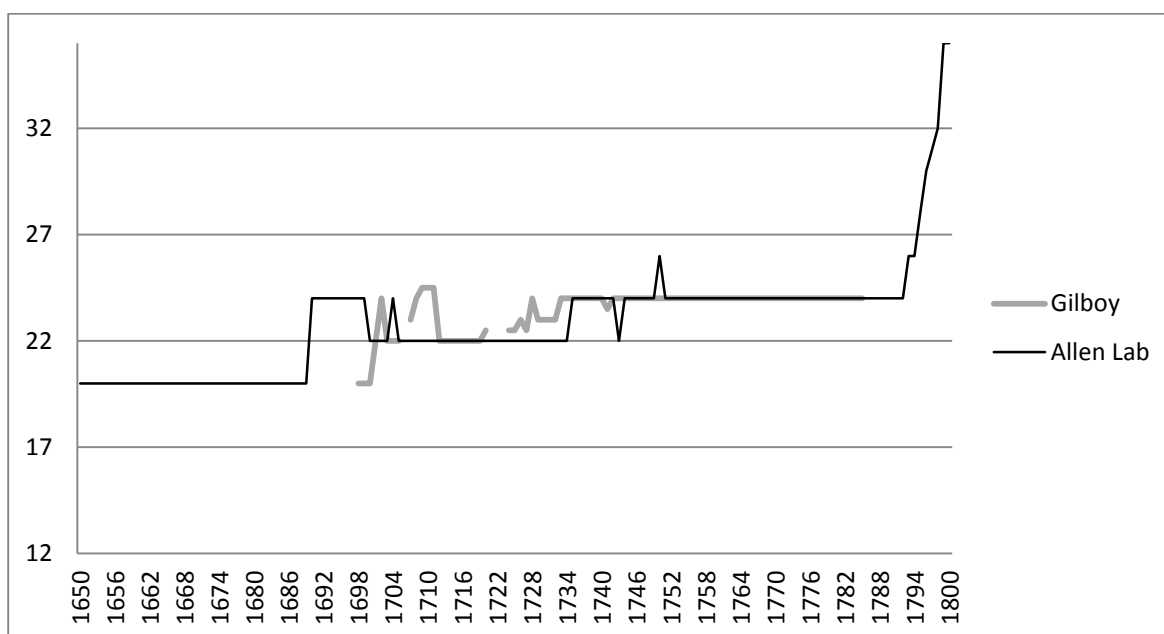
Sources:(Allen 2001, Allen 2013, Schwarz 1985)

Figure 1.10. Allen & Schwarz, London labourers d. per day.



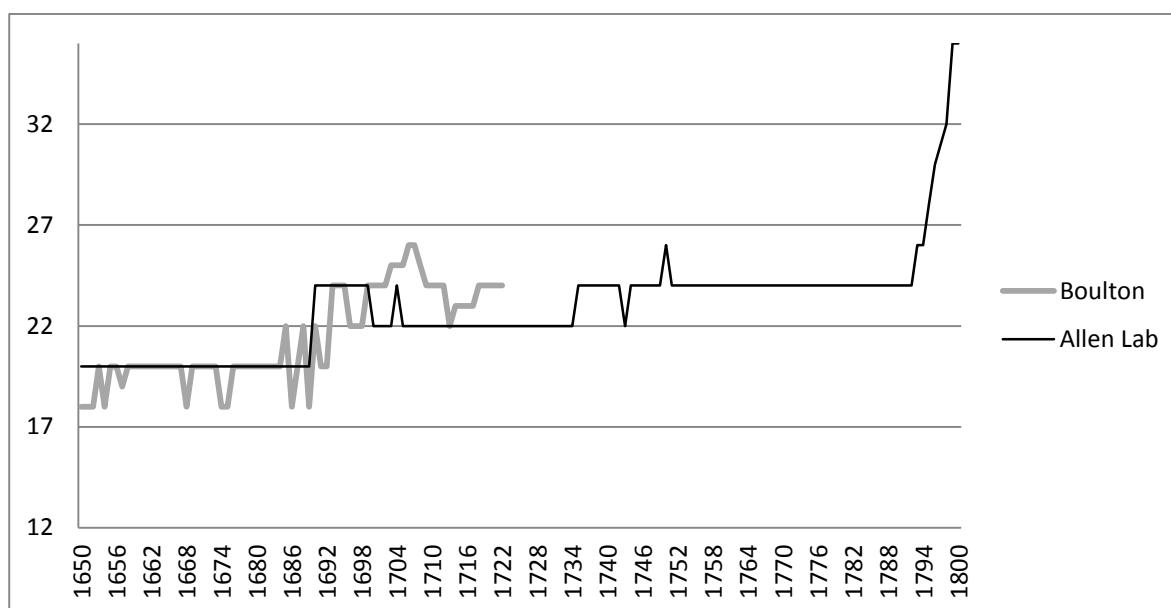
Sources: (Allen 2001, Allen 2013, Schwarz 1985)

Figure 1.11. Allen & Gilboy, London labourers d. per day.



Sources: (Allen 2001, Allen 2013, Gilboy 1934)

Figure 1.12. Allen & Boulton, London labourers d. per day.



Sources: (Allen 2001, Allen 2013, Boulton 1996)

In summary, a review of the sources, methodologies and synthesis of the archival series for London building workers' wages show the archival based series for wage rates for London 1650 -1800 are all based on bills to large institutions. The underlying skill level for craftsmen excludes 'journeymen' for the data to 1721, and assumes them to be the subject from then on. Labourers have been assumed 'unskilled' but the data used implies semi-skilled for much of the series. But above all, it has been assumed that day rates in bills are representative of day pay received.

Chapter 2. Literature on business and construction in early modern England.

2.1. Literature on business forms in early modern England.

There are plenty of indicators in the previous literature that the means by which institutions organized building work was not through the direct hire of labourers or craftsmen. Elizabeth Gilboy herself acknowledged that it was contracts and bills handed in for payment that provided the sources of her Westminster Figures.¹ In her discussion of the contracting system, Gilboy noted that the “normal method” was for a master to contract work and hire his own workmen. She also suggested that there was a “general tendency to farm out various county business”.² She also mentioned a type of contract where a master was retained to carry out work at an institution on an ongoing basis, and speculated that this might affect wages rates by fixing rates under a particular set of prices agreed for a period.³

Woodward found similar practices among northern craftsmen, mentioning contracts and retained or regular craftsmen attached to institutions.⁴ But it is only James Campbell to date who has asserted that on sites such as St. Paul’s only the contractor or foreman would be paid directly by the institution; he would then pay those who worked under him according to their skill and his profit.⁵ If this was generally the case in the building industry, our view of the price of labour would need to be modified to take into account the nature of the employment relation, and the mark up that the contractor took. So, how does this fit within what we know of business practice more generally in England at the time?

Research into organizational forms, and their effects on employment in early modern England, is rare.⁶ This is partly the result of a highly limited record set, and partly the effect of the confusing nature of the legal forms of business and incorporation available before the

¹ Gilboy, *Wages in Eighteenth Century England*. pp. 5, 11-13, 46

² Ibid. pp.6 - 17

³ Ibid. pp.17, 46

⁴ Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*.pp.25 – 27, 35 -40

⁵ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.323.

⁶ John F. Wilson and A. W. Thompson, *The Making of Modern Management : British Management in Historical Perspective* (Oxford: Oxford University Press, 2006).p.4.

mid nineteenth century.⁷ Moreover, perhaps also due to the lack of evidence, it is sometimes implied that firms were not efficient, or properly formed, prior to the industrial revolution.⁸ Mokyr's view; that English business organizations were 'simple' structures and that eighteenth-century growth was the product of entrepreneurs, whose command of technical competence created innovation; is a summary of a general view that the organization of industry before 1800 had little effect on productivity.⁹ Generally, historians of management view the period before 1770 as the era of 'personal capitalism' as defined by Chandler.¹⁰ The characteristics of personal capitalism were a lack of separation between ownership and control of a commercial enterprise, and a "general unwillingness to delegate responsibility to salaried managers".¹¹ In the literature on the history of British management, the lack of organizational form or strategy inherent in 'personal capitalism' is in part to blame for the lack of growth and development in late nineteenth and twentieth century Britain.¹² But the actual problems or frictions that this generated, other than lack of investment, are rarely, if ever specified.

The substitution for management highlighted in the literature is subcontracting, frequently depicted as, essentially, passing the risk and monitoring cost onto someone else.¹³ Pollard noting that there could be no precedents for modern management problems before 1750 due to the general economic environment, the attitude of labour and the legal framework being different, explained the prevalence of subcontracting as a due to its attractiveness in reducing supervisory costs.¹⁴

⁷ Ron Harris, *Industrializing English Law : Entrepreneurship and Business Organization, 1720-1844* (New York: Cambridge University Press, 2000).pp1-13,37-38.

⁸ This is the essence of the Chandlerian thesis, countered by Maxine Berg, *The Age of Manufactures, 1700-1820 Industry, Innovation, and Work in Britain*, ed. Maxine Berg and MyLibrary, 2nd ed. ed. (London New York: London New York : Routledge, 1994).

⁹ Joel Mokyr, *The Enlightened Economy : An Economic History of Britain, 1700-1850* (New Haven: Yale University Press, 2009).pp. 357- 358

¹⁰ Alfred D. Chandler, *Scale and Scope : The Dynamics of Industrial Capitalism*, ed. Takashi Hikino (Cambridge, Massachusetts: Cambridge, Massachusetts : Belknap Press of Harvard University Press, 1990). p.235 and part III.

¹¹ Wilson and Thompson, *The Making of Modern Management : British Management in Historical Perspective*.p.6.

¹² Ibid. p.56, quoting Chandler.

¹³ Sidney Pollard, *The Genesis of Modern Management : A Study of the Industrial Revolution in Great Britain* (London: London : Edward Arnold, 1965).p.38, Mokyr, *The Enlightened Economy : An Economic History of Britain, 1700-1850*.p.353

¹⁴ Pollard, *The Genesis of Modern Management : A Study of the Industrial Revolution in Great Britain*.p.47, pp.38-39.

However, subcontracting has risks, or costs too. Those discussed by Pollard were that short-term incentives for subcontractors would promote poor workmanship, and paradoxically, that any skills or technological knowledge gains would be lost to capital.¹⁵ In modern management and economic literature subcontracting is viewed within themes of integration and disintegration, in relation to the costs of transacting. In a Coasian framework the costs of transacting within or without the market determine the level of integration.¹⁶ Subcontracting is sometimes seen as an innovative modern Japanese invention, not an early modern one.¹⁷ Recently, subcontracting has been viewed by historians in a positive light. Giorgio Riello has suggested that subcontracting was an organisational tool conferring flexibility to complex eighteenth-century trades and markets, while Paul Johnson similarly cast subcontracting as a critical part of development in Victorian London.¹⁸

But few writers, with the exception of Hobsbawm have directly addressed the issue of how subcontracting affected labour. Whilst he noted that it enabled small operations to take on large contracts, without associated large fixed costs, he viewed the proliferation of subcontracts and subcontracting in manufacturing trades as “co-exploitation”, associated with growing inequality and the development of a ‘labour aristocracy’.¹⁹ In Hobsbawm’s view skilled labour lost out to capital through such organization because the pay of everyone except masters was too low for them to accumulate meaningful capital of their own, there was no security of tenure, and training made skills highly trade-specific, lowering the bargaining power of ‘underhands’. From labour’s point of view, then, the main features of subcontracting -- flexibility of contracts, short term working agreements, fixed piece rates and lack of security of position or wage had few advantages, in fact the characterisation of subcontracting has obvious parallels in analyses of ‘sweating’, which was considered so

¹⁵ Ibid.

¹⁶ R. H. Coase, "The Nature of the Firm," *Economica* 4, no. 16 (1937).pp.386-405. George J. Stigler, "The Division of Labor Is Limited by the Extent of the Market," *Journal of Political Economy* 59, no. 3 (1951).pp.185-193.

¹⁷ Oliver Williamson, *The Mechanisms of Governance* (New York: Oxford University, 1996).pp.317- 8, Oliver Williamson, *The Economic Institutions of Capitalism : Firms, Markets, Relational Contracting* (New York, London: Free Press; Collier Macmillan, 1985). pp.120 -123.

¹⁸ Giorgio Riello, "Strategies and Boundaries: Subcontracting and the London Trades in the Long Eighteenth Century " *Enterprise & Society* (2008) 9(2): 243-280 (2008).pp243-280, “Paul Johnson, "Economic Development and Industrial Dynamism in Victorian London," *The London Journal* 21, no. 1 (1996).pp.27-37

¹⁹ E. J. Hobsbawm, *Labouring Men : Studies in the History of Labour* (London: Weidenfeld and Nicolson, 1964).pp. 296 - 301

damaging to skilled workers in early eighteenth century England, and those features are one element cited by others as key to pushing labour into the factory system.²⁰

Subcontracting was noted as prevalent in mining, cotton spinning, shipbuilding, steel and iron, but subcontractors in the building industry were noted as operating the system “par excellence”.²¹ As will be seen below much literature from the architectural history perspective makes clear that ‘partnerships’ and subcontracting were common.

If building contractors can be considered to be part of the London business community what would we expect of their management? The most detailed work on London merchants or business people in this period is still that of Peter Earle.²² Earle used Nicholas Barbon and Daniel Defoe as contemporary sources on attitudes to business. Barbon, of course, was renowned for the heights of speculation in his property businesses, which provoked him to argue in economic treatises for the positive impact of speculation.²³ He described the strategies of early modern business as primarily related to capital costs, cash flow and credit.²⁴ Based on the well-known figures given in Campbell’s ‘London Tradesman’, Earle noted high start-up costs in most trades and that those who succeeded in business were well to do before they started.²⁵ The source of capital was usually familial, and the accounting of household and business cash flowed jointly, without a separation.²⁶ Earle repeatedly highlights the risks inherent to the early modern business environment. Even partnerships were described as risky by Earle, due to legal partnership being of unlimited liability.²⁷

²⁰L. D. Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850* (Cambridge: Cambridge University Press, 1992). pp.179-207, Stephen Marglin, "What Do Bosses Do? The Origins and Functions of Hierarchy in Capitalist Production," *Review of Radical Political Economics* 6, no. 2 (1974).pp. 60-112, James A. Schmiechen, *Sweated Industries and Sweated Labour : The London Clothing Trades 1860-1914* (London: Croom Helm, 1984)., T. M. Geraghty, "The Factory System in the British Industrial Revolution: A Complementarity Thesis," *European Economic Review* 51, no. 6 (2007).pp.1329-1350.

²¹ Pollard, *The Genesis of Modern Management : A Study of the Industrial Revolution in Great Britain*.p.112

²² Peter Earle, *The Making of the English Middle Class : Business, Society and Family Life in London, 1660-1730* (London: Methuen London, 1989).

²³ Ibid.p.130. See Nicholas Barbon, *A Discourse on Trade* (London: Theo Milbourne, 1690).. Nicholas Barbon, *An Apology for the Builder : Or a Discourse Shewing the Cause and Effects of the Increase of Building* (London: Cave Pullen, 1685).

²⁴ Earle, *The Making of the English Middle Class : Business, Society and Family Life in London, 1660-1730*. Chapter 4

²⁵Ibid. p.108, R. Campbell, *The London Tradesman : Being a Compendious View of All the Trades, Professions, Arts, Both Liberal and Mechanic, Now Practised in the Cities of London and Westminster. Calculated for the Information of Parents, and Instruction of Youth in Their Choice of Business* (London: printed by T. Gardner, 1747).

²⁶ Earle, *The Making of the English Middle Class : Business, Society and Family Life in London, 1660-1730*.pp.109 -115

²⁷ Ibid.p. 111

Credit is a feature of early modern commerce that Earle made a great deal of: "The problems of the businessman's cash flow were made much greater by the ubiquity of credit".²⁸

Commercial credit was expensive, and could cost three or four times the Bank interest rate.²⁹

Earle emphasises the terms of credit and the lengthy times for payback, suggesting a view of the seventeenth and eighteenth century credit systems as frictions that created problems for business. Hoppit has shown that contemporary views were similar. Credit was one of the "defining characteristics of the age" and the attitudes toward it were largely moralistic.³⁰

Trade credit was viewed as encouraging businessmen to overreach or gamble.³¹ However trade credit was also acknowledged as "essential to the normal conduct of business".³²

Earle's discussion of business strategy solely focused on financial strategies to deal with risk of credit default, and a short discussion of monopolistic behaviour. Neither he, nor Richard Grassby considered terms of employment, and the organization of skill and human capital.³³ He showed small partnerships; usually dominated by one individual, were the normal type of organization with the networks of marriage and family the most influential source for capital. Firms were run as an extension of family.³⁴

If most workers in England before 1800 were self-employed, as is the general view, there has not been any meaningful evaluation of what the costs of constant search for work were for workers or firms.³⁵ To the extent that labour and employment have featured in discussions of business organization, they generally appeared in relation to one of three specific issues: developments in work discipline; the efficiency (or not) of artisanal production; and the connection between artisan work and proletarianization. Economic historians have previously highlighted discipline and the promotion of application as the main problems to be faced in utilising a lazy, ignorant, or young unskilled workforce.³⁶ But they have also stressed the persistence of 'traditional' forms of production and organisation

²⁸ Ibid.p.115

²⁹ Ibid.p.118

³⁰ Julian Hoppit, "Attitudes to Credit in Britain, 1680-1790," *The Historical Journal* 33, no. 2 (1990).p. 307

³¹ Ibid.p.315

³² Ibid.p.318

³³ Ibid.pp.131 – 136, Richard Grassby, *The Business Community of Seventeenth-Century England* (New York: Cambridge University Press, 1995).

³⁴ Hoppit, "Attitudes to Credit in Britain, 1680-1790."; Grassby, *The Business Community of Seventeenth-Century England*.pp. 401.

³⁵ Wallis, "Labour Markets and Training."pp.180.

³⁶ Sidney Pollard, "Factory Discipline in the Industrial Revolution," *Economic History Review* 16, no. 2 (1963).pp.254-271, E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past and Present* 38, no. 1 (1967).pp.56-97

before industrialisation. Maxine Berg, writing more than twenty years ago on the same topic, noted that most industries did not fit into a “logic of managerial enterprise” which associated scale and scope with market power.³⁷ Rather, she noted a lack of linearity in the development of organizational structures between factory organisations and the modern firm. She stressed the social values of artisans and domestic workers in regulating labour, while noting how little is understood of artisan cooperatives or organisation.³⁸ Berg described subcontracting, also the sweating system, which deskilled artisans, and side-lined the agency of workers.³⁹ However, she suggested that artisan systems with their roots in social structure as much as economic considerations competed effectively with capitalist production to the end of the eighteenth century. Another highly influential body of research views eighteenth-century London as a period marked by the decline of artisan values, which anticipated the emergence of a proletariat and their class consciousness in the nineteenth century.⁴⁰ Hobsbawm, Dobson, Thompson, Rude, and others have all sought to show the roots of collective action and bargaining in the ‘artisan’ trades prior to the nineteenth century, with declining pay and living standards as a backdrop to dissent.

If subcontracted management and monitoring were as prevalent in construction in the long eighteenth century as Campbell asserts, then Donald Woodward’s 1994 question; “what factors played the largest role in the determination of the level and pattern of wages in the early modern economy?” needs to be asked again.⁴¹ Woodward found that it was mostly ‘the interaction of the supply of labour and the demand for it’.⁴² The factors he considered, however, were regulation, population, custom, and supply and demand in trades. The effect of changes in hierarchies of organisation, and nature of contracts under which work was carried out, were not among the issues he considered.

³⁷ Berg, *The Age of Manufactures, 1700-1820 Industry, Innovation, and Work in Britain*.p.127.

³⁸ Ibid.pp.29,61.

³⁹Ibid. p.135 – 6. Also see, Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*. chapter 7, Schmiechen, *Sweated Industries and Sweated Labour : The London Clothing Trades 1860-1914*.

⁴⁰ Hobsbawm, *Labouring Men : Studies in the History of Labour.*, George F. E. Rudé, *Hanoverian London 1714-1808, History of London* (London: Secker & Warburg, 1971).chapters 2, 8; C. R. Dobson, *Masters and Journeymen : A Prehistory of Industrial Relations, 1717-1800* (London: Croom Helm, 1980); E. P. Thompson, *The Making of the English Working Class* (Harmondsworth: Penguin, 1972). Chapter 13

⁴¹ Donald Woodward, "The Determination of Wage Rates in the Early Modern North of England," *Economic History Review* 47, no. 1 (1994).p. 23

⁴² Ibid. p. 38. Also, Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*.pp.169-209.

In summary, there is little analysis of the effects of organisational form before 1770 that considers the employment relationship. It is widely held that management generally in the long eighteenth century was owner led, and not strategic, and failed to invest in organisational development. Capital was familial and much trade credit-based. Credit was expensive. Although artisanal systems were deeply embedded, systems of subcontracting exploited skilled labour, and artisanal systems broke down towards the end of the eighteenth century in most trades.

Whilst the traditional view of eighteenth century ‘personal capitalism’ fits with a view of a growth trajectory that accelerated in the nineteenth century when management and factory organisation developed, the prevalence of subcontracting in the early modern ‘market’ is usually expounded as a failure of early modern ownership to proceed strategically. The other side of the coin –how idiosyncratic transacting was managed, is less explored. The theoretical literature finds market transactions open to hold up, opportunism, bounded rationality, uncertainty, bargaining costs associated with contingent claims, and thus inefficient.⁴³ If “firms will emerge to organize what would otherwise be market transactions whenever their costs were less than the costs of carrying out the transactions through the market”, there naturally arises a question for the nature of businesses before 1770.⁴⁴ Were the structures of what we think of as firms incredibly costly in the early modern world, or was transacting in the market less costly than we have thought?

Given that more recent research shows that growth in the late seventeenth and early eighteenth century was substantial, an understanding of how ‘firms’ organized labour in this period requires new research.⁴⁵ It is likely that building ‘firms’ may not be typical of production throughout the economy - the structure of organization of the building industry today is not held to be representative, after all. Nonetheless, since contractors in the period under examination here worked directly with so many large institutions, their working practice may be indicative of the possibilities that were more generally available across the

⁴³ Williamson, *The Mechanisms of Governance*., pp.317- 8, Williamson, *The Economic Institutions of Capitalism : Firms, Markets, Relational Contracting*., pp.120 -123 Oliver E. Williamson, "Markets and Hierarchies: Some Elementary Considerations," *The American Economic Review* 63, no. 2 (1973).pp.316-325,

⁴⁴R. H. Coase, *The Firm, the Market and the Law* (London: University of Chicago Press, 1988)..p.7.

⁴⁵ Broadberry et al., *British Economic Growth 1270 -1870*. give new GDP figures based on output showing growth and increase in output per worker 1522 – 1759. The difference between wages and output in explaining growth is ascribed hours worked.

economy. The following section will review what is known of the building trades specifically.

2.2. Literature concerned with the organization of the construction industry 1650 – 1800.

In most studies of the building industry, it is suggested that it was only in the Victorian era that building contractors became “master builders”, contracting all trades; prior to the 1830s, building contractors are thought to have only plied their own discreet trade of carpentry, masonry, plastering, etc.⁴⁶ The truth is, of course, a little more complex. In this section I review what has been written about the organization of the construction trades and building sites in two quite distinct literatures, firstly, architectural and construction history, and secondly, economic history.

Architectural historians have generally described the seventeenth century as a critical turning point in design, aesthetics, and engineering in construction, a golden age of enlightenment innovation, and the moment in which we can see the first development of architects in England.⁴⁷ The industry not only made ground-breaking design innovations, but organisational ones too. As well as architect surveyors – those responsible for design as discrete from production - appearing as an occupation for the first time, and they becoming commonly used for major buildings, the discipline of, or precursor to, quantity surveying also was established.⁴⁸ By the early eighteenth century, it was clearly understood the surveyors had responsibility for managing the tasks undertaken on large projects.⁴⁹

While the general outlines of these changes are widely accepted, the details of exactly how the building industry and construction practices developed over the seventeenth and

⁴⁶P. W. Kingsford, *Builders and Building Workers* (1973); E. W. Cooney, "The Origins of the Victorian Master Builders," *Economic History Review* 8, no. 2 (1955). pp.167-176, C. G. Powell, *An Economic History of the British Building Industry 1815-1979* (London: London : The Architectural Press, 1980).p.31.

⁴⁷ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.pp.14-27.Bill Addis, *Building: 3,000 Years of Design, Engineering and Construction* (London, : Phaidon 2007).chapter 4, pp.198-210 . For a wide-ranging description of the trajectory of the profession in the eighteenth century, see Giles Worsley, ed., *Georgian Architectural Practice, Proceedings of Georgian Group Symposium 1991* (The Georgian Group 1992).

⁴⁸ James Nisbet, *A Proper Price* (London: Stoke Publications, 1997).

⁴⁹ David Yeomans, "Managing Eighteenth-Century Building," *Construction History* 4 (1988); Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.pp.15 - 26

eighteenth centuries, and what this meant for the position of craftsmen within the trade, has generated more differences of opinion. The seminal study on masonry remains that by Knoop and Jones, who researched almost every aspect of masonry practice in England from medieval times to the seventeenth-century. In their account of the development of the organization of masonry from the middle ages, they placed the rise of mason contractors in the sixteenth and seventeenth centuries.⁵⁰ Until the late sixteenth and early seventeenth century, the predominant means of contracting building was the direct labour model. The client bought materials, and hired and contracted skilled labour by the day to work them. There are a number of exceptions found to this kind of contracting from as far back as the fourteenth century.⁵¹ Nevertheless, they suggest this remained the main model of building organization until the early seventeenth-century. Knoop and Jones cited the building of the Banqueting House in Whitehall under Inigo Jones as one of the last cases of its kind.⁵²

Even under the direct labour model, Knoop and Jones are clear that the environment they describe is far from a small-scale, guild-dominated artisanal workshop system. They showed that guild regulation of masons was always weak: their review of the London masons' company found that the guild was but a talking shop even before the sixteenth century, and that apprenticeship was also not common among masons.⁵³ Most masons were waged labour, and thus were trained to be journeymen. Writing of the London mason in the seventeenth century, they highlighted the scale and scope of the activities and contracts undertaken by masons employed under Wren and elsewhere. They noted the hundreds of men employed at St. Paul's at one time, and asserted that rather than small scale masters these were 'firms'.⁵⁴ Overall Knoop and Jones described the organization of masons as

⁵⁰ Douglas Knoop and G. Jones, *The London Mason in the Seventeenth Century ...*, Issued in Advance of "Ars Quatuor Coronatorum," Vol. XLVIII, Part I. (Manchester University Press: London : Quatuor Coronati 1935); Douglas Knoop and G. P. Jones, *The Mediaeval Mason : An Economic History of English Stone Buildings in the Later Middle Ages and Early Modern Times*, Economic History Series (Manchester: Manchester University Press, 1933); Douglas Knoop and Gwilym Peredur Jones, *The Sixteenth Century Mason* (London,: 1937); Douglas Knoop, Gwilym Peredur Jones, and Royal Institute of British Architects., *The Rise of the Mason Contractor* (London ,: 1936).

⁵¹ Akira Satoh, *Building in Britain : The Origins of a Modern Industry*, ed. Ralph Morton (Aldershot: Brookfield, Vt., USA : Scolar Press, 1995).pp.9 -10,

⁵²Knoop and Jones, *The London Mason in the Seventeenth Century ...* .p.19

⁵³ Knoop and Jones, *The Mediaeval Mason : An Economic History of English Stone Buildings in the Later Middle Ages and Early Modern Times*.pp.162 - 3

⁵⁴ Knoop and Jones, *The London Mason in the Seventeenth Century ...* .p.47

almost industrialized by the mid seventeenth century, the “age of the great mason contractors”.⁵⁵

Beyond the contractors, Knoop and Jones also highlight the variation within the masons’ trade. Although masons’ were held to be divided into hewers and layers in medieval times Knoop and Jones acknowledged openly that the type of work and skill deployed was hard to evaluate in the later period, probably due to the fact that contractors’ bills do not contain the same detail of workers skill as direct records would.⁵⁶ Knoop and Jones categorized London masons into ‘shopkeepers’ (statuary masons running workshops), stone merchants and /or quarry owners, foremen, contractors, journeymen, and apprentices.⁵⁷ The scale of operation they described for shopkeepers seems small. Nine men were found in Mr. Stanton’s shop in Holborn, and between one and five in other shops.⁵⁸ Workshops then, give the impression of small artisan like industry. However, sites tell a different story. There were frequently one hundred men under Richard Jenings at St. Paul’s 1705 – 10.⁵⁹ A mason’s company search in September 1694 found 119 masons on site at St. Paul’s.⁶⁰ William Kempster’s records show over 50 men at work for him directly there on occasion in 1708.⁶¹ Thomas Fitch famously kept two hundred men, mostly bricklayers and carpenters, on site wharfing the Fleet Ditch in 1671-4.⁶²

Whereas Knoop and Jones saw most masons as effectively jobbing journeymen even before the mid seventeenth century, Colvin put greater emphasis on the individual craftsman’s loss of status and agency after the Restoration. Colvin, one of the most prolific and respected architectural historians of the twentieth century, argued that over the course of the seventeenth century the status, agency and welfare of master craftsmen declined significantly. As the contracting system favoured only those masters with the greatest capital and craftsmen became subject to the direction of architect designers, whereas previously they had taken the leadership role, creatively and operationally, in design and execution; “Many who a generation before would have set themselves up... [..]...were now content to

⁵⁵ Ibid. p.19, Douglas Knoop and G. Jones, *The London Masons' Company* (Bungay: R.Clay & Co., 1939).pp.2-3

⁵⁶ Knoop and Jones, *The London Mason in the Seventeenth Century*p.18

⁵⁷ Ibid..p.19

⁵⁸ Ibid..p.21

⁵⁹ JWP Campbell, *Building St Paul's* (London: Thames & Hudson, 2007).p.157

⁶⁰ Knoop and Jones, *The London Mason in the Seventeenth Century*Appendix C

⁶¹ TNA PRO C106/145, day books

⁶² A.W. Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830* (Thomas Telford, 2002).p. 228.

accept the position of employee.”⁶³ In the view advanced by both Colvin and John Summerson, master craftsmen before the mid-seventeenth century still owned the design process and had aesthetic authority and agency. This was relinquished to architect-surveyors through the eighteenth century, and “...by 1840 it would have been difficult to discover a worthy representative of a class which had once stood for so much that was admirable in the history of English Architecture.”⁶⁴

Summerson, in particular, described the seventeenth century as the era in which the old functions of artificers continued from the Tudor period.⁶⁵ He considered the building trades to be still organized along medieval lines before the Great Fire of London, with apprentices and journeymen moving up to become master craftsmen of considerable skill and status. By the beginning of the eighteenth century, however, Summerson suggested there were ‘master builders’ and the construction trades were businesses.⁶⁶ His *Georgian London* offered the first exploration of the size and scope of large firms involved in the construction of London’s new townhouses and squares in the eighteenth century.⁶⁷ Now, the industry was no longer about independent craftsmen, but master builders and wage-taking journeymen.⁶⁸ The process described by Summerson for contracting new building was a commercial system of subcontracts between trades with the profit dependent on speculation not craftsmanship.⁶⁹

Summerson’s chronology of the rise of subcontracting and speculative building has since been revised by Elizabeth McKellar, whose study of private building in London between 1660 and 1720 ended for good most notions of artisanal production in the building trades after the Great Fire.⁷⁰ She found similar scale development and speculation compared to what Summerson had highlighted in the later period.⁷¹ She exposed the highly commercial and cut-throat world of builder- speculators, contracts, pattern books, prefabrication and speculation, with a virtually non-existent role for artisanal craftsmen or organization, except

⁶³ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*, p.9

⁶⁴ Ibid. Introduction; ‘The Building trades’, particularly pp.7 -9. quote p.9.

⁶⁵ Summerson, *Architecture in Britain 1530 - 1830*, pp.157-8.

⁶⁶ John Newenham Summerson, *Georgian London*, New ed ed. (New Haven: Yale University Press, 2003), pp.55

⁶⁷ Ibid.

⁶⁸ Ibid.58, also pp. 61 - 4

⁶⁹ Ibid.pp.62 - 64

⁷⁰ McKellar, *The Birth of Modern London*, p. xi.

⁷¹ Ibid.p.41.

at the highest levels of expenditure.⁷² The complex system of speculation was underpinned by the separation of land and building leases, and the system of credit vital to development. Any clear-cut separation between trades was also largely defunct in her account, with many trades contracting to put up brickwork, for instance.⁷³ McKellar showed the contracting system was increasingly a financial not a craft arrangement.⁷⁴ She challenged the notions of craftsmen that Summerson and Colvin had held so sacred by asserting that the separation of design and production was well cleaved in architecture by the seventeenth century.⁷⁵ Her evidence was all from the private sector, and she gave several cases of men who contracted whole projects that involved them undertaking work that traversed all the different building trades.⁷⁶ In short, McKellar placed the dawn of the 'master builder' in the seventeenth century, not the eighteenth, and in her version of events the role of craftsmen was as "substantial operators" not artisan operatives.

James Campbell has since built upon McKellar's argument, showing contracting to be the norm in London for masons, carpenters and bricklayers on large public sites too.⁷⁷ Campbell's discussion of carpenters in seventeenth century London shed more light on the scale of industry, and also highlighted that only ten per cent of the carpenters who worked on St. Paul's Cathedral had been apprenticed or taken freedom of the carpenters company.⁷⁸ He showed that bricklayers and masons worked on similar lines. Campbell treated master craftsmen as contractors and highlights that only they were paid the sums found in building accounts, those working for them received less, and what they did was wholly dependent on their relations with the contractor, not with the institution or site they were working at.

Yet, the changes in the industry outlined by both Campbell and McKellar have not yet been wholly heeded by economic historians. To the extent that they have been noticed, economic

⁷² Ibid. Also see Geoffrey Beard, *Craftsmen and Interior Decoration in England 1660-1820* (Edinburgh: 1981).for details of the artisan craftsmen at the luxury end of the market.

⁷³ McKellar, *The Birth of Modern London*.p.81, Campbell also cites John Fitch's contracting of both brick and carpentry in Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.327, n.80.

⁷⁴ McKellar, *The Birth of Modern London*.pp.86 -89. James Ayres, *Building the Georgian City*, Paul Mellon Centre for Studies in British Art (Yale University Press, 1998).p.77.

⁷⁵ McKellar, *The Birth of Modern London*.pp.95 -96.

⁷⁶ Ibid.pp.101 –109.

⁷⁷ J.W.P. Campbell, "Seventeenth-Century Bricklayers' Contracts: Wren's City Churches," *British Brick Society Information* 87 (2002); Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."; J.W.P. Campbell, "Building a Fortune: The Finances of the Stonemasons Working on the Rebuilding of St Paul's Cathedral 1675-1720. ," *Proceedings of the Third International Congress on Construction History*. (2009).

⁷⁸ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.322.

historians have asserted that these large scale and almost industrialized conditions were unique to masons and, or, London, and there has been little further research into what that might mean, because the only in-depth study of working in the industry focused on northern England.

Donald Woodward found masons ‘a race apart’ in the Northern towns, and asserted that other building craftsmen worked as small masters and were in charge of their own business.⁷⁹ Woodward found no workshop with more than five employees, but the numbers working alongside are usually in single figures too.⁸⁰ The usual organisational form given throughout the book is of small masters, with a couple of journeymen and an apprentice carrying out work. Although Woodward acknowledged some large-scale projects, he concluded that “with few exceptions, urban markets were too fragmented to encourage the emergence of large building firms”.⁸¹ He also showed that guild regulation was still effective in the Northern towns in the early eighteenth century, although their authority began to wane after mid-century.⁸² Woodward found that the “journeymen body was more heterogeneous than is usually imagined”.⁸³

He reported that not all journeymen received their full pay. “The wage of a dependent journeyman was given to the master”.⁸⁴ In the first half of the seventeenth century, only 8 per cent of the qualified journeymen became masters in Chester.⁸⁵ Woodward’s study is for a much earlier period in the main, the bulk of his evidence is from before 1650, but many of the cases described by him show that the contracting system was operating, if not prevalent in the seventeenth century in Northern England. Nevertheless, the organisational system he describes throughout is wholly artisanal.

Jeremy Boulton only discussed briefly the organisation of the building trades. Although he noted the decline of the influence of guilds in seventeenth-century London, he used Knoop and Jones’ evidence of mason’s company searches to defend the idea that the guilds had influence over the working practices of building crafts, (whereas labourers were organised

⁷⁹ Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*.p.16.

⁸⁰ Ibid.pp.25 – 26.

⁸¹ Ibid.pp.4–5, p.63.

⁸² Ibid.pp.28–35, 80.

⁸³ Ibid.p.72.

⁸⁴ Ibid.p.68.

⁸⁵ Ibid.p.68.

casually with “rudimentary fellowship” or in hired in gangs by foremen or masters).⁸⁶ He noted that the structure of earning for masters and more common journeymen was different. Masters would have made a profit on the sale of materials, and the wages of journeymen and labourers working for them.⁸⁷ Like this study, he found that there was no difference between summer and winter pay rates,⁸⁸ and that seasonality in work was not clear.⁸⁹ However, he cautioned that the type of site or project would affect payments and working practice.⁹⁰ So, although he showed knowledge of the contracting system, Boulton did not have the evidence to discuss what this meant for organisation.⁹¹ Nor did he apply his observation about masters and journeymen’s structure of income to the day rates he published.

In summary, the architectural historical perspective leads to the conclusion that the building industry, and the role for the journeymen or craftsmen within it, changed fundamentally in the 200 years to 1800. There has been no real consideration in economic history of how this affected ordinary craftsmen’s and labourer’s work or welfare.

⁸⁶ Boulton, "Wage Labour in Seventeenth-Century London."p.271.

⁸⁷ Ibid.p.274.

⁸⁸ There is only one occurrence of summer and winter day rates found explicitly stated in accounts. See chapter section 5.3, below.

⁸⁹ Boulton, "Wage Labour in Seventeenth-Century London."

⁹⁰ Ibid.p.275

⁹¹ Ibid.p.282

2.3. Outline of argument and methodology.

This thesis argues that economic historians have failed to appreciate the nature of building craftsmen's and labourer's day rates, and therefore their earnings, and have misunderstood the nature and structure of their industry in London in early modern times.

My argument is simple. Earlier historians have recorded the day rates found in bills made out by large building contractors to institutions and clients and treated them as pay. These amounts were *not* what workers received; these were what they were charged out at – and contractors added a large mark up. What workers actually received from their employers was in the region of twenty to thirty per cent lower.

When I first examined the accounts at Westminster Abbey that Elizabeth Gilboy had used to construct her famous series I noticed two things. Firstly, the Christopher Wren Fabric Books are not the journals or day-books of a busy building site, they are important documents that were produced with an eye on posterity, written in careful ink on parchment and arranged in part to justify the revenue from the coal tax that was being used to fund the project. Secondly, the first entry, the bills of Edward Tuffnell, mason, were for a total of £1971 in the first year (1712-13), yet they recorded only 699 mason days, the equivalent of just two and a half masons annual work, with no given names and all at exactly the same rate, 2s. 6d.⁹² The value of the work is equivalent to a labour value of over £3m today.⁹³ Could it be possible that work of that sort just required a couple of men for a year?

There is another, more plausible, explanation. Work that was charged out by the day in early modern London building was just *one* kind of work, and it was usually work for large and rich institutions. Most work was carried out by the measure – a sort of piece rate, or by the task or great – as part of a single bid for a building or part of it where labour was included in the price of a fixed length or volume of carving, or brickwork, or carpentry. Measured work and task work did not specify the labour costs within. Where day rates were a regular means of pay, at dockyards and London Bridge they were part of a complex system of tides, overtime and other rates. Those who have recorded day rates have mostly captured the

⁹² Gilboy, *Wages in Eighteenth Century England*.

Westminster Abbey Muniments, Christopher Wren Fabric Books, 34513, 34514

⁹³ Calculated at <http://www.measuringworth.com/ppoweruk/>

charge out rates of very large and rich firms, on some very prestigious sites – Westminster Abbey, Middle Temple, and Greenwich Hospital.

My argument is actually not entirely new, and should in no way be surprising. James Campbell anticipated several of the conclusions I have reached about the contractors' margins in a succinct paper presented in 2005, but no-one recognised the implications for wage series.⁹⁴ Historians of the nineteenth-century building trades have long recognised that taking a mark-up from wages was normal operating practice.⁹⁵ But no one else has explored the system and its implications in the seventeenth and eighteenth centuries. In addition to drawing out the ways in which margins figured in the wage records that exist, this thesis makes two further contributions that allow us to appreciate its impact. First, my use of the payment records of William Kempster, mason contractor, at St. Paul's Cathedral allows us to observe and analyse real payment records for the first time; and secondly, my calculation of the elements determining the necessary operating margins of those contractors who were responsible for large works in London throughout the period under discussion. I also present for the first time Bridge House payment rates over the long term to the 1780s.

The thesis is concerned with nominal rates of pay only, and makes no attempt to update or challenge either any price data nor any further elements that contribute to real wages or any other derivatives. The methodology used in presenting new figures has been, literally, just to present them, and I have included many photographs to assist in understanding of the sources. I argue that the existing series are accurate for their sources, and where I have presented any data I have calculated arithmetic means, and modes on some occasion, which I have made clear. Where I have presented long run data it is based on the three series and Allen's synthesis of them as described in chapter 1.

The next chapter describes the world of construction in London in the years after the Great Fire, the large sites which dominated demand for supplies and labour, the market for building, and some of the biggest players within it. The chapters following will detail how the contracting system for building work operated, what the incentives, pressures and practices were, and what they meant for those working within it.

⁹⁴ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."

⁹⁵ Powell, *An Economic History of the British Building Industry 1815-1979*, pp.33 - 35

Chapter 3. The market for building.

3.1. The extent of the market:

This thesis is concerned with the organisation of work, and the rates of pay, on the large sites that characterised construction in the long eighteenth century in London. There are two types of work for which eighteenth-century building records survive: ‘ordinary’ and ‘extraordinary’. Work that was termed ‘extraordinary’ for crown and city was, for instance, large new building projects in the public sphere. That described as ‘ordinary’ work was routine maintenance or repair. By way of example, the everyday repair of London Bridge was ‘ordinary work’; the construction of Westminster Bridge was ‘extraordinary’. Fixing the roof of a city church would have been ‘ordinary’. The construction of new churches, ‘extraordinary’.

The focus of this thesis is the contractors and operatives who built the ‘extraordinary’ large public projects, such as the new St. Paul’s Cathedral, the city churches, Westminster Bridge, and who carried out ‘ordinary’ works for city institutions such as London Bridge and Middle Temple. This first part of the chapter tries to put that work into the context of building generally in London in the period. The second looks at the people who undertook the work, and the last part examines the sites as sources for projects and wage data.

“Towards the end of the seventeenth century London became the largest city in Europe”.¹ The population rose from 200,000 at in 1600 to nearly half a million by 1670, by 1700 it was 575,000; by 1750 675,000, and almost a million by 1801.² Such massive population growth and associated consumption made London an ‘engine for growth’.³ The expansion of the gentry and merchant classes and their predilection for London residences and new building has been cited as the cause of the development of the West End.⁴ This trend had a profound impact on the built environment.⁵ The second half of the seventeenth century saw a shift in the scale and scope of public and private building in London and the two centres –city and

¹ E. A. Wrigley, "A Simple Model of London's Importance in Changing English Society and Economy 1650-1750," *Past and Present* 37, no. 1 (1967). p.44

² E. Anthony Wrigley, "Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period," *The Journal of Interdisciplinary History* 15, no. 4 (1985). Table 1. p.686

³ Broadberry et al., *British Economic Growth 1270 -1870*. pp.271-2

⁴ Lawrence Stone, "The Residential Development of the West End of London in the Seventeenth Century," in *After the Reformation : Essays in Honor of J.H. Hexter*, ed. Barbara C. Malament and J. H. Hexter (Manchester : Manchester University Press, 1980). pp.167-212

⁵ Allen, *The British Industrial Revolution in Global Perspective*. pp.92-3

port, and Westminster – were ‘joined together’.⁶ From the 1620s, with an increasingly wealthy population, private individuals, particularly merchants, landowners and office holders, had begun to invest in constructing housing in new areas of the city. New style townhouses and terraces grew up in the area north and west of the Inns of Court; Covent Garden was developed in the 1630s, Lincoln’s Inn’s fields in the 1640s and 1650s.⁷ Although there are no estimates of how many new buildings were put up in the period, the evidence of two maps or surveys of London from 1664 and 1720 show large development in both east and west of the city and Westminster in the period.⁸ Much construction was carried out by small scale carpenters and bricklayers speculating, often against Royal or city prohibitions on building.⁹

The Great Fire of London literally destroyed the city; it “laid waste to about 440 acres, destroyed over 13,000 houses and 89 churches and chapels, rendered homeless about 200,000 people and, altogether, caused losses variously estimated at between £9,900,000 and £10,788,000”.¹⁰ The rebuilding challenged supply chains, particularly in brick, and the regulation of land and leases.¹¹ The city was not only rebuilt, but also improved, with works mostly finished by the early to mid-1670s.¹² It is impossible to accurately calculate the amounts expended, but if one estimates an average of £300 per house the total expended would have been £3,900,000 solely on private houses, or £780,000 per annum over five years.¹³ Based on British GDP in 1670 of approximately £52m this would represent approximately 1.5% of GDP for those five years, just for the private reconstruction.¹⁴

If before the Fire much London housing had been timber, after the fire most was constructed of timber and brick.¹⁵ The rebuilding of the city churches and St. Paul’s also required large

⁶ Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*. p.7.

⁷ The best account of these developments remains N. G. Brett-James, *The Growth of Stuart London* (London: Allen & Unwin, 1935).pp.151–171, {Summerson, 1945 #1237} chapters 2 – 5.

⁸ Both are shown and reviewed in McKellar, *The Birth of Modern London*.pp. 18-20.

⁹ William C. Baer, "The House-Building Sector of London's Economy, 1550–1650," *Urban History* 39, no. 3 (2012).pp.409-430

¹⁰ Knoop and Jones, *The London Mason in the Seventeenth Century*p.5

¹¹ T. F. Reddaway, *The Rebuilding of London after the Great Fire* (London: E. Arnold, 1951).pp.72 - 26

¹² Ibid. pp.281 - 2

¹³ McKellar, *The Birth of Modern London*.p. 65, estimates the cost of building houses at between £100 and £500 in 1686. This may be a low estimate as it is for building terraces and in bulk, moreover it is only based on the builder’s costs, not the price to the owner /occupier. The costs of a gentleman’s’ house in the 1760s is estimated at £1700 by William Pain, in his ‘Builders Companion’

¹⁴ The GDP figures come from Broadberry et al., *British Economic Growth 1270 -1870*.p.238.

¹⁵ Summerson, *Georgian London*.pp.65-6

quantities of stone.¹⁶ Although the demise of the wholly timber built structure might lead to conclusions that carpenters lost some market power or work, in fact stone building required the input of a great deal of carpentry, either scaffolding or centring for arches and vaults.¹⁷ The rebuilding boom was one for all trades.

The late seventeenth-century private housing building boom was characterised by speculation by financiers, such as Nicholas Barbon, who obtained and then sold on the building leases on newly released property of landowners.¹⁸ These leases were then taken up by established entrepreneurs and city office holders who hoped to profit from the sale of the newly completed houses. McKellar showed that many of these contracts involved a complex system of mortgage credit, shares and subcontracts, rather than cash exchanging hands. One of the most prolific carpentry firms in the business of building these sorts of properties was that of John Foltrop, city carpenter 1686 to 1698.¹⁹ The number of building deeds issued annually peaked in 1721.²⁰

The Fire followed shortly after the Restoration of Charles II and punctuated a period distinguished by architectural ambition, where great projects would be the legacy of a new era. The Crown had generally increased its expenditure on building since the beginning of the seventeenth century. Expenditure under James I had already risen to four times the level seen under Elizabeth.²¹ The re-establishment of the Office of Kings Works at the Restoration, in a manner echoing Inigo Jones's organisation of the same before 1642, was a strong signal of interest in investment in palace building, and expenditure in the Office of the King's Works from 1670 to 1686 increased from £20,000 per annum to £45, 000 per annum.²²

The scope of Crown enterprise extended beyond new palaces and buildings for the royal household to institutional spaces and public facilities, such as the Hospitals of Greenwich and Chelsea. The city of London's institutions too, although without the same financial resource, acknowledged the need for the improvement of public buildings, such as the plans

¹⁶ Reddaway, *The Rebuilding of London after the Great Fire*.pp122-3

¹⁷ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."pp.314 – 6.

¹⁸ McKellar, *The Birth of Modern London*. pp.38-58, 93-114.

¹⁹ Ibid. LMA MSS/133/21

²⁰ Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*.p.81. Summerson, observed a boom from 1713 onwards, Summerson, *Georgian London*., p. 1.

²¹ Howard Montagu Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*, 6 vols. (London: Her Majesty's Stationery Office, 1976).p.32.

²² Ibid.p.40 - 42

for the repair of St. Paul's Cathedral from 1635. In the aftermath of the Fire, Parliament assigned a portion of the coal tax to cover some of the costs of rebuilding. The city also wharfed the Fleet ditch, and designed a new Thames' Quay. Knoop and Jones estimated the value of mason's contracts alone on these 'municipal' projects to have been £24,482.²³ The total cost of these projects was much higher: wharfing the Fleet ditch, where the work was led by Thomas Fitch in 1671 – 4, cost £56,000.²⁴ Other notable works executed at the same time were Montague House and the new Bedlam Hospital.²⁵

A central part of the public side of reconstruction after the fire was replacing destroyed churches. Of the fifty new city churches needed, forty-two were completed by 1686 at an average cost of £5,275. The Wren Society put the total costs at £263,786, 10s 4.5d. spent between 1670 and 1694. Accounts for five churches were missing. If we assume they were built at the average cost of £5,367, this implies the total price of the rebuilding program was £290,622.²⁶ The final total may even have been higher. Peter Jeffery, who examined individual parish records put the total costs at £362, 793s 6d., as this was the amount paid out by the coal tax. The difference may be accounted for by interior decoration costs.²⁷ A further fifty churches were planned from 1711, but only twelve were actually completed.²⁸ The expenditure on St. Paul's Cathedral alone was £804,758 to 1716.²⁹

Throughout this period, there were further substantial investments in London's infrastructure. To give just a few examples, work was carried out by John Fitch and Thomas Cartwright on the Holborn Bridge and the river above it, although the costs are not identifiable. A timber bridge over the Thames between Fulham and Putney was built in 1729, at a cost of £12,000.³⁰ The mason's contract alone for Westminster Bridge (1738 – 50) was £155,000, and the project was undertaken by Andrews Jelfe and Samuel Tuffnell, whose contracts in the first year were for £27,000.³¹ The total cost of the bridge has been

²³ Knoop and Jones, *The London Mason in the Seventeenth Century*p.6

²⁴ Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830*.pp.228-9

²⁵ Ibid.p.337

²⁶ Wren Society Vols., (Oxford: University Press, 1924 - 43). Vol.XIX

²⁷ P. Jeffery, *City Churches of Sir Christopher Wren* (Hambledon Continuum, 2007).p. 356.

²⁸ Yeomans, "Managing Eighteenth-Century Building."p.5. {Summerson, 1945 #1237} p.69.

²⁹ Campbell, *Building St Paul's* The amount raised or borrowed by the cathedral was £1,157,782 10s. 2 ½ d. and only £721,552, 7s.7 ¼ d was spent on building costs, the difference was in interest and other associated cost of building. pp. 8, 68

³⁰ Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830*.p. 824.

³¹ TNA Work 6/46

estimated at between £198, 000 and £397,000.³² Later in the century, Blackfriars Bridge cost £166,000 in 1760 -69, while the costs for Somerset House were £330,000 to 1794.³³

1650 to 1800 is held to be the period in which the modern process of architectural design was born.³⁴ Inigo Jones, appointed Surveyor to the king in 1615, is usually credited as the first architect in the modern sense in England.³⁵ The period after the Great Fire is also when the engineering and design capabilities and innovation of those practicing architecture in England reached a zenith.³⁶ The most dominant, prolific and influential individual in this period was Sir Christopher Wren, who worked with the most ambitious and innovative engineers of his age, such as Robert Hooke, and who trained many subsequent important architects of the eighteenth century, such as Nicholas Hawksmoor. He also developed a network of known and trusted contractors.

As the next section will show, building work on the scale and scope of projects such as the new St. Paul's was achieved by large firms who could execute architects' ambitious designs and utilize both new and existing techniques. These firms were headed by experienced and highly capitalised contractors who were capable of managing operations involving hundreds of men, of different and varying trades and skill, at multiple sites, with supply chains extending across the country. They were a world away from the traditional picture economic historians have of masters and journeymen operating in small artisanal teams. This next part of the chapter draws on secondary sources to put their work in the context of the relevant economic history and that of London's built environment.

³² Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830*.p.824 gives the first figure. TNA Work 6/46 does not have complete accounts, LMA Westminster bridge Original manuscripts, notes on, p.4 B/CWB/I/1 gives the higher figure.

³³ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*.p.467.

³⁴ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.

³⁵ Ibid. p.11.

³⁶ Addis, *Building: 3,000 Years of Design, Engineering and Construction*., chapter 4.

3.2. Contractors.

Who were the men who undertook the delivery of these large scale projects? In this section, I discuss what is already known of the master workmen, or artisans who undertook building contracts with the city and crown, and who contracted with the institutions which have provided the sources for previous authors.

A body of research in architectural history has sought to detail the backgrounds and biographies of the largest contractors, and particularly those who worked for Sir Christopher Wren.³⁷ The 'master craftsmen' who built St. Paul's, the new towers at Westminster Abbey, Greenwich Hospital, and who carried out work at the Middle Temple were rich businessmen who managed large teams of labour and profited richly from the contracts they took on. In much of the extant literature they are considered architects themselves, while elsewhere they have been seen sometimes as craftsmen, sometimes sculptors and artists. Knoop and Jones argued that due to the length of their partnerships and the scale of their business we should view them as heads of firms.³⁸ It is this perspective that I adopt here, and for this reason the term I use throughout for those responsible for building contracts is contractors rather than master craftsmen, as contracting was their primary function.

Architectural historians agree that well before the late-seventeenth century contractors were capable of providing design and engineering solutions, as well as managing the business of construction; they sold not just building services, but design, to the crown and other important institutions and clients.³⁹ After the mid-seventeenth century, these select contractors worked increasingly with and for architects, rather than directly with clients. Much twentieth century architectural literature sees this as somehow marking a step down for the building trade, a loss of status and aesthetic agency.⁴⁰ Another strand ignores the lament

³⁷ I refer to the work of Colvin, *A Biographical Dictionary of English Architects, 1660-1840*. Ingrid Roscoe, Emma Hardy, and M G Sullivan, "A Biographical Dictionary of Sculptors in Britain, 1660-1851," (Paul Mellon Centre for Studies in British Art, 2009). Beard, *Craftsmen and Interior Decoration in England 1660-1820*; Melody Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford" in *First Conference of Construction History Society* (2014).pp.273-80, And all Wren Society Vols.

³⁸ Knoop and Jones, *The London Mason in the Seventeenth Century*p. 47

³⁹ Knoop and Jones, *The Mediaeval Mason : An Economic History of English Stone Buildings in the Later Middle Ages and Early Modern Times*; Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.pp.4-11. Ayres, *Building the Georgian City*.pp.8-28.

⁴⁰ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*. The introduction is almost a lament for a master artisan. Summerson, *Architecture in Britain 1530 - 1830*. created a whole new oeuvre of seventeenth-century architecture – the 'artisan style', to justify the design capability and skill of English building contractors.

and just writes about masons and plasterers as if they were artists.

The Henry Moore Database of the Biographical Dictionary of Sculptors in Britain 1660-1851 is a case in point. The entry for Joshua Marshall, who laid the foundations of St. Paul's, begins with a long description of his art:

“He was the eldest son of Edward Marshall, from whom he probably received his training.Like his father, Marshall held office in the Masons’ Company...[..]. He became master in 1670 [...] He carried out much work at the royal palaces. [...]Only ten of his memorials from the pre-Fire period are signed or documented...[..] .[In] the earliest identified Marshall made use of one his father’s compositional formulae, a half-length Figure in a swagged architectural niche. Sir John Cullum, writing in 1774 ... noted that the bust had admirable vitality and the hands and draperies were finely rendered: ‘in short it would be no discredit to any of our most modern artists’ (Nichols 1812-15,VIII, 674, quoted by Gunnis 1968, 255). The monument to John Whattonalso owes debts to his father’s work, has three frontal busts ...similar in style to fifteen other monuments attributed by White to Joshua Marshall. Another recurring formula makes use of a panel architrave with a segmental top surmounted by diminutive pediments and indented along the lower edge to make room for a winged cherub’s head. The first recorded instance of its use is on the monument to Sir John Gore...”.

However, the entry goes on to note that:

“He must have employed a large work-force, for he was extensively involved in the City’s rebuilding programme and handled large sums over a period of 17 years. He rebuilt or helped rebuild six of the City churches, largely under the supervision of Sir Christopher Wren: they were St Mary, Aldermanbury, 1670-86 (£3,190), St Stephen, Coleman Street, 1674-81 (£2,160), St Peter, Cornhill, 1677-87 (£741), St Mary-at-Hill, 1670-76 (£1,928), the tower of St Clement Dane’s, 1682 (£2,525) and St Bride’s, Fleet Street, 1670-84. His work at St Bride’s brought in £8,964 between 1670 and 1684 (35). He was also employed at St Swithun’s from 1677, but died before the building was finished and the payments were made to his executors Henry Phillips and John Oliver on 18 March 1680. In 1674 he began work as one of the mason contractors at St. Paul’s Cathedral, responsible initially for laying foundation

walls. He was still working in the choir in 1678 at the time of his death, when he was due the sum of £2,391...Marshall was the master mason for the Monument to the Great Fire, working under Wren and the architect Robert Hooke, a project that was delayed, according to Wren's son, by the difficulty Marshall experienced in obtaining stone of an appropriate size and shape. Over a four year period Marshall handled payments of more than £11,000..."⁴¹

Marshall was probably capable of working stone, but, as should be apparent, his management commitments and time dedicated to contracting and accounting raise serious questions about the provenance of statutory work ascribed to him. It is more likely accurate to say that his statutory work is "from the workshop of", not by his own hand.

Marshall was not alone in having many valuable and large contracts and many sites under management, all combined with public office. For example, in the period 1690 to 1710 Edward Strong had large operations at St. Paul's, Winchester, and Greenwich Hospital and was master of the Mason's Company in 1696.⁴² His work at Greenwich and St. Paul's was concurrent. Likewise, Christopher Kempster had operations at St. Paul's, St. James' Garlick Hill, Tom Tower in Oxford and was master of the Masons' Company in 1691 and again in 1700. Thomas Wise was a major contractor at St. Paul's, Portland, Winchester, and London Bridge. Although some historians' accounts treat these contractors as 'masters', the scale of their business stretches any association with an artisanal workshop setting.

Some sense of this can be obtained by looking again at the sums involved in these contractors' operations. The accounts at Westminster Abbey show that Edward Tuffnell, mason, billed the Abbey £1,971 17s 2d. in 1712 – 13 for work done there. In 2013, the equivalent in labour cost terms would have been £3.82m, as a share of GD £41m, and using a GDP deflator £269,000.⁴³ At St Mary Le Bow church, one of the more famous Wren Churches, the masons' charges from Thomas Cartwright and John Thompson for 1671 – 77 were £9,279 15s 14d out of a total of £15,421.⁴⁴ As can be seen from table 2.2.a, this was not unusual.

⁴¹ Roscoe, Hardy, and Sullivan, "A Biographical Dictionary of Sculptors in Britain, 1660-1851." Entry for Joshua Marshall 1628 to 1678.

⁴² Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.pp. 577-9

⁴³ Calculated at <http://www.measuringworth.com/ukcompare/relativevalue.php>

⁴⁴ Wren Society, Volume XIX,p.89

Bill Addis described Robert Hooke and Christopher Wren as operating the world's first architectural engineering consultancy.⁴⁵ Like any consultancy they had suppliers who they used repeatedly, and those suppliers had specialist skill. Table 2.2. lists the mason contractors at St. Paul's Cathedral and the value of their contracts. Wren's master masons and carpenter contractors were sought for their input to particular and specific engineering design or process problems, and many of them worked for him over and over again. Joshua Marshall may have got the first contract at St. Paul's, but the largest of the contracts went to a name which has become better known since: Thomas Strong. In the following paragraphs I summarise what is known of the training, work and wealth of the Strongs and other contractors. Where specific notes are not given the information comes from Colvin's Biographical Dictionary.⁴⁶

Thomas Strong (1634 – 81) came from an established family of quarry owners in Taynton, Oxfordshire. The family have been traced to Timothy Strong, who acquired freestone quarries in Little Barrington in Gloucestershire in the early seventeenth century, and operated for 'extraordinary rates' at St John's College, Oxford in the 1630s. His son Valentine continued the business, and he in turn had six sons including Thomas, all masons.⁴⁷ Thomas carried on the business and quarry and is credited with work at Longleat among other places. It may be that he started working with Christopher Wren on his project at Trinity College, Oxford. He took his freedom of the Mason's Company in London in 1670 by redemption. So close was he to Wren that he reputedly laid the first stone of St. Paul's.⁴⁸ He died in 1681 leaving the business to his younger brother Edward. The Strongs feature prominently in the St. Paul's accounts and provided Burford Stone as well as masons work according to Colvin.⁴⁹ In the same period, the Strongs partnered the Kempsters in the construction of St Stephen's Walbrook, where the total value of the contract was £4,423 18s. 6d. between 1674 and 1682. Edward also contracted for work at St Clement East Cheap, (£2661), St Mary Magdalen Old Fish Street, (£2776), St Mildred, Bread St, (£872) and St Michael College Hill (£4766), and St Benet Thames St (£1866). Edward Strong in particular was one of the most prominent masons of the age.⁵⁰ He contracted for work at St. Paul's, Winchester Palace, all of the masons' work at Greenwich Hospital, and he was the sole

⁴⁵ Addis, *Building: 3,000 Years of Design, Engineering and Construction*.p.198

⁴⁶ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.

⁴⁷ Ibid.pp.995-6

⁴⁸ Campbell, *Building St Paul's* p. 75

⁴⁹ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.p. 996

⁵⁰ Campbell, *Building St Paul's* p.76

mason contractor at Blenheim Palace. Unsurprisingly, he was also a rich man who purchased lands near St Albans in later life. His son Edward succeeded him to the business.⁵¹ The family's portrait was painted in 1732 and is in the collection of the Metropolitan Museum of Art.⁵²

Table 3.1. Mason's contracts at St. Paul's Cathedral.

Contractor	Total Bills of work	dates	Also contracted at
Joshua Marshall	£5,543 14s 5 ½ d	August 1675 - 1678	Office of King's Works, City Churches.
Thomas Strong	£7,918 10s 11 ¼ d	1675 - 1681	Trinity College, Oxford
Edward Strong	£46,446 19s 3d	1679 - 1708	Greenwich Hospital, Blenheim, Winchester Palace, St Stephen Walbrook
Edward Pearce	£13,494 17s 8 ¼ d	1678	
Thomas Wise	£5,616 18s 10d	1678 - 1686	
Thomas Wise Junior & Thomas Hill	£24,509 9s 1 d	1687 -	Bridge House, City Churches
Jaspar Latham	£10,537 14 8 ¾ d	1678 - 1693	
John Thompson	£8,089 4s 11 ¼ d	1688 - 1700	City Churches
Samuel Fulkes	£23,115 17s 10d	1688 -	City Churches
Nathaniel Rawlins	£15,751 5s 2 ¼ d	1693 -	
Christopher Kempster & Ephraim Beauchamp	£15,132 11s. 10 ½ d	1693 -	St James Garlickhythe
William Kempster	£9,019 3s 0 ¼ d	1700 – 1708	St St James Garlickhythe
Total	£185,196 7s 10 ½ s		

Source: Wren Society, Volume XX page xiii - xiv

⁵¹ Ibid. and Colvin, *A Biographical Dictionary of English Architects, 1660-1840*, pp.577-9

⁵² View at <http://www.metmuseum.org/collection/the-collection-online/search/437280>

Christopher Kempster (1627 to 1715) was also from Burford in Oxfordshire. He owned a quarry near Burford, inherited from his father William Kempster. In 1681 Wren was putting him forward to John Fell Bishop of Oxford to build Tom Tower at Christ Church Oxford in very strong terms as “a very able man, modest honest and Treatable,”⁵³ He seems to have acted as Wren’s overseer or agent on the Tower project 1681 - 3.⁵⁴ He was a partner of the Stronges at St Stephen’s Walbrook and also held independent contracts on St Mary Abchurch (£1695) St Mary Somerset (£4140).⁵⁵ He was in partnership through 1691 to 1707 with Ephraim Beauchamp at St. Paul’s. We know little of his means, but Kempster’s pocket book, surviving at the National Archives, details payment for a silver watch at £ 1 13s⁵⁶

William Kempster, Christopher’s son, was master of the Mason’s Company in 1705. He worked closely with John Thompson, before taking over his contracts at St. Paul’s. He had a son named William also, who was made free of the Masons by patrimony in 1714. The Dictionary of Sculptors records that William senior “spent four days modelling the scroll for a pilaster in the library at a rate of 2/6 per day and in 1703 he was paid £10 for making a stone cistern to hold water for making mortar. In 1704 he made a model for the geometrical staircase in the south-west tower; and he received just over £463 in June 1705 for the staircase itself.” He continued to work at St. Paul’s after his father’s death in 1715 and in 1717 was in charge of re-casing the great piers in the crypt, described as ‘very confidential work’.⁵⁷ His burial is recorded in the Garlickhythe parish register for 13 March 1719”.⁵⁸

Edward Tuffnell was the son of a burgher of Westminster and master mason and would himself become a burgher. He was buried in Westminster Abbey in 1719 and there is a large memorial to him. He owned a large property on Milbank, but little else is known of his life.

Edward Stanton paid a bond of £2,000 to succeed Tuffnell as mason to Westminster Abbey. Stanton was also part of a long-running family business. His granduncle Thomas Stanton

⁵³ Wren Society, V, p. 18.

⁵⁴ Wren Society, V, pp. 20-1

⁵⁵ Campbell, *Building St Paul's* p. 77, and see chapter 8 throughout. Strong and Kempster are referred to as dining with Hooke and Wren during work on St Stephen’s Walbroke by Colvin, Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.pp.995-6.

⁵⁶ TNA PRO106/145 small leather book with clasp

⁵⁷ Wren Society XIX, pp.102

⁵⁸ Roscoe, Hardy, and Sullivan, "A Biographical Dictionary of Sculptors in Britain, 1660-1851." (accessed at http://217.204.55.158/henrymoore/sculptor/browserecord.php?action=browse&-recid=1524&from_list=true&x=0)

had apparently established workshops at Holborn by 1635. His father William contracted with Edward Pearce for the reconstruction of St Andrew's Holborn, and he was also known for building large country houses. William Stanton contracted for the gate at St Bartholomew Hospital – and supplied a very similar quote to Middle Temple for the gate there at £550. He was one of the most established London masons of the mid seventeenth century.⁵⁹ As well as his work at Westminster Abbey and School, Edward Stanton continued this tradition, although he seems to have concentrated on monumental masonry. He was city mason from 1708.

Andrews Jelfe's father's occupation is not known but he was apprenticed to a mason in 1704. On gaining freedom his first and most well-known partnership was with Christopher Cass, which lasted until Cass's death in 1734.⁶⁰ Cass was the contractor at St Martin in the Fields in 1721.⁶¹ Jelfe later worked in partnership with Samuel Tuffnell, son of Edward, above, for the large contract on Westminster Bridge from 1738 – 45. He contracted for carving and sculpture, as well as taking on advanced engineering projects such as Westminster Bridge. In addition, he held a number of offices for the Office of the King's Works.⁶² Jelfe died a rich man with property worth £30,000.⁶³

All of these examples of contractors are tied to 'extraordinary' work. These were the heads of the firms who took on large new projects. However, the contractors on ordinary maintenance work for major institutions were not obviously different. Building contractors at Bridge House were engaged in 'ordinary work', yet they were still employing up to forty people, and submitting audited accounts, including billing up to £1,000 per annum just for labour costs.⁶⁴

In practice, the individuals operating at Bridge House overlapped with those who took on extraordinary projects. Thomas Wise Junior was the contracting mason at Bridge House from 1685, and his son held the office after him until the 1730s. His father, Thomas Wise Snr, took his freedom of the Mason's Company in 1672 by redemption; by 1678 he was Master Mason to the Office of the King's Works. In addition to his work at Bridge House,

⁵⁹ Ibid. also see Rupert Gunnis, *Dictionary of British Sculptors 1660-1851 (Revised)* (Abbey Library, 1951).p.366.

⁶⁰ BL MS27587

⁶¹ Ayres, *Building the Georgian City*. Appendix II.pp.232-6.

⁶² Roscoe, Hardy, and Sullivan, "A Biographical Dictionary of Sculptors in Britain, 1660-1851."

⁶³ Colvin, *A Biographical Dictionary of English Architects, 1660-1840*. p.3.

⁶⁴ LMA CLA/007/FN/04 /001 – 10.

Thomas Junior was the contracting supplier of Portland stone to St. Paul's, in partnership with Thomas Gilbert, so it is speculated that Portland may have been their origins. He was also a contractor on the city churches, receiving £1,019 for work at St Michael Wood Street 1670 -1687, £3,141 at St Nicholas Cole Abbey 1671 -1681, and £2,658 at St Benet Gracechurch, 1681 -1687.

Table 3.2. Contractors observed at Bridge House and their salaries.

Trade	Contractor	Annual salary	dates
Mason	Joseph Cartwright	£4	1681 -
Land Carpenter	William Gray	£4	1681
Bricklayer	G. Braithwaite	£1 10s 4d	1681
Plumber	J. Hathaway	£2 10s 4d	1681
Plasterer	Tho. Burton	£13 5s	1681
Mason	Thomas Wise	£4 (and £1 in lieu of edge tools)	1685- 1720
Land Carpenter	Thomas Russell	£4	1685 - 1706
Land Carpenter	Thomas Wilmor	£4	1706- 1785
Tide Carpenter	Jeremy Bower	£4	- 1710
Tide Carpenter	Bartholomew (and son) Sparruck	-	1710 – 1757
Tide Carpenter	Jos. Nixon	£64	1757 – 1770

Source: LMA Bridge House Estates, Remittance books. CLA/007/FN/05/006 – 9, 061

The Wise family reflect the norm, not the exception. Bridge House's receipt or remittance book show salaries paid to workmen or contractors. In 1681 the salaried contractors included Joseph Cartwright, mason, and William Gray, carpenter. Cartwright was the son of Thomas Cartwright, one of the leading sculptor contractors in mid-seventeenth century London who supervised the building of St Thomas's Hospital to 1702.⁶⁵ Similarly, the chief carpenter William Gray was also a contractor to the City Churches. From their position at Bridge House, they were paid £4 per annum each, and 11s. a week. They presented bills for their men based on days worked and materials used. When Thomas Wise Jnr. succeeded Cartwright as mason in 1685 he maintained the same salary of just £4 per annum plus

⁶⁵ Roscoe, Hardy, and Sullivan, "A Biographical Dictionary of Sculptors in Britain, 1660-1851." http://217.204.55.158/henrymoore/sculptor/browserecord.php?action=browse&-recid=473&from_list=true&x=0

another £1 for edge tools until 1720. The next mason on the books, Kinleside, did not receive a salary. However, Thomas Wilmor, paid £322 for his position in 1706, and his descendants and successors, William, Thomas, and William Wilmor, each carried on taking the salary of £4 per annum until the late 1780s while working for Bridge House.

Contractors were sometimes related by marriage or connected through apprenticeship.⁶⁶ A study of the financial strategies to survive late payment of crown and city in the seventeenth and eighteenth century cited family or dynastic capital as a major factor in their connections, but it seems that non-familial links also thrived. There were many partnerships between these known successful contracting firms.⁶⁷

One indication of the significance of partnerships can be found in the way in which the reconstruction of London's churches was organised. Of the fifty-four City Churches, eighteen of the carpentry contracts were awarded to partnerships. John Longland, chief carpenter at St. Paul's, undertook the carpentry as a sole contractor on nine churches, but he was partner in the contract at another six churches, all with different combinations of contractors. Some of these contracts had four partners. Matthew Banks was involved in twelve contracts, of which five were awarded to him solely. William Gray was contractor on just one, in partnership with Israel Knowles.⁶⁸ Knowles himself, also a contractor at St. Paul's, was involved in nine, just two solely. The masons' contracts for the churches show partnerships too, but not quite as many or complex. There was one partnership of three men, Joshua Marshall, Abraham Story and Thos. Humphreys at St. Peter Cornhill. Marshall also partnered Samuel Fulkes on two Churches, and Fulkes in turn also took on four churches solely. Edward Strong partnered Christopher Kempster at St Stephen Walbroke, as well as undertaking six solely. Christopher Kempster contracted as sole mason at St James, Garlick Hill.⁶⁹

At St. Paul's Cathedral, the long term partnership of Thomas Hill and Thomas Wise survived for 21 years, that between Christopher Kempster and Ephraim Beauchamp 15 years.⁷⁰ Edward Strong and Thomas Hill partnered on the masonry contract at Greenwich, in

⁶⁶ All apprenticeship information has been taken from Cliff Webb, *London Livery Company Apprenticeship Registers, Abstracted and Indexed by Cliff Webb.*, vol. 27. Mason's Company 1663 - 1800 (London : Society of Genealogists 1996).

⁶⁷ Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford ".pp.273-280

⁶⁸ The same carpenter contractor at Bridge House. See LMA CLA/007/FN/03/ 019A

⁶⁹ Wren Society, Vol XIX, pp.46-52, Table of the Fifty Four Churches with Trades and Costs.

⁷⁰ Knoop and Jones, *The London Mason in the Seventeenth Century ...* .p. 47.

1696, although by 1699 it seems only Strong was billing.⁷¹ Another mason, Ephraim Beauchamp, is mentioned in the minutes but the partnership seems to have gone no further.⁷² It is well known that Andrews Jelfe and Samuel Tuffnell partnered on the stone and masonry construction of Westminster Bridge. But Jelfe's letter book shows correspondence to do with the partnership with Christopher Cass, known for the masonry contract at St Martin's in the Fields, only dissolved in 1734 on Cass's death. The letter book shows that in 1741, seven years later, he was still dealing with finances and bills arising from that partnership.⁷³

Knoop and Jones' search of the records in 1935 contains relevant information about partnerships.⁷⁴ Major contractors such as Nathaniel Rawlins and Samuel Fulkes were free of companies other than the masons, so the list cannot be exhaustively researched but of those referred to in this study the following case studies show some of the networks and relations.⁷⁵

Edward Strong married Martha Beauchamp, she was the sister of Ephraim, another St. Paul's mason contractor.⁷⁶ He bound his own son (Edward II) apprentice in 1691, and another relation from Taynton in Oxfordshire in 1717.⁷⁷ His elder brother Thomas apprenticed John Strong, son of his brother Valentine in 1672. Christopher Kempster bound as an apprentice Edward Tuffnell, son of John, of St Margaret, Westminster in 1692; both Tuffnells were mason contractors at Westminster Abbey. After his apprenticeship, and on attaining freedom of the Mason's Company Andrews Jelfe went, reputedly, into partnership with Strong and Christopher Cass.⁷⁸ John Devall (a major Office of King's Works contractor in the late eighteenth century) was apprenticed to Joshua Fletcher (a contractor at St. Paul's, table 1.5.a) in 1718. Thomas Wise, mason at Bridge house apprenticed family members in 1673, 1689, 1715, 1717. (In fact there are records of a Thomas Wise taking an apprentice in 14 years between 1672 and 1710). Joseph Kinleside, mason contractor at Bridge House from

⁷¹ TNA ADM 67/2

⁷² Knoop and Jones, *The London Mason in the Seventeenth Century* ... , p. 41

⁷³ Andrews Jelfe letter Book BL MS 27587, p. 38 dealing with bills on Hawksmoor residence.

⁷⁴ Knoop and Jones, *The London Mason in the Seventeenth Century*pp.9 -18

⁷⁵ Ibid.pp.15 -17

⁷⁶ <http://217.204.55.158/henrymoore/sculptor/browserecord.php?-action=browse&-recid=2609>

⁷⁷ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.343

⁷⁸ http://217.204.55.158/henrymoore/sculptor/browserecord.php?-action=browse&-recid=1457&from_list=true&x=0

the 1730s on was apprenticed to William Leslow in 1729, who was also a contractor at Bridge House.⁷⁹

What does this short prosopography of the leading contractors suggest about their characteristics? Mason contractors responsible for this type of building work were most definitely of a 'merchant' class, not 'master craftsman' to apply Unwin's typology.⁸⁰

- 1) They were often dynastic: Melody Mobus typified the businesses as dynastic, depending on access to financial and social capital that could be transferred across generations to deal with late payment, fluctuating prices and other uncertainties.⁸¹ It can be seen from the list above that the Strongs, Kempsters, Tuffnell's, Stantons all worked as dynastic businesses.
- 2) These were wealthy entrepreneurs who had capital resources to fund the growth of their business activities. The Kempsters and Strongs had quarries, the Stantons and Marshalls had large statuary businesses with premises. They required well-established supplier networks and capital to finance projects carried out under the Office of the King's Works and the city's notorious long payment schedules. That finance seems to have been a product of dynastic accumulation but it is also thought that accumulated profit financed some contracts.⁸²
- 3) Many came from outside London and used the livery company to naturalise and establish themselves in London work. Strong and Kempster bought freedom by redemption and Strong also purchased it for others of his employ it seems.⁸³
- 4) As well as family ties, they made heavy use of partnership and other non-familial links in contracting.

This brief description of the work and backgrounds of what have previously been written about as "master craftsmen" has used evidence of the scale of their businesses and personal

⁷⁹ LMA COL/CC/BHC/10/006.

⁸⁰ G. Unwin, *Industrial Organisation in the Sixteenth and Seventeenth Centuries*, ed. T. S. Ashton (London: 1963).

⁸¹ Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford".

⁸² See Colvin's remarks on Fulkes and Jelfe Colvin, *A Biographical Dictionary of English Architects, 1660-1840*. p.3.

⁸³ Knoop and Jones, *The London Mason in the Seventeenth Century* ... pp.13-14

backgrounds of wealth and connections to cast them as businessmen, not what are usually termed artisans.⁸⁴ The next section describes the sites and projects they worked on.

3.3. Sites and sources.

Despite the impression often given in the extensive literature about the paucity of evidence of wages in early modern London, there are actually voluminous sources in building accounts of day rates. However, each has limitations for the researcher of building wages.

In this section, I review the main sites and primary sources from which previous researchers have extracted wages and which are used in my thesis. As has been discussed in chapter one, the sources have been cited by authors, but not much consideration has been given to the type of work that was being carried out, or the terms or contracts under which it was undertaken. As we will see, these sites are distinctive both for their scale and administrative processes, both of which affect the kind of wage evidence available.

When data from these sources are used it is assumed and implied that the monies recorded were the day rates that the worker (craftsmen or labourers) received. As I will show, the records do not give details of payments to individual men, they give details of bills submitted by the main contractor for work done, which may or may not have included day rates, and the later payment dates of those large bills. There is only one group of workers who were most probably paid directly in the period of this study. Labourers at St. Paul's Cathedral 1675 – 1711 were paid by the clerk of works. It is feasible that only foremen were paid, and that they paid their teams and their hands, but this cannot be proved.⁸⁵ The following reviews what can be known of the work and payments systems at the sites.

⁸⁴ James Farr, *Artisans in Europe, 1300-1914, New Approaches to European History* (Cambridge: Cambridge University Press, 2000). Farr's definition p.3 does acknowledge those who ran enterprises, but the bulk of his cases and research is those who performed craft functions manually.

⁸⁵ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction." Campbell's view emerges in the paper as that only overseers were paid.

Image 3.1. Westminster Abbey Showing the West Towers designed by Nicholas Hawksmoor 1722-45.



Source: https://upload.wikimedia.org/wikipedia/commons/e/ea/Westminster_Abbey.jpeg

Westminster Abbey dates from 960 but the current building dates from the reign of Henry III. Major work was undertaken during the reign of Henry VII and the church has been a “Royal Peculiar”, solely responsible to the sovereign, since the late sixteenth century. In the early eighteenth century it received major repairs and new stonework under the direction of Christopher Wren, and from 1722-45 its famous towers were designed by Nicholas Hawksmoor. The Abbey has a floor area of 32,000 square feet and is up to 156 metres in length.⁸⁶ The work between 1712 and 1719 was under the auspices of the Act for the Building of Fifty New Churches, and thus funded by the coal tax.⁸⁷ The accounts that Elizabeth Gilboy used for her research in the early 1930s were the Christopher Wren fabric books. The books give totals paid to all contractors providing materials or labour to the

⁸⁶ View details at http://www.westminster-abbey.org/data/assets/pdf_file/0009/86076/ABBEY-Dimensions-for-web-.pdf

⁸⁷ {Summerson, 1945 #1237} p.69

Abbey for repairs in biannual accounts running September to March (Lady Day to Michaelmas), 1712 – 19, as seen in Table 3.3.

Expenditure in the years 1712 – 1719 was between £2,500 and £3,500 annually. The accounts were signed by a Samuel Barton Thos. Nots, Laurence Broderick of the Abbey, John Battley, paymaster, William Dickinson, surveyor, and Christopher Wren (Junior). A committee to oversee the works comprised the Lord Bishops of Rochester and Carlisle, and Dr. Barker and Dr. Mandeville in 1722.⁸⁸

Table 3.3. Contractors at Westminster Abbey 1712-19.

Westminster Abbey	Contractors 1712 - 1719
Edward Tuffnell	Mason
Elizabeth Gregory	Carpenter
Goo Mortimer	Plumber
Edward Drew	Glazier
Charles Handford	Painter
Jon Tufnell	Joyner
John Hester	Bricklayer
Richard Adams	Carter
Widow Spoone	Iron Smith
Ralph Sims	Labourers
Thomas Page	Ropemaker
John Peerman	Timber

Source: Westminster Abbey Muniments 34517

It is important to note that the Westminster Abbey accounts, like many other sources, are a summary of bills submitted to the paymaster and subsequently approved. No working craftsmen were directly employed; there are no daybooks, nor any call books. If original bills are retained in the Abbey's records they are not catalogued in a chronological or project sorted order, and so we have no sight of any negotiation between the original claim or bill and the final allowance by the construction committee. Remittances are also preserved at Westminster and show prices paid by the Abbey and School for food over the long run. The accounts also include payments for building materials, labour of all different kinds, and services such as auditing and surveying. The Abbey has building accounts over a very long

⁸⁸ Westminster Abbey Muniments 34517

period. The Muniments room does not publish a catalogue, and the card catalogues that do exist does not run chronologically or thematically. In addition to the Wren Fabric books used by Gilboy, I analyse various associated bills and papers that shed light on the management of the construction at the Abbey.⁸⁹

Image 3.2. Greenwich Hospital, view from the River front towards the Queen's House.



Source: openbuildings.com

The day rates for labourers and craftsman at Greenwich Hospital have been published or used many times, by Gilboy, Bowley, and others.⁹⁰ The site, over six miles from Westminster, and five miles from St. Paul's was planned as a palace in the 1660s and a large building erected, but in the 1690s it was allocated as the new site for a Hospital for Seamen. Christopher Wren designed the new buildings and the clerk of Works and Surveyor was Nicolas Hawksmoor. Summerson thought Greenwich was one of the last substantial

⁸⁹ I consulted catalogue numbers 34513- 34514, which are the Fabric books, notes and loose papers in 34517, bills and loose papers in 34552-62.

⁹⁰ Gilboy, *Wages in Eighteenth Century England*; McCulloch, *A Dictionary, Practical, Theoretical and Historical of Commerce and Commercial Navigation, 1789-1864*; Bowley, *Wages in the United Kingdom in the Nineteenth Century : Notes for the Use of Students of Social and Economic Questions*.p 81- 2, McCulloch, *A Dictionary, Practical, Theoretical and Historical of Commerce and Commercial Navigation, 1789-1864*.

projects of ‘royal enterprise in building’.⁹¹ Its vast quadrants were planned and designed by Wren, but both Nicholas Hawksmoor and John Vanbrugh used it as a show case for dramatic colonnades, elevations and arches. The majority of the Wren phase of building was carried out between 1698 and 1709. Accounts of the Fabric Committee survive at the National Archives.⁹² In this study, alongside the account and minutes presumably used by Gilboy for her source for wage rates, I used the account book of the main mason contractor Edward Strong held at the London Metropolitan archives.⁹³ Strong’s book is a copy of bills submitted to the Hospital, and it shows bills discounted and the proportion of day bills to measured ones at Greenwich. I have not found any records of Strong’s that show what he actually paid his men.

Contracts and minutes from the Fabric Committee show that the hospital retained Nicholas Hawksmoor as clerk of the works, or in a similar position from 1696. Hawksmoor took instructions from the committee and it seems drew up contracts and considered tenders. The contractors hired were solely responsible for the labour deployed on site. There are no day books nor call books. The rates recorded by previous authors are the rates that appear in bills as agreed charge out rates for man days.

Gilboy’s third substantiated source for London was the Middlesex session papers collection. These were also a source for Schwarz’s 1985 series. Schwarz gave his sources as “MJ/SP”, Gilboy’s Greenwich and London data, and the work of Postgate.⁹⁴ The Middlesex session papers are preserved at London Metropolitan Archives and they give details of building work which related to administrative or legal functions such as maintenance of gaols, asylums, bridges etc. I reviewed the session’s catalogues and papers at the London metropolitan archive, for MJ/SP and the adjacent papers relating to building Hicks Hall.⁹⁵

⁹¹ Summerson, *Architecture in Britain 1530 - 1830*, p.236

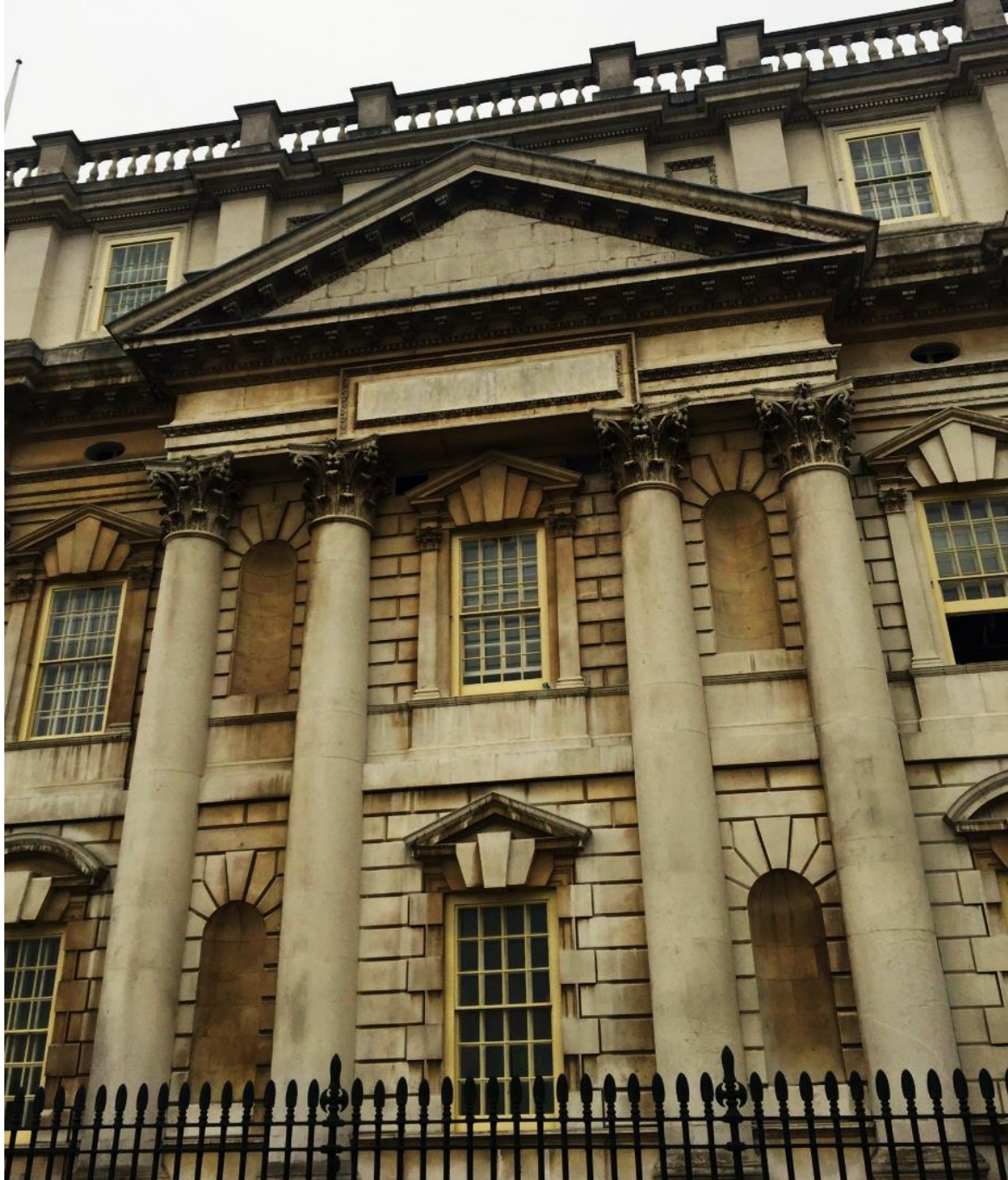
⁹² TNA ADM 67, and ADM 64.

⁹³ Strong’s book is at LMA CLC/B/227-175, the Greenwich records are at TNA ADM 67/ 2 and 4 and ADM 80/4. Gilboy’s source is given as ‘accounts of’, under Admiralty, only.

⁹⁴ Raymond Postgate, *The Builders' History*, ed. Operatives National Federation of Building Trade (London: London : National Federation of Building Trade Operatives, 1923).

⁹⁵ LMA MJ/SP 1690 – 1775 samples at roughly 5 - 10 year intervals. MA/S/001-236 for Hick’s Hall

Image 3.3. Greenwich Hospital, King Charles Block.



Source: Author's photograph.

I found fewer bills than one would expect for such a long series as Schwarz's in MJ/SP.⁹⁶ However, all the materials that were found are bills, and where rates are given they correspond with Schwarz's figures. There is not much in the way of work descriptions.

Middle Temple has been a London institution since the thirteenth century. The site, adjacent to the Inner Temple, just west of the City, and a liberty of it, was developed piecemeal throughout the centuries until the Great Fire, when it avoided large-scale damage. A fire in Middle Temple Lane in 1679, however, destroyed several houses. The Temple holds archival bills and accounts fully documented from the late sixteenth century. Jeremy Boulton logged over 1,350 entries of day rates from Middle Temple accounts in the mid-1990s. Although much of the work billed there was 'ordinary', Middle Temple employed many of the contractors found at St. Paul's and Westminster Abbey. There are many bills from Edward Stanton and the City Mason, Christopher Horsenaile, measured and approved work there.⁹⁷ The Middle Temple seems to have employed some men directly building a garden wall in 1614.⁹⁸ But a review of the rest of the seventeenth and eighteenth century accounts found no other direct payments. The bills in Middle Temple are mostly for smaller work than the large sites of Westminster Abbey or St. Paul's.

A bill for plasterer's works in 1682 shows the nature of organisation. Mr. Philips the plasterer carried out (or had some of his men carry out) the plastering work detailed "for 797 yards washing stopping whitening, colouring ..." and billed the presumably agreed amount, 7d. the unit yard, which came to, £23, 4s. 11d. The work was measured (and approved as done) by Tho. Proudlove on August 8th 1682. A note was made that a sum of £2 10s. was paid for the use of the scaffold. The bill however was then passed to Sir Christopher Wren." I have perused this bill and find it may be allowed as follows... for whitening stopping sizing and colouring in part of stonework in part on render 2d, the yrd, for use of scaffolding £1, 5s. for making the scaffolding £7, in total the demand on the Temple £16, 7s. 10d." (See Image 2.3.e). The bill gives no detail of how many days' work were involved, nor whom was paid for it. It does suggest that Mr. Philips would have been out of pocket if he was

⁹⁶ I found very few bills. Those that I did find were for rates as Schwarz described, but as I do not have any further references from either Gilboy or Schwarz I cannot draw any other features.

⁹⁷ Middle Temple Treasurers books MT.2/TRB/1682

⁹⁸ Middle Temple ACCVOUBI MT/ TOT/3/2 discussed in chapter 5, below.

charging materials and labour at cost. The difference between 7d. and 2d. a yard suggests he was not.

Image 3.4. Middle Temple bill, plasterers, 1682.

Plasterers Worke done for the Hon.^{ble}
Society of y^e Middle Temple
By John Phillipps.

for 797 yards washing stopping
whiting sizing & colouring } @ 8 s
the Temple Church at 7 s } 23. 07. 11
on the middle Temple side

Measured August 8th 1682
J^{no} Proudlove

paid for the use of the scaffolding 2 10 00

I have perused this Bill, & I find it may allowed as followeth
for whiting stopping sizing & colouring
797 yards upon stone worke in part &
part rendering at 2^d y^d yard 6. 12. 10
For making the scaffolds 7. 0. 0
For the use of the scaffolding 1. 5. 0
For new rendering 60 yards that were
fallen down as the workmen assert 1. 10. 0
16. 7 10

In all for all demands for
the middle Temple
~~Sixteen~~ pounds seven shillings & ten pence

Aug. 29. Let this bill be put according to the allowance
of the warden
Cur: Wren
Aug. 11th 1682

Source:

Boulton may have noted that pay at St. Paul's Cathedral was lower than he found elsewhere, but wages from it have not previously been used by economic historians. In one form or another, the Cathedral has been standing since Roman times. In the late sixteenth and early-seventeenth centuries it fell into an advanced state of disrepair. Inigo Jones designed and oversaw a large programme of repair and rebuilding, including a new west front, in the 1630s. However it was virtually destroyed in the Great Fire of London. A new building was planned and designed by Sir Christopher Wren, who received a warrant from the King for the design in 1675. Work began soon after, in the autumn of that year, and took at least 35 years, the building announced complete in 1711. The scale of the building is well known, but should be put in context. The dome reaches a height of 365 feet, or 111 metres. This made it the tallest building in London until the twentieth century. The length is approximately 175 metres. The exterior, wholly of ashlar masonry, is in two storeys. The most up-to-date and succinct account of this large and important monument was published by James Campbell in 2007.⁹⁹ St. Paul's was designed and executed as the most important, experimental, and beautiful building of its age.¹⁰⁰ Campbell, and Lang before him, have described the system at the Cathedral office of works. Contractors were appointed by the Surveyor and Commissioners and were responsible for their own men and their own pay, with the exception of the cathedral labourers who were paid directly by the clerk of works.¹⁰¹

In the 1920s The Wren Society compiled the accounts for all years 1675 - 1720.¹⁰² The original accounts moved from the Guildhall to the London Metropolitan archives between 2009 and 2011. One of the mason contractors was William Kempster and a box of his papers is held at the National Archives.¹⁰³ They include his personal records of the amounts he directly paid his men in 1700 to 1702 and 1706 to 1708, and have not previously been identified or used by historians.

⁹⁹ Campbell, *Building St Paul's*

¹⁰⁰ Ibid.pp.7-11, 26-34, and personal communication with the author.

¹⁰¹ Ibid.pp42-52, Jane Lang, *Rebuilding St.Paul's after the Great Fire of London* (London ; New York ; Toronto OUP, 1956).pp.80-85

¹⁰² LMA series" CLC/313/I/B: accounts" can be consulted, but the Wren Society's transcription of the account is accurate and aided by knowledgeable narrative. Wren Society Volumes XIII, XV, XVI. XX. I used the original call books at LMA CLC/313/I/E/005/MS25485

¹⁰³ TNA PRO C106/145. The papers are in relation to a chancery case 'v. Wigglesworth' the details of which I have not been able to trace. The box only contains personal effects and copies of personal papers, no depositions.

Westminster Bridge was one of the most complex and challenging engineering feats of its age.¹⁰⁴ The first new stone bridge across the Thames since London Bridge, and funded by an act of Parliament and a lottery, the ambition of the commissioners, all 175 of them, required some kind of breakthrough.¹⁰⁵ The decision to build a stone bridge was contested and the engineering techniques controversial.¹⁰⁶ Too complex to go into in detail in a study such as this, the problems were focused on both sinking the piers and centring the arches in the water.¹⁰⁷ The mason contractors were Andrews Jelfe and Samuel Tufnell. The Office of the Kings Works holds the original contract book from 1738 and some of the bills from contractors.¹⁰⁸ There are also accounts of bills which include day rates for carpenters and masons charged to the Bridge by Etheridge, master carpenter, and masons Jelfe & Tuffnell. Andrews Jelfe's letter book at the British library, retained as of interest due to his role on the Bridge, has copies of the vast correspondence to his agent throughout the period of the building of the bridge. It also has his own account of costs and payments made to masons working for him in 1734 -35 whilst doing work in London and Cambridgeshire, (four years prior to work on the Bridge).¹⁰⁹

¹⁰⁴ Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830*. Described some of the challenges, p.589, <http://www.arct.cam.ac.uk/Downloads/ichs/vol-1-887-902-cross-rudkin.pdf>

¹⁰⁵ Peter Cross-Rudkin, "Centres for Large Span Masonry Arch Bridges in Britain to 1833," in *Proceedings of the Second International Congress on Construction History* (2006).p.889

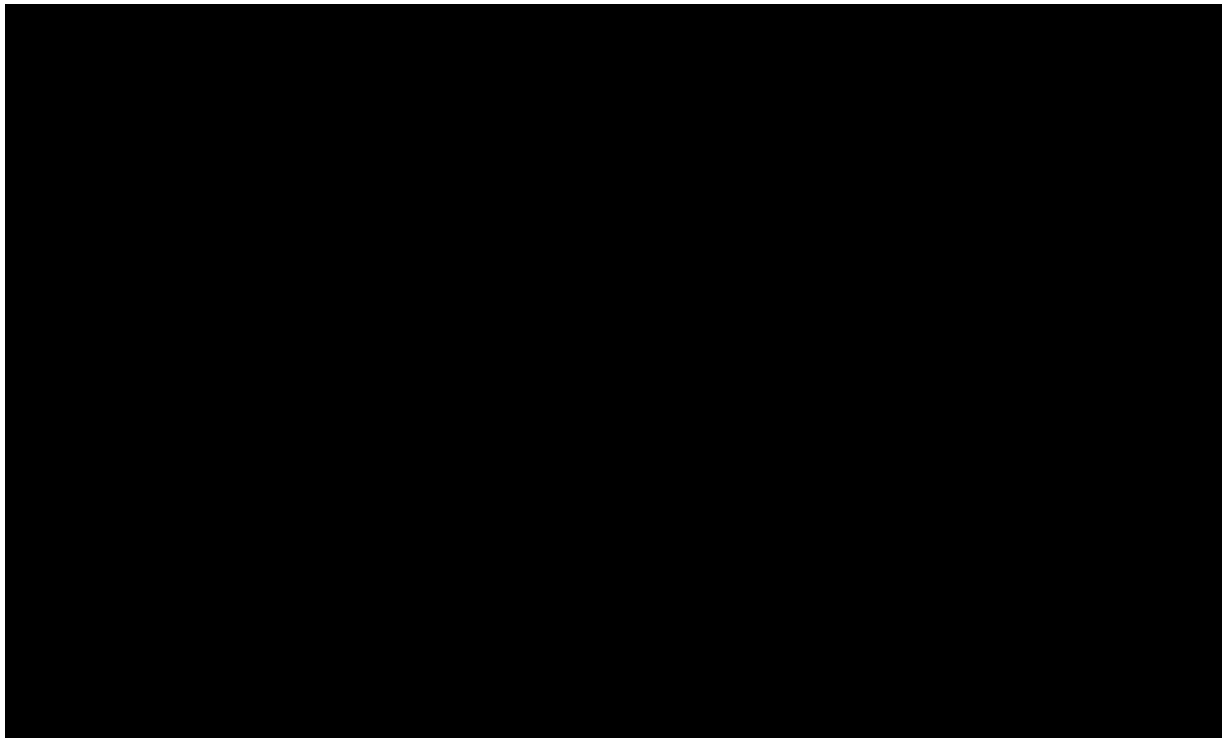
¹⁰⁶ Ibid.

¹⁰⁷ Ibid. p.890

¹⁰⁸ TNA Work 6/46

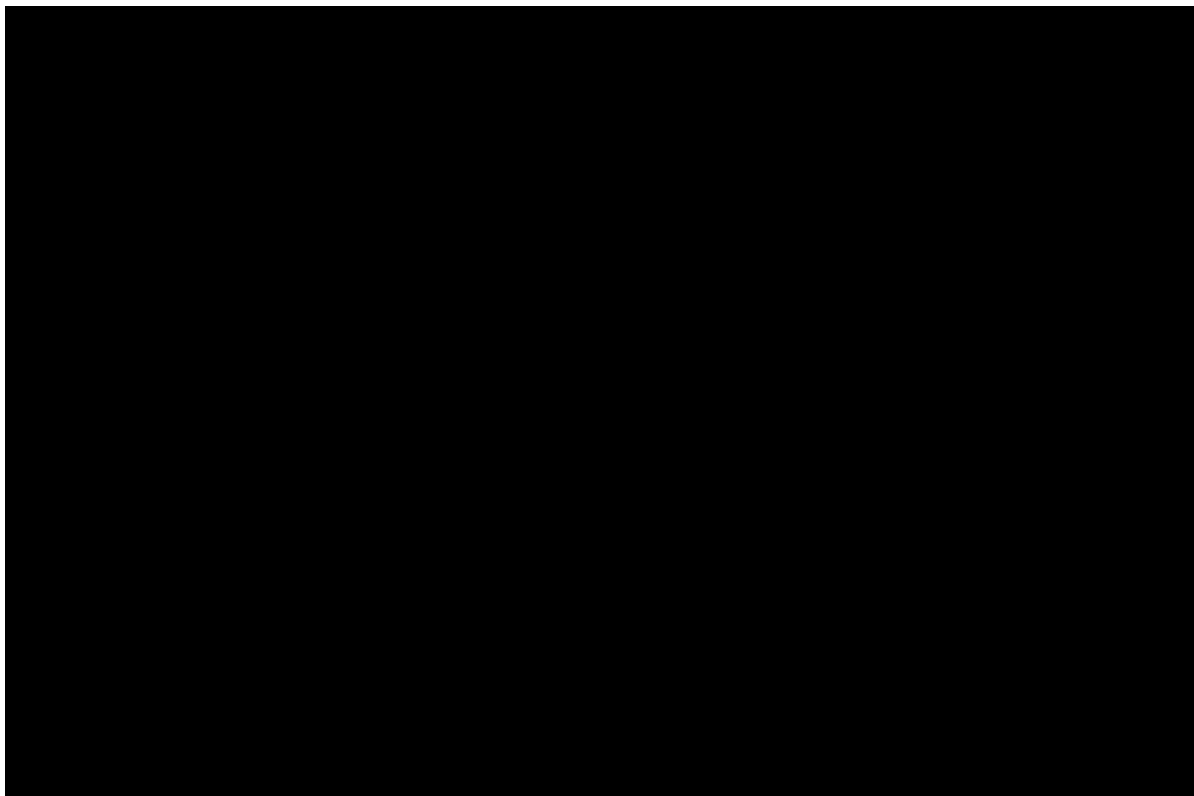
¹⁰⁹ BL 27587

Image 3.5. Old Westminster Bridge c.1750.



Source: <http://www.skydive.ru/en/londons-bridges/323-westminster-bridge-part-four.html>

Image 3.6. A model of Old London Bridge prior to 1757 showing wooden starlings at piers.



Source: <http://www.pla.co.uk/News/Thames-history>

One of the most voluminous sources for wages and prices in London throughout the mediaeval and early modern period is Bridge House. Bridge House was the institution that owned, ran, and maintained London Bridge and had a wealth of property throughout the city and in Southwark. If London Bridge was falling down, it was the Bridge House masters and workmen who were responsible and probably liable. At the Bridge office, holders of artisan positions were responsible for building work, and they in turn employed teams to carry it out. They presented weekly bills to the Bridge master, and in turn they were paid for the labour costs. Bills and payment details for workmen conducting building work at Bridge House, or on the Bridge, survive from the fifteenth century right to the end of the nineteenth century, including weekly pay records from the early 1600s onwards.¹¹⁰ No historian has tapped this rich seam in any depth before. Jeremy Boulton mentioned Bridge House, but did not include any figures in his series. This study draws on the bill books, remittance books, weekly payments and accounts to examine solely the construction work carried out by contractors on the Bridge.¹¹¹

As Mark Latham has pointed out, the records are wholly under-researched, partly because of ideas about the institutional bias of the city, and partly because the accounting systems are complex and not always comparable to other sources.¹¹² Latham studied Bridge House organisation and management in the eighteenth century in depth, and asserted that a key feature of the administration there throughout the early part of the eighteenth century was corruption.¹¹³ Some of his research implies that the accounts of workmen cannot be trusted as accurate records of working hours, days, pay or scope. One piece of key evidence is a deposition from a labourer, employed at 7s. a week, that masters, particularly Land Carpenters, were using Bridge funds and materials for their own private business, and that they were not present on site, and that they may have been overcharging; wages and days which were paid for were not worked.¹¹⁴

¹¹⁰ All at LMA. Receipt books at CLA/007/FN/05, bill books at CLA/007/FN/04, payments at CLA/007/FN/03, sundry papers at CLC/215/MS31022, 3, and COL/CC/BHC/10 03 - 10

¹¹¹ LMA CLA/ 007/FN 03, 04, 05 series form the bulk of the material examined here and weekly bills at COL.CC/BHC/10/03 - 6

¹¹² Mark Latham, "The London Bridge Improvement Act of 1756: A Study of Early Modern Urban Finance and Administration" (University of Leicester, unpublished Thesis, 2009). Unpublished Thesis.

¹¹³ Ibid. p.168.

¹¹⁴ CLA/007/AD/01/007

The contractors at Bridge House were, however, also contractors elsewhere. They employed up to fifty or sixty men on the bridge each year. They paid a great deal for the positions at Bridge House and they expected to profit from them.¹¹⁵ Payments for work at Bridge House were a complex system of days and tides. Days were worked by some and tides by others, and a small number got paid for both. The system of tide rates was not constant. Bridge House may provide sources for a future study to examine annual weekly earnings rather than day rates.

The Office of the King's Works - variously referred to in the literature as the Board of Works or the Office of Works - is another source of large numbers of pay rates and bills from 1661 to the end of the nineteenth century. Held at the National Archives under Work 5, the records have not been used since B.L Hutchins in 1900, possibly because it was felt that Royal Works payments were not representative of the broader market. The organisation of the Works and the many changes over the period under discussion were discussed by H.M Colvin.¹¹⁶ The predominant feature described was not corruption on the part of contractors, but failure to pay on time on the part of the Crown. Colvin offered that this late payment system ultimately cost the crown dear in having to pay higher prices to contractors to cover the credit shortfalls.¹¹⁷ The accounts of the 'ordinary' works are those approved as the expenditure of various clerks of works at various sites. They comprise bills, abstracts and monthly accounts for routine ordinary maintenance work at a number of palaces and sites around London, including The Tower of London, Kensington Palace, Denmark (Somerset) House, and Whitehall. Here, I have utilised data from the Tower of London and Whitehall as the most central sites in the City. The only men directly paid after 1668 were the Clerk-of-Works, the Labourer-in-Trust and house Carpenters, who held positions and who were paid a small annual salary as well as their day rates. The accounts do not have day rates for large extraordinary work, rather there are abstracts of large contractors' billing.

These, then, are the sources I have drawn on to evaluate how work was organised and paid for on large publicly-funded sites in the building trades in London in the long eighteenth century. The geographical spread of sites covers the City, Westminster, and major adjacent

¹¹⁵ Mark Latham, "'The City Has Been Wronged and Abused!': Institutional Corruption in the Eighteenth Century," *The Economic History Review* (2015).p.1044.

¹¹⁶ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. 'Financial Stress' p.42 – 46.

¹¹⁷ Ibid. p.44.

sites - e.g. Greenwich. In chronological terms they all hold records for years throughout the period under review. They encompass both ordinary and extraordinary work. The inclusion of both Bridge House and the Office of King's Works gives the perspective of long term development of two major clients or employers in the City. How these sites managed the business of building such large and ambitious projects is the subject of the next part of the thesis.

Chapter 4. Managing risk, contracts and ways of working in the building trades.

4.1. Managing risk in construction.

This section will explore how institutions and contractors utilised an array of organisational systems to manage the risks of construction, to turn into built reality the innovations in architecture and design that were found in major projects in the seventeenth and eighteenth century. I will show how contemporary practitioners understood that their organisational response to such risks could mitigate them in a number of ways, and that different organisational responses held varying incentives for all parties. Those organisational responses were a product of bargaining between clients, surveyors and contractors over the distribution of building costs and risks.

The central device that we will examine is the contract for construction and how it was executed in practice. Craftsmen's and labourer's experience of work and welfare were governed by these developments, but it was one they had neither part in nor influence over. In this chapter, I focus on the type of contracts in use in building, their respective advantages and disadvantages, and the way in which they were written in practice. As the chapter shows, the merits of contracting by the measure help explain one of the fundamental limitations of our understanding of wages – the limited number and particular context of day wage observations – and also begin to uncover the role and skills required of a building contractor.

In the seventeenth century, as before, the problem of quality control and timely progress of building work was just the same as it is for clients today. Building sites are, and always have been, dangerous, messy, and confusing places, while the process of construction is one which exposes the client to financial risk.¹ Designs on paper are just that, and rarely visualise with any sort of realism or accuracy what the three-dimensional space and finished product will look and feel like. Even the 'Warrant' design of St. Paul's Cathedral was in no way an accurate representation of the finished product.² The quality of the craftsmanship of

¹ Ayres, *Building the Georgian City*.p.2, Nisbet, *A Proper Price*.pp. ix, x,

² Campbell, *Building St Paul's* pp. 31–32.

builders is hard to evaluate except through use. You do not know that the new lead on the roof is working until it rains; the pointing on the brickwork solid until it crumbles, and you cannot see the carving until it is done, and the materials and labour are spent. In other words, monitoring building work is difficult.³

These asymmetries of information were widely recognised at the time. In the body of literature that was intended to offer advice to those wishing to build in the seventeenth and eighteenth centuries, authors repeatedly make it clear that the client's money and reputation were always at risk. To protect themselves, they needed expert help. As Balthazar Gerbier, known for his design of Hampstead Marshall, put it:

“Whoever is disposed to build ought in the first place to make choice of a skilful surveyor from whose directions the several Master work men may receive instructions by way of draughts models frames etc. For the better managing their intended work, since an ill built palace leaves a perpetual selection of ignorance on the Builder”.⁴

Gerbier gave full advice on reducing risk in the building process by testing the surveyor's capability, by buying one's own materials to avoid profiteering workmen, and by only appointing master workmen who would be on site.⁵ He also gave advice on getting the best value and prices for materials:

The chosen master workmen must be bound to a presixt time for the performance of their undertaking, to observe exactly the model and moulds held fourth to them by the chosen surveyor and to make good at their own cost what they do amisse. They are to manage the paying of their own workmen, on such a contract as they have made with the proprietor of the building; for the master workmen must keep the workmen under a certain regular proportion of pay to hinder them from spending their wages to fast, and to run to other works, as many (upon slight occasion) doe.⁶

³ In modern times also, see Torger Reve and Raymond E. Levitt, "Organization and Governance in Construction," *International Journal of Project Management* 2, no. 1 (1984).pp.17-25

⁴ Balthazar Gerbier, *Counsel and Advice to All Builders* (London, St Paul's Wharfe: 1663). p.5.

⁵ Ibid.p. 61, pp. 62-4

⁶ Ibid.p. 60.

This burgeoning literature on managing the building process included advice on choosing the ground and designs of pleasing elevations alongside advice on managing workmen to avoid malfeasance and loss.⁷ They contained endless information about materials, types of contract, prices, rates, and design. It was not commonplace in the seventeenth or eighteenth centuries to accurately estimate the costs of building, and building in stages was seen as having advantages in managing financial, engineering and aesthetic risk.⁸ The title of William Pain's volume tells it all: *Builders companion, and workmen's general assistant, demonstrating after the most easy and practical method all the principal rules of architecture from the plan to the ornamental finish.... Being not only useful to all masons, bricklayers, plasterers, carpenters, joiners, and others concerned with the several branches of building &c but also necessary for the gentlemen who will be hereby enabled to know the exact expense of any building, alteration or repair*. Published for the first time in 1758, it was reprinted many times, and naturally gives a detailed guide to quantities and prices, and estimates of materials and workmanship.⁹ Contemporary practitioners were well aware of the limitations or risks of commissioning work. The risks seem even greater when it is taken into account that clients could not expect to estimate accurately their likely expenditure. Architectural historians believe that it was common practice for the final price to not be established for a building until its completion through most of the eighteenth century.¹⁰ As more and more investment was made into large building projects, this problem became mitigated by new ways of working.

4.2. Three Ways of Working.

There are 3 ways of working: by the Day, by Measure and by Great; if by day it tells me when they are Lazy. If by measure it gives me light on every particular and tells me what I am to provide. If by the Great I can make a sure bargain neither to be overreached nor to hurt the undertaker; for in things they are not every day used to, they do often injure themselves and when they begin to find it, they shuffle and slight the work to save themselves. I think the best way in this business is to work by measure: according to the prices in the estimate or lower if you can and measure

⁷ See also William Pain, *A Builder's Companion* (London: 1761); Richard Neve, *The City and Country Purchaser and Builder's Dictionary* (London: 1707).

⁸ Campbell, *Building St Paul's*, chapter 4, p. 33. Satoh, *Building in Britain : The Origins of a Modern Industry*. pp.8-11

⁹ Pain, *A Builder's Companion* The copy I consulted was the third edition, printed by Robert Sayer in 1769. I am indebted to Sir Christopher Wates for access to it.

¹⁰ Nisbet, *A Proper Price*. p.39. Campbell, *Building St Paul's* pp.60-69

the work in 3 or 4 measurements as it rises. But you must have a trusty measurer, there are few that are skilled in measuring stone worke, I have bred up 2 or 3.¹¹

Sir Christopher Wren wrote the above to John Fell, Bishop of Oxford, when he was undertaking the erection of Tom Tower at Christchurch College Oxford, to Wren's design, in 1681. In further correspondence, to assuage Fell's fears of the risks of undertaking the work, he contracted Christopher Kempster, mason, to be his overseer or agent at the site.¹² Wren's consideration of the incentives and risks of these ways of working shows his understanding of the use of organisational responses to varying risk and quality control issues; moreover it shows a strategic use of organisational form.

As Wren recognised, each way of contracting had different incentives associated with it. In 'day work', where the client paid for labour on an ongoing basis, the lack of an incentive to finish quickly is obvious. The risk was that the client would be paying workers to not be productive, with few monitoring opportunities that allowed them to prevent this. In contracting 'by the great' the risk was that a contractor would mis-estimate or underbid, risking sunk costs and unfinished work or poor workmanship. In 'measured work', however, money would not be paid out until the work was certified as satisfactory. Measured work was in essence a sort of piecework rate for building, and a 'stop option' at the same time. Yet it also had a downside in the bureaucracy and skilled monitoring it involved.

Put simply, measured work was a system of buying fixed amounts of building work. The practice of measuring was the father of and precursor to quantity surveying.¹³ In working under a measured contract, contractors built the required product in given units, a rod of brickwork, a foot of carving, and so on, and clients only paid them for doing so when the units had been checked that they were completed as per the contract by a qualified measurer.¹⁴ When the work was completed the client ordered the work measured by a suitable surveyor. If all was as specified they paid the price agreed, probably after a lengthy approval process. If, however, the work was found wanting, the client reserved the right to discount the price, or have the work made good at the contractors' expense.

¹¹ Wren written correspondence to Bishop of Oxford John Fell in 1681, as quoted in Colvin, *A Biographical Dictionary of English Architects, 1660-1840*. The 'two or three', probably included Hawksmoor and Dickinson.

¹² Wren Society, Volume V. pp.22 -25

¹³ Nisbet, *A Proper Price*.p.1.

¹⁴ Ibid.p.9. A rod was 272.25 square feet, a lineal rod 16.5 feet. In practice bills and estimates or large projects tended to specify items idiosyncratic to its requirements.

Measurement for the client was carried out by surveyors, or clerks of works.¹⁵ Given the risk to their profit, contractors hired their own measurers too.¹⁶ Guidebooks to effective measurement were available to accompany the guides to building and design that appeared in the eighteenth century. Indeed, a number of guides to measurement were being published from the 1660s onwards: “The Carpenter’s Rule”¹⁷, *The Mechanic Exercises*¹⁸, “The Marrow of Measuring”¹⁹ all give practical guidelines for how to measure and evaluate and pay for building works of all kinds accurately.²⁰ Measurers were surveyors, but it seems that there were independent measurers, who did not also engage in design or building, as early as the 1660s, and probably before.²¹

For the client the benefit of working through a measured contract was that the system was essentially self-monitoring until the final measurement. The risk of having bills discounted ensured quality workmanship from the contractor. The contractor working under a measured contract was incentivised to drive down the costs of inputs, but only to the point at which quality could still be assured. If the contractor found they could not keep to the terms of the contract and still profit, then theoretically they could choose not to complete further measures – essentially stopping a loss that would not be possible if they were tied into a contract by the great.

This categorisation of day work, measured work and work by the great is but a guide, however, because contracts came in many variants and with multiple idiosyncrasies. In fact, in the most instructive review of working methods to date, James Campbell identified six types of contracts:

1. Day rates: the client paying a rate per person per day on site. All materials paid for by the employer.
2. By measure without materials: the contractor to supply labour, the materials supplied by the client, payment by measurement at pre-agreed rates at intervals or on completion or later.

¹⁵Ibid.pp. 24- 26

¹⁶ Ibid.p.26

¹⁷ John Darling, *The Carpenters Rule*, Eighth edition ed. (1727).

¹⁸ Joseph Moxon, *The Mechanic Exercises* (London, Warwick Lane: 1693).

¹⁹ Venterus Mandey, *Mellificum Mensionis, or the Marrow of Measuring* (London: Moxon, 1682).

²⁰ Occasionally contractors well known for their design skills were measurers, see Ayres, *Building the Georgian City*.pp. 4, 5, 13, 120, 35-7, 90, 218, 237,

²¹ Nisbet, *A Proper Price*. pp.1 -2

3. By measure finding all materials: as above, but the contractor supplying all the materials and labour.
4. By measure and by day: with the contractor providing materials and labour, and the client paying a small amount to the workers direct, and on completion that amount being deducted from the measured total.
5. By the great without materials: contractor supplying labour only, with payment in stages or on completion.
6. By great with labour and materials: Contractor supplying all, with payment in stages or on completion.²²

Historians who have studied construction have concluded that contracting became more uniform over time and that the system evolved into one of 'measure and value', which was universal on public works by the mid-eighteenth century.²³ If this was the case, then the earlier period saw more idiosyncrasies in the forms of contract, and with this produced a greater range of associated differences in the risks to be managed.

For the client, the benefits of measuring (2, 3, 4 above) in managing risk and monitoring performance can be clearly perceived. In (1) above the client had the search and bargaining costs of obtaining materials, and faced the risk that the day work they hired may not be up to scratch, despite having paid for it. The costs of obtaining materials may be advantageous if the workmen could not be trusted to bring the best deal, or if materials were available to the client but not others. In (2) the costs or benefits of sourcing materials were still present, but the contractor did not get paid until the work is done and checked. In (3) the client wholly contracted out the construction work, but the system of measurement monitored and protected him from opportunism or poor workmanship. Approach (4) allowed the client to ensure the contractor did not skimp on skill by paying for day work himself, whereas (5) allowed the exact opposite. Contract form (6) would only be a good contract if the contractor was well known to the client and could be trusted to be sufficiently capitalised to maintain credit and pay suppliers, and was sufficiently experienced to estimate and strike a bargain accurately.

²²Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction.", pp. 331 – 2

²³Nisbet, *A Proper Price.*, pp.26 – 27, 29 – 31.

To grasp the elements of building contracts more fully, it is useful to look in greater detail at the actual contracts that were written between institutions and contractors. How did the oft quoted “three ways of working” translate into contracts and what other characteristics do we observe? In general, the written contracts show clearly how measuring was put at the centre of the arrangement. Contracts gave clients the right to monitor work, to appoint an inspector of work externally if need be, and to discount if the quality they had stipulated was not met.²⁴ However, it is also striking that contracts for several parts of a project might be written, specifying the contractor’s duties to supply work at specific prices until the building was completed. As the St. Paul’s records show frequently contracts would be renewed or new ones drawn up. This gave clients a further mechanism to discipline contractors, by turning single large projects into situations in which the need to retain trust across repeated transactions offered a counterweight to opportunism.²⁵

The key elements of measured contracts, as they were written in the period, can be observed in one dated July 1675, in which Joshua Marshall undertook to lay the foundations of the new St. Paul’s Cathedral. The contract specified the stone to use, the dimensions, and that Marshall would be paid by measurement, and would be able to claim funds:

“when one hundredth Rod is wrought, & ye same certified by Mr Edward Woodruff & allowed by Sir Christopher Wren Knt, so much lawful English money as ye said one hundred Rods of Work shall amount to after ye Rates foresaid, and so proportionally for every one hundred Rods of Work, as ye work goes on until measurement be made of the whole, & when the said severall works shall be well and sufficiently done, & approved of, then the said J.M., his Exors, or Assigns, shall receive so much more as the said Work upon a Just measurement thereof had made & shall justly amount to....”²⁶

The degree to which the authority in measured contracts was put in the hands of the client’s agents in this contract was by no means unusual. Indeed, one extant contract for Greenwich from 1696 is even more extreme, stating that the masons undertaking the work ‘do further agree that if any part of the work when performed shall appear to be deficient either in good

²⁴ For a surviving contract at Greenwich, see: LMA CLC, MS00233,

²⁵ Campbell, *Building St Paul's*

²⁶ Wren Society, contract Book, Volume XVI.p.15. ‘Exors.’ are executors

workmanship or materials performance of quantity they will submit to such [?] action as Sir Chris Wren and the Directors for the said Hospital shall think fit.’²⁷

In general, the detail of the stipulations is a prevailing characteristic of the contracts. The contract with Thomas Gilbert and Thomas Wise to provide the Portland Stone to the Cathedral stipulates that they:

“at their own proper cost and charges, for and in consideration of the rates and prices hereafter mentioned, raise, scaple, prepare, and cause to be delivered on board such vessels as they can procure to take ye freight such and so much Portland Stone, as they shall be directed to prepare & send from the Isle of Portland to such Wharfe in the Port of London below Bridge as shall be appointed. And shall scappell the said stone according to the moulds and directions both for the fashion and the number of stones...[.]..and give account from time to time of the Marks and Measures of the said stone therein ..[...]... and shall take care that all Stone by truely scappelled, not wanting of ye moulds at the corners or sides, also that the said stone be well conditioned and proper for use intended, Without flinty beds or rag beds or clay holes near the faces of the stone...”²⁸

In March 1685 it was noted that Gilbert and Wise were billing the Cathedral for “mending of wayes, for Crain ropes, and other such like Charges”. The commissioners were of the opinion that they were not to be charged, and this was humbly accepted by the contractors.²⁹

At Greenwich Hospital a similar approach is seen in the contracts, which specify clearly monitoring and discounting systems from the outset. On June 5th 1696 the Hospital Fabric Committee recorded that “agreement was made with Daniel Foe of the Parish of Islington, Brick-maker to burn and supply from time to time as the work shall require,

”..bricks, “delivering the same to the wharf near the workes, and if a considerable part of any load.... appear to be clinkered or otherwise unprofitable for the use of the work it shall be lawfull for the clarke of the works to reject or turn back such ill

²⁷ TNA ADM 80/2 p.15.

²⁸ Wren Society, Vol. XVI.p.15,19.

²⁹ Wren Society, Vol.XIII p. 51.

goods 14 shilling the thousand for stock and 25 shillings the thousand for rubbing bricks contract in force for this summer only.”³⁰

The same day Thomas Hues and Richard Billinghamurst, bricklayers, agreed a price of £1 7s per rod for new brickwork, “Rubbing and setting the straight arches being brick and half deep and one brick thick twelve pence a foot running and they shall find all workmanship making up of mortar well-tempered mixed and beaten and all scaffolding and towards scaffolding they are to be allowed £15.”³¹ Then on June 13th the first masons contract was made with Thomas Hill & Edward Strong “to perform that masons worke”.. “and the said masons do agree to keep as many workmen and labourers as the surveyor of the said work shall think reasonable for the carrying on the same with the brickwork so that they not be obstructed”.³² It is not known when Thomas Hill stepped away from the partnership, but by May 1698 Strong was contracting alone for the stone work at the wharf alongside the site.³³ There was also a contract with James Grove carpenter, “that the said James Grove by himselfe servants and workmen finding all materials, workmanship and labour will performe and finish in goode, such carpenter work as shall be directed by the surveyor of the said work”.³⁴

The predominant approach to contracting for building projects seems to have been for institutions to write detailed contracts for set amounts of work, and then to either renew them or add further contracts as the project moved on to new parts of the work. The records of St. Paul’s show that sometimes contracts were inherited or passed from contractor to another. For example, Edward Pearce succeeded Joshua Marshall’s contract, Thomas Wise Junior and Thomas Hill succeeded Thomas Wise senior’s contract, and Nathaniel Rawlins succeeded Joshua Latham’s contract, William Kempster assumed John Thompson’s in 1700.³⁵ But individual contractors also had several contracts in force at any one time for one client. Where a contract needed to be limited, it was, as with Foe’s Greenwich contract above.

³⁰ TNA ADM 80/ 2 p.3.

³¹ TNA ADM / 80 2 p.5.

³² Ibid p.9.

³³ Ibid p.27.

³⁴ Ibid p.11, Grove is the subject of Campbell’s case study and calculations of contractor profit margin, ‘*The Finances of the Carpenter in England*’.

³⁵ Wren Society Vol. XVI, p. xiv – xvii.

4.3. How did contracting work?

How did the contracting system for major projects work in practice? For ‘extraordinary’ work or new building, the client and the surveyor or clerk of works agreed the requirements for the job. The clients in the case of the Fifty New Churches, or Greenwich Hospital, or St. Paul’s were Commissioners, appointed by Parliament, Crown or City to administer the new building.³⁶ Once surveyors had been appointed and designs agreed, the building requirement was then posted at gates or submitted for publication to the *London Gazette*.³⁷ Contractors would submit their tenders or estimates and the Surveyor would meet with those that could meet the requirements.³⁸ Meetings and presentations with Commissioners or boards also took place depending on the scope of the work. Case studies of St Martin’s in the Fields, or St. Paul’s show that the appointment of contractors was frequently a long drawn out process, involving meetings that might involve a range of stakeholders.³⁹ In this system, the responsibility for hiring and managing labour rested solely with the contractors who were awarded the contract.⁴⁰

Once an estimate was agreed and work had started the contractor submitted bills by piece quarterly or biannually as agreed. The paymaster or Treasurer would receive the bill and pass it to the Surveyor or the Clerk of Works for approval. To approve or “pass” a measured bill, the clerk had to ensure the work met the specification by appointing a surveyor to measure and evaluate the work done.⁴¹ Once assessed or measured, the bill was passed or discounted and went back to the Treasurer to be signed and eventually to the paymaster to be paid. Delays in payment were endemic, and expected.⁴²

³⁶ See Reddaway, *The Rebuilding of London after the Great Fire*.. for the formation of the Commission for the rebuilding of the city after the Fire.pp.55 - 56 See Campbell, *Building St Paul's* pp.18 – 21.

³⁷ Yeomans, "Managing Eighteenth-Century Building."p.11. Descriptions of the process survive in: TNA ADM 67/4 (1697 description of the Greenwich Hospital Commission’s instructions to Nicholas Hawksmoor for the procurement of masons services); Portland papers, Vol. X (the appointment of contractors in 1710 at St. Paul’s). This is not to say that contracts were not handed directly on occasion to specific contractors.

³⁸ Records of deliberations include: ADM 67/4, Westminster Abbey Muniments no 34516.

³⁹ See Ayres, *Building the Georgian City*. Appendix II, *Campbell, Building St Paul's* , chapters 2, 6, 8,9, 11.

⁴⁰ Campbell, "Seventeenth-Century Bricklayers’ Contracts: Wren’s City Churches."

⁴¹ Or measure it himself if he were so qualified, such as Hawksmoor at Greenwich. The final account usually states a number of dates: the rough dates the work was completed; the date the work was measured by the Clerk; the dates the work was approved and the bill passed by Committee; the date the sum was paid. See Westminster Abbey Muniments 34513 for dates of Dickinson’s measurement and latter dates for passing of bills.

⁴² Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. ‘Financial Stress’ pp34- 44.

The role of the clerk of works, who acted as the on-site surveyor and manager of all contracts, was thus a critical one in this system.⁴³ Yet, the role was one which varied by institution and client. Clerks of works were usually skilled and experienced men, but that skill and experience varied. Nicholas Hawksmoor, one of Wren's most talented protégés was clerk at Greenwich, where he procured contractors and drew up contracts himself.⁴⁴ But Ralph Sims, who is sometimes described as Clerk of Works of Westminster, was the son of a smith, and had no such surveying skills. As a result, Westminster Abbey procured the services of another of Wren's protégés, William Dickinson, to act as surveyor and measurer.⁴⁵ At St Martin's in the Fields a clerk was not appointed until work was underway and contractors already on site.⁴⁶

In 'ordinary' work the process was streamlined somewhat, and payments were made regularly for labour.⁴⁷ It was not unusual for a contractor to enter a bond to secure a contract, particularly if it was his first contract with a client.⁴⁸ At Bridge House, contractors paid for their positions.⁴⁹ Accounts show that institutions usually had an ongoing relationship with a contractor to carry out required works. At Bridge House, where London Bridge required work year round, some firms persist in the accounts for nearly a century.⁵⁰ Contractors on extraordinary projects did not receive meaningful remuneration or retainers for being available or having the option of first refusal on work. Although surveyors, office holders and clerks of works were paid salaries, most contractors were not. Master artisans at the office of Kings Works were, in fact, paid *not* to profit from works contracts.⁵¹ Some Bridge House contractors received nominal salaries of £4 to £10 per annum. Ordinary contractors were not guaranteed work or contracts for larger projects, and when work was completed

⁴³ Ayres, *Building the Georgian City*. pp.34.

⁴⁴ TNA ADM 67/2.

⁴⁵ Westminster Abbey Muniments. 34513, Dickinson signed the accounts as 'bills examined'.

⁴⁶ Ayres, *Building the Georgian City*. p.236.

⁴⁷ Bridge House contractors billed weekly for labour costs, and payment was made weekly assuming their account was not unaudited. All at LMA, CLA/007/FN/03/022, CLA/007/FN/03/019/A, CLA/007/FN/03/027, by way of example.

⁴⁸ Edward Stanton, one of the most well-known city masons secured the contract at Westminster Abbey in 1719 after the death of Tufnell. He refers to his bond of £2,000 in meeting minutes of December 1722: Westminster Abbey Muniments 34517.

⁴⁹ Latham, "'The City Has Been Wronged and Abused!': Institutional Corruption in the Eighteenth Century.", p.1044.

⁵⁰ Thomas Wilmore purchased the position of Land Carpenter in 1706, cf. Latham n. 360 above, and Land carpenters bills continued to be submitted by a Wilmore until the 1780s.

⁵¹ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. p.13.

bills were submitted and subject to the same audit process (and risk of discount) as in extraordinary work.

As the eighteenth century wore on, contracting became more uniform, and in the latter part of the century a commonly adopted system of ‘measure and value’ prevailed at the Board of Works and described by various Commissioners of Military enquiry in 1806.⁵² Essentially it was a formalised version of that described above. Measurements were conducted for each trade alone, and measurements were prices at cost plus fifteen per cent for profit on barracks and military commissions. Monitoring on such a standardised basis was problematic. The system was recognised as open to opportunism by contractors where building was conducted far away from the Office of the King’s Works and measurers were not employed directly.⁵³ A system of general lump sum tendering developed over the early decades of the nineteenth century.⁵⁴

Contracts were not uniform in the seventeenth and eighteenth centuries. There seem to have been few standard clauses; work was organised under varied or different agreements. But there is one major theme in common. The contracts specify perceived possible risks and costs in the process of building, and they put those risks firmly in the hands of the contractor. Gilbert & Wise took on the responsibility of the (hugely problematic) transport of Portland stone, and failed in their attempt to get their clients to absorb the costs.⁵⁵ Strong & Hill were to absorb their own costs in avoiding affecting the bricklayers work or schedule. Marshall (and most others) was to await payment until he had done substantial portions of the contracted work and its quality had been approved. The Strongs agreed to a contract at Greenwich in 1706 which left them open to discount on agreed rates for work if the work was not to the approval of Wren and the Hospital, with no protective clauses to limit his loss, nor to be able to appeal.

If “all contracts are necessarily incomplete” then these building contracts did their best to overcome the perennial problem by being individually specified to the circumstances, highly detailed, and, in some cases, very flexible.⁵⁶ In terms of the typology established in the theoretical economics literature by Oliver Williamson, these are recurrent spot,

⁵² Nisbet, *A Proper Price*.p.29, and chapter 2.

⁵³ Ibid.p. 30.

⁵⁴ Ibid.pp. 38 - 42

⁵⁵ Campbell, *Building St Paul's* pp.91-95

⁵⁶ George Norman and Darlene C. Chisholm, *Dictionary of Industrial Organization* (Elgar, 2014).p163.

contingent claims contracts.⁵⁷ The economic and management theoretical literature holds contingent claims contracting to be extremely costly, if not outright inefficient, due to the costs imposed by bounded rationality, searching for partners, gaining information to enable negotiation, the process of bargaining, the risk of hold up, and different specificities of assets and investments between contractors.⁵⁸ Recurrent spot contracting relationships are thought to be unlikely to persist due to opportunistic bargaining and hold up.⁵⁹ Despite the well-documented financial difficulties of St. Paul's, and the large work contracted by the Office of the King's Works, Westminster Abbey, the Fifty New Churches, the system remained until the end of the eighteenth century. How did the system operate to overcome these problems?

In fact, one mechanism to ameliorate this kind of risk was engaging in repeated transactions. James Campbell posited that as working relationships developed with Christopher Wren, contracts with his carpenters became simpler, and less was iterated, more trusted.⁶⁰ This presents features of a bilateral monopoly, which is probably a feature of all construction contracts.⁶¹ Yet it is clear that, despite the potential advantages of repeated contracts, contractors operated in a competitive environment for the most part. Pricing was competitive, contracts were advertised in the Gazette and there seems to have been varying competition.⁶² The market was ostensibly 'open'. There were enough firms to make it so in reality. In practice, of course, only those with the best information, who had worked with clients or surveyors before or with the capital to survive such risks, were able to price competitively first time. After the Great Fire the City and Crown made it illegal to sell goods or labour for too high a price, but the nominal price of labour or materials was not stated.⁶³ In the construction of the Fifty New Churches the commissioners always chose the lowest quote, so time spent working out what the tightest margin could be in order to profit from work was well spent.⁶⁴ Minutes from St. Paul's show that the commissioners received

⁵⁷Oliver E. Williamson, "Transaction-Cost Economics: The Governance of Contractual Relations," *Journal of Law and Economics* 22, no. 2 (1979).pp.233-261

⁵⁸ Oliver E. Williamson, *Markets and Hierarchies : Analysis and Antitrust Implications : A Study in the Economics of Internal Organization* (New York: New York : Free Press, 1975).chapter 5, section 1.2

⁵⁹Ibid. pp.91 – 95.

⁶⁰Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction.", p. 330.

⁶¹ Reve and Levitt, "Organization and Governance in Construction."pp.17-25.

⁶² TNA ADM 67 / 2.

⁶³Reddaway, *The Rebuilding of London after the Great Fire*.

⁶⁴ Yeomans, "Managing Eighteenth-Century Building."p.11.

offers and tenders for work and material regularly.⁶⁵ There were several contenders for contracts at St Martin's in the Fields in 1721.⁶⁶ When contracting for the Fifty New Churches from 1711 the Commissioners were able to choose the lowest bidder in each case.⁶⁷ So, it would seem that repeated transactions only mitigated the costs of transacting in the market to a limited extent.

Against this background, it is easy to appreciate the appeal of contracting by the measure. Measurement was a vital tool in being able to transact highly idiosyncratic, financially costly work with a high percentage of sunk costs at outset, and it worked for both parties. The advantages for clients are clear: measurement allowed them to make terms, monitor progress, reduce negligence and agency problems, and pass many of the transaction, search and operational costs onto the contractor. Thus, the system of measurement could provide an effective monitor for the client. Although it seems like contractors took on all the risk, and covered this in their margin alone, there were also upsides to measurement for contractors.

For contractors a measured contract fixed an upper bound of profitability on any one job. Because the price of the goods or inputs was fixed, profit could not exceed the difference between those prices at supply and those at sale, less overhead, labour, financing and operating costs. But it also had the potential to fix an upper bound on risk because the potential loss was limited to the scope of that measurement alone. If one measurement lost the contractor a large sum he could adapt his prices or his measures or his inputs in the next one, or rescind the contract. Thus, for contractors measurement was a risk-managing strategy in the long run. It limited sunk costs. In agreeing to a measured contract the contractor would have to know that he could manage to get the inputs at a price low enough to make the measurement profitable, or less. He would also have to calculate his costs of meeting the contracts – which included his costs of measuring. Measurement was not a 'customary' way to account for building work, it was an advanced management tool to minimise risk and assure quality at the same time.

⁶⁵ Wren Society., Minute Book, Volume XV, p.51.

⁶⁶ Ayres, *Building the Georgian City*.p.234.

⁶⁷ Yeomans, "Managing Eighteenth-Century Building."p.11.

Measurement, of course, entailed certain costs to operate. Firstly, both parties had to be able to accurately estimate, evaluate, measure, and issue bills in the same units of account. One or perhaps both sides might employ surveyors and measures, and both sides needed someone who could estimate costs and maintain accounts.⁶⁸ The contractor's costs of measuring were of three kinds. Sourcing and search costs to find inputs at the right price (owning one's own quarry minimised some of these), estimating costs which equated to the skills of an experienced and accurate surveyor to measure and price, and accounting costs to account for and bill accurately. All of these things are highly skilled labour inputs, some of which the contractor would have done himself, but for the latter two contractors may have resorted to hired help.

4.4. Contracts and Wage evidence.

Labour costs were priced and presented differently in each of the contracting methods that were in use in this period. Crucially, in neither measured work nor work by the great can labour costs be observed; only work by the day gives any insight into wages. Yet, for all their complexity, contracts were mostly written for measured work, and as we will see this had a profound effect on the kind of evidence we have been left with.

As Wren did not favour the system there is no work 'by the great' found for any of the major projects I have examined here. However, there was plenty of task work for small project or amounts - fixed price for a specified product; for instance Thomas Strong erected the screen wall around St. Paul's site with rubble on site for the fixed price of £25.⁶⁹ Fixed prices were also agreed for carving by piece.⁷⁰ Task work at smaller prices and for well-defined products minimised the risks of misestimating or non-performance. Where task work is presented in the accounts, the amount of labour and its cost is not detailed. Task work is listed in the accounts at St. Paul's with a simple description such as "masons sawing Portland" and a price.⁷¹

⁶⁸ Nisbet, *A Proper Price*. believes that practice was for both sides to deploy measurers by 1750.p.26

⁶⁹ Wren Society, Vol XVI, p. 16.

⁷⁰ Lang, *Rebuilding St.Paul's after the Great Fire of London* , p. 81.

⁷¹ Wren Society, Vol XVI, Building Accounts Jan – June, 1697

If the majority of work was agreed by the measure, the evidence this leaves us can be seen if we look at typical example of a measured Bill, in this case one that Thomas Knight submitted to the City in 1675:

Thomas Knight Pavior his bill for worke done at Holborn Bridge November the 12th 1675.

For 315 yards of paving at 2d ½ per yard £03: 05:7 ½

For 16 loads of stones at 7s. per load £05: 12: 00

£08: 17: 7½ ⁷²

The bill was signed by the City Surveyor, Nicholas Duncombe, and the acquittance acknowledged by Knight below that. There are no rates given for the labour employed on the job, although this is explicitly for “worke done”, as well as materials delivered. The labour costs of paving the 315 yards are incorporated within the price per yard. In this period, Knight held the position of City mason, but he was also agent for St. Paul’s Cathedral to the Isle of Portland, and was also contracting with the Office of Kings’ Work. It seems safe to say he was not laying the stones himself, and we are ignorant of what he paid to those who did.

It is only day bills that include any kind of wage rates. A day bill from Edward Strong at Greenwich Hospital (1699 – 1709) offers a typical example of a bill for ‘day work’.

December 1700

Days work by Edward Strong pulling down the scaffolding made to raise the pedestals and trophies upon the pediment of the B[....] , in cutting way into the brickwork for the corridor frames chimney pieces corner stows, windows, soyles and window stones and taking out the iron barrs of the cellar windows in the KC his building aforesaid and cutting way for the top of four staircases descending from the first floor of the B[....]the cellars or vaults of the same.

⁷² COL CC MRK /02/01/1

Wm. Loggans 20 days at 2s 6d.	02:10:00
Jb. Adams 25 days at 2s6d.	03:02:06
Richard Nailer 8 days --	01:00:00
Edward James 20 days at 20d.	01:13:04
Wm. Derry 10 ----	00:16:08
Wm. Hosslet 1 day	00:01:08
J How—1 day	00:01:08
Matt Allen 2 and half days	00:04:02
Wm. Macon 1	00:01:08

09:11:04⁷³

Day bills of this kind have four characteristics that need to be understood if the wages they report are to be interpreted correctly. First, they only indicate *some* of the labour employed on a project. For example, Edward Tufnell's bills to Westminster Abbey in 1712 amounted to £1,917. Yet they only listed 600 "days" worked, enough for three masons for a year, and equating to less than 5 percent of the total.⁷⁴ Day bills make up a small amount of the work at Westminster Abbey and the Office of the King's Works. Day work was approximately only ten percent of the mason's bills at Westminster Abbey in 1712 – 13, zero the year after, and thirty percent in 1714 – 15, but less than five per cent in 1718. Only one trade had its majority of work contracted for as day work, carpenters; days formed the bulk of their billable work, except in 1714-15 when there was also no day work for them either.⁷⁵ Likewise, at Greenwich Hospital they are approximately fifteen per cent of the work.⁷⁶

Second, day bills show the price the contractor charged the client for a person's work for a day. They are not a record of what the worker actually received – and as we will see the day rates they list were not in fact received by the named or carpenter. Third, day bills contain no

⁷³ LMA CLC/B/227/-115 MS00233. The calculations seem to be incorrect by 4d.- in the books there are a number of corrections and errors.

⁷⁴ Westminster Abbey Muniments, Christopher Wren Fabric book, 34513.

⁷⁵ Westminster Abbey Muniments 34153, 34514.

⁷⁶ Calculated from the bill book of Edward Strong. LMA CLC B/227/175

separate line for the contractor's own overheads and profit. And finally, day bills were used for particular kinds of work.

Appreciating the specific role of day bills helps explain the puzzling uniformity of wage rates found in account books and bills. Some historians have interpreted the repeated 2s.6d. charged for day wages as evidence of a customary wage.⁷⁷ The contracting and pricing context suggests that the persistence of the rate is more likely to have been a product of contractors in competition with each other utilising a “going rate” or acknowledged trade price. Institutions may have given guidance after comparing rates. Nicholas Hawksmoor, surveyor and clerk of works at Greenwich was asked to conduct a review of prices for advising on the renewal of contracts in 1698.⁷⁸ In fact, surviving records of direct payments show little sign of a customary wage for craftsmen, rather there is much variation, presumably for skill and productivity.

On extraordinary sites the proportion of work carried out by day was small. After St. Paul's was completed, Wren apparently only used day work for small maintenance work, with the exception at St. Paul's for carpenters, to avoid cutting corners on the scaffolding and supports that everyone's safety relied upon.⁷⁹ Other day work was for jobs that, judging by the description, were where the amount of work could not be successfully estimated or measured, or was risky. It seems that a key benefit of day work is that if more or fewer men were needed the contractor adjusting the numbers in consultation with the surveyor.⁸⁰ Day work descriptions do not detail highly crafted carving or intricate levels of ashlar smoothness. Some record conditions in which it was done. By example: In November 1675 Thos. Strong charged out 4 men for 50 days in total at 2s 6d per day “Cutting holes in Wall of north gable for scaffolding”. This is not especially skilled work, except that it was performed in the winter, probably at height, and the cutting tools would have had to be carried up to do so.⁸¹ At Greenwich Hospital, we can see further examples of work by the day that share this characteristic:

⁷⁷ Lang, *Rebuilding StPaul's*

⁷⁸ For this and other evidence of institutions bargaining with suppliers, see: ADM 67/ 2. Wren Society, Volume XV, p51.

⁷⁹ Wren Society, XVI, p. 151, quoted in Campbell, *Finances*, p. 332, 337. Campbell is of the opinion that the purpose of giving day rates was to ensure adequate numbers of men on site.

⁸⁰ Lang, *St. Paul's* p. 81

⁸¹ Wren Society, Vol XVI, p. 73.

“Days work pulling down the scaffolding made to raise the pedestals and trophies upon the pediment of the dass wing in cutting way in to the brickwork for the window frames. Chimney pieces corner stows window soyles and window stons and taking out the iron barrs of the cellar windows in KC building aforesaid and cutting way for the stops of four staircases descending from the first floor of the Bass wing to the cellars or vaults of the same”

was recorded in Dec 1700.⁸²

Indeed, rather than having the all the highest skilled work charged by the day, most of the carving at Paul’s was done by the measure.⁸³ For instance, Edward Strong’s bills in the St. Paul’s accounts of 1691 record:

For masons worke ...

for worke and sett 480 ½ ft of outside Circle P Stone in round columns and rustiq. at 18d ft £36 0s 9d.

for worke and sett 55ft circle plinth P stone upon attic cornice 17 ½ d. foot sup.

£58 15s 8 ½ d

for carve 52 ft run large leaves in heads of .. windows 10s ft run

£26 0s 0d.⁸⁴

We can have no way of knowing from these bills for highly skilled work what the men who carried out such work were paid.

Day rates seem to have been the norm for much maintenance work. At Bridge House all carpenters and masons were paid by the day or by the tide, the number of days or tides determining pay. At the Office of Kings Works day work was also common on short term work until 1668.⁸⁵ In both these places bills were submitted regularly, so if there was a problem with the number of days this could be dealt with.

In summary, if previous historians have just recorded day work rates they have only captured charge out rates on a small proportion of work carried out. Because day work exposed clients to risk of opportunism and incentive for contractors, most building work on large projects was carried out under measured or task contracts that gave responsibility for hiring and

⁸² LMA CLC/B/227-175

⁸³ Wren Society, XXVI, p. xv.

⁸⁴ Wren Society, Volume XIII building accounts Nov Dec 1691, p. 91.

⁸⁵ See below chapters 5 and 7.

deploying labour wholly to contractors at prices and rates that they determined. The appeal of measured and task contracts lay in the opportunity to overcome monitoring and agency problems, limiting client exposure to risk. Labour day rates and costs cannot be observed in them.

Furthermore, the contracting system reveals a set of skills and requirements that contractors would have needed to carry out – and fund – to enable the business of delivering to such contracts to be profitable. These skills, activities and requirements are considered in the next chapter.

Chapter 5. Contractors' operating and profit margin.

5.1. The question of margin

This chapter aims to estimate the likely operating margin contractors needed to receive in order to operate their businesses profitably.¹ As the previous chapter showed, contractors were operating under a range of contracting regimes that required them to perform a variety of functions, and which only generated bills reporting day wages in specific circumstances. I have suggested that these bills necessarily included a margin to cover contractor's costs. One way to appreciate what effect this business context had on the actual wage that workers received is to identify the share of the bill that would be soaked up by overheads.

The idea that the prices and wages recorded by previous historians have a margin in them is not new but it is disregarded, mostly because, for prices anyway, it is taken that all final consumers will pay some kind of margin to a retailer or wholesaler, and that the prices of wholesale or retail will trend the same way. The issue is thornier for wages however.

Authors dealing solely with the construction industry in the nineteenth century have been explicit about mark up and profit in charge out rates. The London day work rates in 1826 included a 20% allowance for profit.² Despite indications that a similar allowance might have been applied in earlier periods, no one has ever seriously considered the implications. Those examining wages generally do not take contracting costs into account. The one exception is Gregory Clark, who acknowledges that wages prior to 1815 should have some overhead removed. However, Clark only discounts ten per cent.³

There has been only one previous attempt to calculate the likely profit margin that contractors would have been taking on day wages: Campbell's 2005 paper. In that study, Campbell examined the finances of carpenters on seventeenth-century King's Works projects. He mostly examined day work, of the kind where the client was providing materials. He used the cases of James Grove, chief carpenter at Hampton Court 1689 – 96 and Richard Jenings at St. Paul's Cathedral to explore how much profit contractors made.

¹ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."

² Powell, *An Economic History of the British Building Industry 1815-1979*. p.33

³ Clark, "The Condition of the Working Class in England, 1209–2004." His main agricultural source., "Beveridge, Prices and Wages in England, LSE Archive, Beveridge Price History D:3/4/5, E:7b/8/9/10/24a/25 F:1/8/9. records a mixture of direct and contracted prices for labour throughout this period

Campbell proposed that the profit margin that contractors were working with was 21 – 41 per cent on labour.⁴ Although this seems large, he justified it on the basis of the large fortunes they accumulated. Campbell argued that mark-up on materials was not guaranteed to contractors because of the predilection of clients to source their own.⁵ But he also thought the costs of finance and administration were impossible to calculate.⁶ The only evidence Campbell had to substantiate his claims and calculation was the “Jenings case”.

In this chapter, I begin with a discussion of the Jenings case, as this has been the natural starting point for all prior thinking on margin. I then set out and pursue a somewhat different approach, building an estimate for contractors’ overheads from the bottom up. I start this with an examination of their management costs, before moving on to the costs of credit, discounting and other costs. Taken cumulatively, these suggest contractors were taking a margin of twenty to forty per cent from bills.

If contractors had not taken a margin on the labour and goods they supplied they would not have been paid. Only rarely did contractors gain a day rate for themselves, and when that was the case it was usually as foremen, at St. Paul’s, or a nominal amount for special attendance to ensure the attendance of the contractor. Edward Tuffnell charged 16d. per day “for mine owne attendance” for just some of the days at Westminster Abbey.⁷ Presumably, the 16d. a day was not funding his house at Millbank. Most bills found only charge measured, task, or day rates for craftsmen doing the work. The only way contractors made their own pay was through mark up.

5.2. The Jenings case.

The Jenings case is the one instance that deals with the margins contractors could extract from day wages which has been long known about by historians. However, its implications have also been disputed. Elizabeth Gilboy herself referred to it in 1934 when discounting the idea that masters may have taken some form of mark up. Whilst she floated the possibility

⁴ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction." p.334.

⁵ Ibid. p.338.

⁶ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p. 360, *in diabbato*.

⁷ Westminster Abbey Muniments 34513.

that a master may have “shaved a penny or two off wages”, she decided that this was unlikely to be standard practice.⁸ She referred to this well-known case to support her assertion.

The outline of the case is as follows. In 1710 - 1711 Richard Jenings, Wren’s chief carpenter contractor at St. Paul’s from 1708, admitted to a committee of commissioners tasked with evaluating whether he should be tried for fraud, that he was paid 15s. a week for his carpenters, but he paid them on average only 11s. The correspondence generated by the case is voluminous.⁹ The accusation of fraud was part of a complex conflict over Wren’s role and a souring of relations between him and the commissioners at St. Paul’s.¹⁰ Richard Jenings had begun his career as an apprentice to the carpenter John Longland and had risen to become Longland’s partner in 1703. When Longland died three years later, Jenings assumed the contract.¹¹ When a contract for ironwork went to a contractor, Richard Jones, for £11,000, against Wren’s wishes, Jenings was apparently vociferous in his criticism of Jones, who was subsequently found to have been of dubious character, and who subcontracted the railings for £6,000, making an enormous profit for himself.¹² The commissioners, who were later suspended, tried to make an example of Jenings to cover up the dubious nature of the contract with Jones. Although he was dismissed from work at St. Paul’s, Jenings was not prosecuted because the complaints against him were found to be without foundation.¹³

Campbell concludes that ‘There is no reason to doubt the veracity of Jenings claim that it was normal practice at the time for overseers to deduct a portion of the money they received to cover their own costs’.¹⁴ Jenings was paid 2s. 6d. (30d.) per day, or 15s. a week per man, but in his evidence states that he was paying varying rates to different men, with the more skilled or valuable getting 12s. a week, and the lesser just 7s.¹⁵ Jenings’ defence was that it was normal practice to take margin on wages, and that skill in the team was variable, and that he had to look after old and indigent workmen who were not productive. Some men

⁸ Gilboy, *Wages in Eighteenth Century England*.p.17.

⁹ The Duke of Portland’s involvement can be read in the Portland papers Volume X the best collection is in the Wren Society Volume XVI. The Wren Society dealt with the case under the heading of “frauds and abuses”.

¹⁰ See Summary in Campbell, *Building St Paul's* , chapter 11 and p.154.

¹¹ Ibid.p.86.

¹² Ibid.p.158-161.

¹³ Ibid. p.161.

¹⁴ Ibid, p.160.

¹⁵ Lang, *Rebuilding St.Paul's after the Great Fire of London* p.80.

‘were not worth 12d.’ a day, he declared. Moreover, Jenings complained that he was discriminated against: because he lacked the financial capacity to trade on his own account, he could not take on profitable task work. The commissioners for the rebuilding of St. Paul’s never disproved Jenings’s claim that his practice was normal.

Jenings average mark up on skilled craftsmen’s wages was approximately 27%, but as we don’t have his pay books we cannot know the exact distribution of that figure. By taking the highest and lowest margin possible on the figures given, Campbell calculated that it must be between 21 and 41 percent.¹⁶ He proposed that this margin was *all* profit, as, he asserted, on day work under Wren’s stewardship, all other supplies and costs were provided.¹⁷

The approach I take here is rather different to Campbell’s method. Rather than trying to identify the level of pure profit, I begin with the costs that contractors’ faced in operating building firms. Chief among these were the cost of giving credit to clients, the risk of retrospective discounting of bills, and the contractor’s own management or operational costs. Together these amounted to the overhead or operating margin the contractor added to the costs of goods and services (including labour) that he billed *before* allowing for profit. Due to the differing levels of organisational integration and the different types of contract, I distinguish between margin calculations for extraordinary work and ordinary work. In practice, this amounts to a division between Office of The King’s Works/ Church projects and Bridge House.

5.3. Management & Operating Costs.

One of the primary costs that affected contractors’ margins was their own operating costs. As is attested by the size of these projects, the contractors were not small masters. They were employing tens or hundreds of staff, some working on-site fitting and constructing, some off-site prefabricating and preparing. In the years 1698 – 1710, for example, the Stronges had operations and teams of persons at three large sites continuously. Contractors paid for the carriage of supplies, negotiated with suppliers, and used their own surveyors and estimators to verify lengths and work done. Even when clients were supplying materials, contractors faced the operating or management costs involved in running

¹⁶ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction." p. 334.

¹⁷ Ibid. p. 334 – 5.

complex operations. These were the administration, accounting, and fulfilment of measured contracts.

To identify and estimate these costs we need to grasp the range of roles and functions that contractors' firms needed to carry out beyond the direct application of labour on a building site. Or, to put this another way, given what we know about the constraints of the contracts they undertook and the multitudes of partnerships they engaged in, if we are to think of contractors as 'firms' what was the form of the firm?¹⁸ How were sites, labour and skill organised and deployed to meet the contractor's objectives and commitments?

Contractors have not left us organograms, and even the rare day books, bill books and letter books that survive give us only half of the correspondence. As a result, working out the organisational form or hierarchy of these contractors' firms is largely a process of induction based on some fragmentary evidence. The first step to building up a picture of the organisational form is to understand the activities required to fulfil the contacts described in the previous chapter. As a result of the way these were sought, tendered, agreed and granted these are best understood as falling into four sets of management activity: search and information, bargaining and decision making, policing and enforcement, and directly managing, and monitoring the factors of production.¹⁹ These are discussed below in the order in which they were likely to affect production.

To preface the discussion, it is useful to survey the likely range of organisational roles needed within a large contracting operation such as Strong's operation at Greenwich, Jelfe's at Westminster Bridge, or Kempster's at St. Paul's.²⁰ It is an organisational world away from small masters, and the artisanal or domestic system. All contractors would have had to deal with some form of this organisational hierarchy to be able to deliver what they contracted to do. Since the 'real' payments detailed in Kempster's & Jelfe's books are just to those identified as men on site, in the short term it is likely that most of these roles were carried out by people who were not 'employee's' in the permanent sense, rather they were contracted for individual tasks or took commission on services rendered. (See Figures 5.1.a,b.)

¹⁸ As per Knoop and Jones, *The London Mason in the Seventeenth Century ...*, p. 47.

¹⁹ Carl J. Dahlman, "The Problem of Externality," *Journal of Law and Economics* 22, no. 1 (1979); Coase, *The Firm, the Market and the Law*.

²⁰ BM Ms 27587, TNA PRO 106/145, LMA CLC – 227-15, MS00233

Figure 5.1.a Likely roles under large mason contractor off-site.

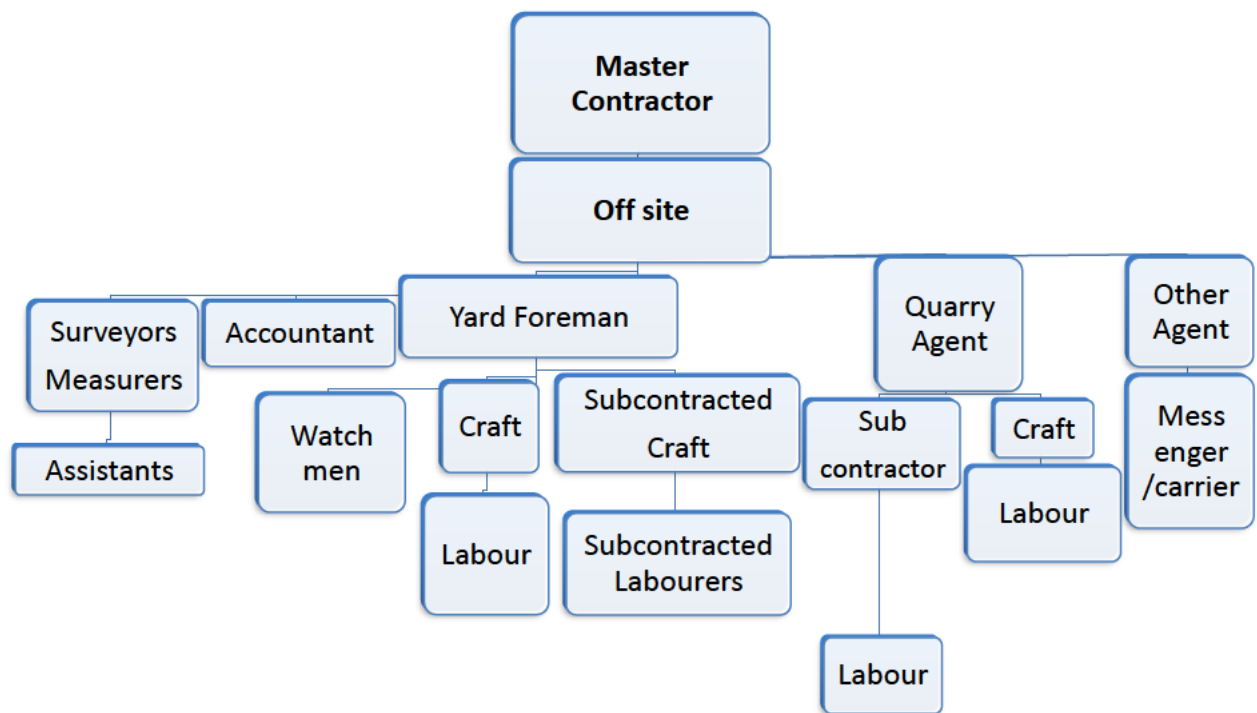
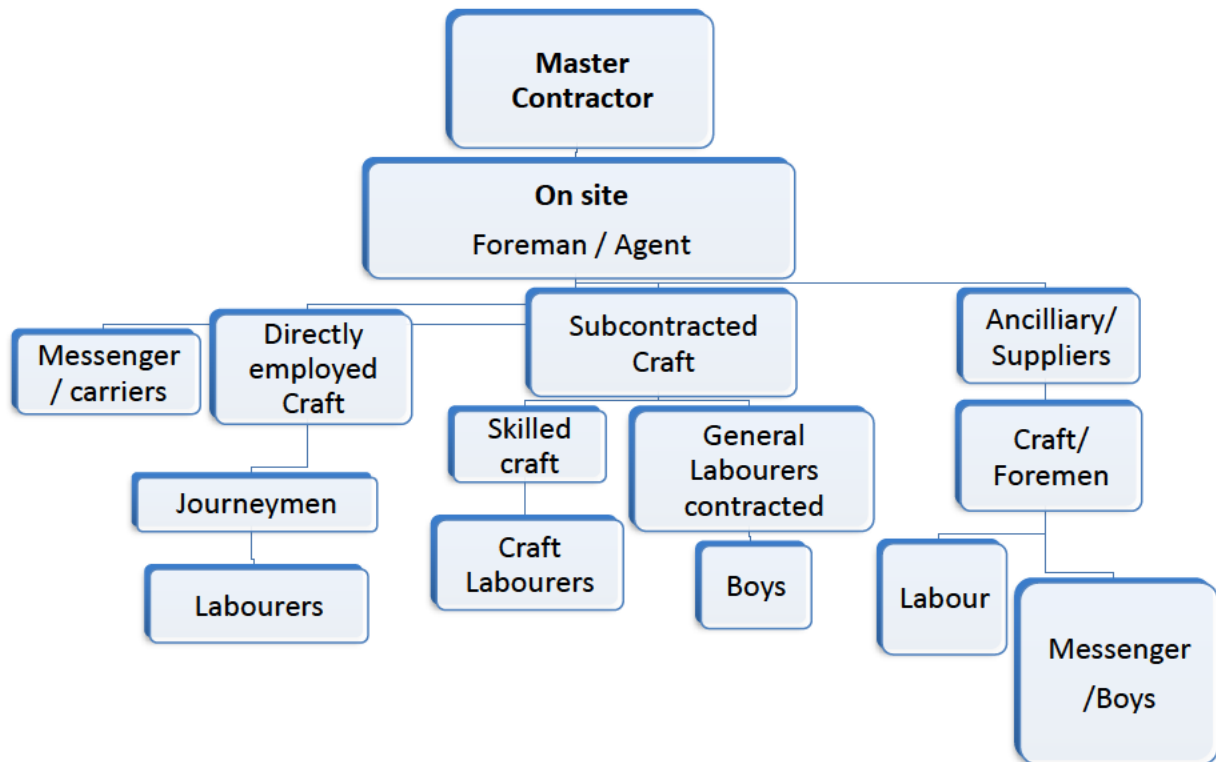


Figure 5.1.b Likely roles under large mason contractor on-site.



Search and Information costs: If contracts were advertised freely by clients in the *London Gazette*, contractors' information costs mostly related to pricing and associated supply chain issues. Prices to be paid for goods labour and materials were agreed as part of the overall project contract. Generally, a client took the right to discount or amend the prices paid if they were not satisfied with quality. So, in setting their prices for a contract, the contractor needed to know the best sources for materials and labour and reckon on how the risks of supply chain shocks and client action could affect their margin.

We can see the impact of supply chain difficulties clearly in the letter book of Andrews Jelfe. This includes a large and regular correspondence with his and Samuel Tufnell's agent for procuring materials for Westminster Bridge, one Mr Roper.²¹ Jelfe faced ongoing problems with the quarrymen, Mssrs. Tizard and Bryer, over the delivery of stone. Many of the letters deal with sourcing alternatives, and discuss how Tizard and Bryer could be persuaded to produce what was needed. Roper received instructions as often as twice a week on sizes of stone and cutting and carriage directions. Jelfe also wrote to him regularly to advise him of contract developments; in July and August 1743, it was to say that work on the Bridge was not going according to plan and to warn him to lay off men (his "many hands"): "I am sorry there is no work for them here".²² Mr Roper may have been agent for labour and materials or just labour in relation to stone. Jelfe may have had more men who provided similar information for different parts of the process. The costs of maintaining such a network would have been commission to such men, and the costs of correspondence. A reliable network of merchants, carters, and procurers meant that supply could be produced flexibly to meet contracted demand, and in other trades it has been shown that the use of middlemen was widespread in the supply chain.²³

The Gilbert & Wise contract for Portland discussed earlier suggests some of the kinds of costs that would have to be handled within a contract that involved the supply of materials. The partners would have had to procure or build cranes, hire a contractor or overseer to manage the quarries, a rope supplier, a tools supplier, a cart and carriage supplier, and one to manage the transport and boats, and a team to load at Portland.²⁴ For example, Jelfe's

²¹ A Thomas Roper worked as a mason at 22d. per day for Jelfe in the year 1734 – 5. It is possible that the Roper acting as his agent in 1741 –3 is the same man, but cannot be confirmed. See p.1 – 10 of BL MS 27587.

²² British Library, MS 27,587, Andrews Jelfe Letter Book.pp. 30 - 147

²³ Ray B. Westerfield, *Middlemen in English Business, Particularly between 1660 and 1760* (Newton Abbot: Newton Abbot : David & Charles, 1968).

²⁴ For a discussion of how this went wrong see Campbell, *Building St Paul's* , chapter 11.

letter books reveal that contractors used agents in key locations, and the volume of correspondence required to deal with such matters.²⁵ Given these activities, and pressures, it's not surprising that contractors managing men on site were sometimes paid to actually be on site. Clients had to offer them some sort of daily allowance to procure their time.²⁶

In relation to such risks of client action, client payment was up to twenty-four months after work was carried out in many cases, and on big public works projects frequently later. In ensuring that this did not incur them a loss on such projects contractors had to price materials and labour to withstand such allowances. It was highly unlikely that clients would raise their rates to accommodate any supply shocks. For instance, the prices that St. Paul's were willing to pay for labour charged to them did not move for the best part of four decades. The rate Bridge House was willing to pay for labour barely moved in nominal terms over a century; those for materials prices rose but so did costs of administration and surveying. The activity of pricing took information as described above but also negotiation, which could take many meetings and correspondence.

Bargaining costs: For extraordinary work, the terms of each contract had to be stipulated and agreed individually. Contractors frequently attended meeting with commissioners and other contractors and paymasters. The Committee at Greenwich Hospital had at least three meetings with Edward Strong and Thomas Hill before issuing a contract. The minutes imply that Nicholas Hawksmoor as surveyor and clerk of works had many more.²⁷ Edward Stanton was called to the Committee for the repair of the Abbey in October 1722 to give an account of his works there. He had offered a bond of £2000 to take on the work and position of Edward Tuffnell, who had died in 1719. At St Martin's in the Fields four contractors contested the bricklaying contract, and several for the masons. The business of appointing contractors took the summer of 1721; Cass, the mason, also gave a bond.²⁸ It was not unusual for the process of agreeing a contract to take months.

Once the contract was in hand, its operation imposed obligations on contractors. Measured work necessitated measurement, which was administered by an accountant and surveyors. Billing and accounts had to be managed to the calendar that the client institution adhered to, typically twice yearly. Contractors would also have to comply with the measurement or

²⁵ BL MS 27587

²⁶ Westminster Abbey Muniments 34513, quoted page 105 above.

²⁷ TNA ADM 67/2, ADM 82/4

²⁸ Ayres, *Building the Georgian City*. Appendix II, p. 234-5

enforcement systems of clients. At Bridge House contractors not only had to make themselves available for inspection by the City surveyor, but possibly also had to pay a commission towards his costs.²⁹ In the later part of the eighteenth century, it was common for architects to charge workmen for assigning contracts and handling bills.³⁰

Because discounting by clients could wipe out a whole bill, the process of measurement was very important to the contractors' profit. Campbell has asserted that measurers were independent.³¹ Nisbet found evidence that measurement sessions always had both the clients and the contractor's representatives present.³² Only the client's measurer usually appears in the accounts however, such as at Westminster Abbey at least. There, all bills are measured by William Dickinson, who is paid £50 per annum for his services, approximately 1.5 - 2 per cent of the annual expenditure. The costs of measuring the work on Fleet Ditch carried out under John Fitch's contract was 0.12 percent of the total cost of the project (£51,307), likely because the measurement was only carried out at the final account.³³ At Westminster Abbey, by contrast, measurement was biannual, and at St. Paul's quarterly. The contractors' measuring costs were borne by himself, and can be presumed to have cost the same. Measurers or surveyors day rates were from 10s. to a guinea a day.³⁴

The other kind of skilled service that contracting firms needed was accountancy, even if that was not of a professional form at these dates. Accountants were required and undoubtedly used by contractors of all kinds. It seems from the letter book of Andrews Jelfe and the day books of William Kempster that contractors made their own rough accounts of costs on a weekly or bi-weekly basis.³⁵ However, as the account book of Edward Strong shows, the costs had to be properly accounted into bills to the client.³⁶ Jelfe's and Strong's books have a number of hands in them, suggesting that Jelfe had assistants or scribes. Given the number of sites and contracts they were involved in, and the distance between sites, a contractor such as Strong, or Tufnell or any of those discussed in

²⁹ Bills at Bridge House in the 1740s were signed by the surveyor, George Dance, and some have an amount, 4d, assigned them.

³⁰ Nisbet, *A Proper Price*.p.34.

³¹ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p. 336

³² Nisbet, *A Proper Price*.pp.2,26.

³³ Ibid. p.2.

³⁴ LMA CLA/007/FN/04/001

³⁵ BL Ms 27587, TNA PRO 106/145, Day book. Jelfe's accounts are fortnightly, Kempster's weekly.

³⁶ LMA CLC/B/227-175

the previous chapter surely did not have time to sit down and account for all their measured rates for all sites for all workers. Foremen or other managers must have gathered data from all sites and collated and prepared it.

Accountants, like surveyors, were well paid in this era. At Westminster Abbey the accounting and audit costs for the refurbishment of the Abbey in the years 1712 – 1720 were approximately £70 per annum, comprising the accountants fee of £60, the auditors' assistant's halfpenny fee in 1716 of £6 9s 10 ½ d., and the clerk's fee for writing up of £2 12s and 14d. This represents 2.2 to 2.5 percent of the total costs at Westminster. As recipients of the coal tax the Abbey was required to create abstracts for the Treasury, which would not have been needed by contractors. It is also not likely that contractors hired auditors and accountants who were as prestigious and pricey as the clients. However, contractors had to employ accountants to write and submit bills throughout the years work - the client had only to receive and check them. It seems reasonable to put contractors' accounting costs at the same level as those of the clients'.

Operating and production costs (including the supply and deployment of labour):

Contractors were wholly responsible for hiring and for paying the labour, skilled or unskilled, that they utilised on a project. As today, much building work, especially on “extraordinary” projects, required the supply of large numbers of workers for short periods of time.³⁷ The construction of scaffolding, for instance, had to be performed prior to masonry work, and if scaffolding labour was not needed for the period that the masonry was ongoing, then the removal of the scaffolding meant calling in large numbers of carpenters again. Labourers were engaged in clearing and demolition one week and soldering and assisting masons the next. In order to meet the cost requirements for each job, time and resources had to be chosen carefully and effectively deployed.

To recruit, organise, and let go casually hired labour at short notice, and to deploy it effectively, took experience, and trust. Yet the search and information costs contractors faced in hiring labour are very difficult to ascertain. Despite the scale of the projects, there are virtually no records of contractor's employment practices. As was mentioned earlier,

³⁷ Campbell, *Building St Paul's* p. 154; Knoop and Jones, *The London Mason in the Seventeenth Century ...*., Appendices A-C, pp. 66 – 72.

Knoop and Jones' survey of company searches showed that the numbers employed in workshops were never more than eight or nine.³⁸ Yet, the St. Paul's call books show hundreds of workers on site. Task work and measured work, by their very nature, necessitated that labour was only deployed for and paid for the time or days it took to complete the pieces or measures required. The labour requirement at sites varied substantially over time, as discussed in greater depth in chapter six and eight below. To give just one example here, there were one hundred and one carpenters on site at St. Paul's in January 1707, eighty nine the following January.³⁹ That a large share of the workforce was fluid is also clearly visible from Kempster's day books for St. Paul's. These show a changing team. A team of approximately seventeen men worked 4 – 6 days October to December 1700, but then had no work for the whole of January. Six to eight of them were rehired in February.⁴⁰ Of the twenty-one men who worked in the week ending October 12th 1700, twelve were also found working in the team a year later. In October 1702 only 9 of the 21 men he had employed in October 1700 were still working for him. Three men who had not been known at that time were now working for him. But eight men who were employed 1700 – 1702 were also employed in 1706 when Kempster returned with a much larger team (around forty men).

Although much employment seems to have been based on casual hiring, some long-term relationships can be observed. William Kempster seems to have not only taken over Jon Thompson's contracts but many of his usual team too. Richard Richards, working for Thompson in 1694, was working for Kempster in 1702 and 1708.⁴¹ Bridge House in particular saw some very long-lasting employment relationships. Bartholomew Sparruck was first observed on the books working for Jeremy Bower in 1707. His son or grandson relinquished the contract finally to Joseph Nixon in 1757. During the 1740s and 50s a regular team of 'gin men and carpenters were recorded. Nixon had been working for Sparruck since the early 1730s.⁴²

³⁸ Knoop and Jones, *The London Mason in the Seventeenth Century*p. 25-8

³⁹ LMA St. Paul's MS 25574

⁴⁰ TNA PRO 106/145, day books.

⁴¹ Ibid. and Knoop and Jones, *The London Mason in the Seventeenth Century*Appendix C.

⁴² See LMA CLA/007/FN/04/19 - 27

Still, most of the available evidence implies that masons were mostly hired on a casual and semi casual basis, with all the search and administrative costs that implies for the contractor - and the uncertainty of income for the masons.

Beyond hiring, labour on site also needed monitoring and direction. The solution to the problem of search and monitoring presumably lay in employing a foreman. However, costs of such a skilled agent or overseer are hard to evaluate. Jelfe's letter book only has his correspondence to Roper not his payment – which would be in the accounts of the partnership of Jelfe and Tuffnell for Westminster Bridge. Roper's pay would not, so far as we can tell, appear in day bills, but rather were one of the firm's costs of operating – he may well have just taken a commission or percentage of the contracts he procured for Jelfe and Tuffnell.

In Jelfe's account for 1734 – 5, he has a number of men regularly employed for most of that year at a number of locations. One, John Ogle, is paid a day rate of 4s. 2d. (50d.) per day, but is not listed as a mason or labourer in any of the bills. It seems that Ogle died during the year. Jelfe paid Anne Ogle, his wife a sum "owing on Ogle's account".⁴³ Given the very high level of his pay Ogle was possibly some kind of overseer, but without further information we can't know how his role worked. Overseers are not priced separately in day or measured bills, which usually charge out masons or carpenters at a flat rate. William Kempster's foreman Fletcher at St. Paul's appears in his daybooks paid 20s. a week in 1708.⁴⁴ The detailed sawing records kept by Kempster and Strong from St. Paul's imply that there was a full time monitor present to record the amounts sawn and the distribution of the load and account for any wastage.⁴⁵ Kempster's day books refer to men who spent time 'in the yard', so there must have been someone overseeing that, and other men present who were not on bills for work done.

Communication and administrative costs between sites presented a particular challenge and added to the set of costs. The letter book of Andrews Jelfe shows many letter to his agent Roper and his fortnightly accounts show that he paid 3d. or 4d. for each letter to and from

⁴³ BL MS 27587, March 1735.

⁴⁴ TNA PRO 145/106, also see Wren Society, Vol XVI, Fletcher appears in the bottom of the list of pay in several weeks in 1708, he is referred to as a foreman, in the Wren Society account, but he is not present throughout Kempster's books.

⁴⁵ TNA PRO 145/106; , and the marble sawing records at LMA CLC/313/I/B/003/MS25473

London when working away. There are frequent referrals to extra charges for transport, paper, pens, letters, and porters. In the six weeks prior to 30th September 1734 these sorts of costs were 2.5 percent of the amounts in his day book.⁴⁶ These may have been exceptional costs because he was working away. Contractors working on projects, but not staying on site themselves, probably had similar high levels of correspondence to overseers or foremen, agents or subcontractors.

5.4.Credit.

As has been recognised by every author who has examined any of the records of the Office of King's Works, the credit that had to be provided for clients (in this case the crown) was one of the major costs faced by building contractors.⁴⁷ The Office of Kings Works owed money to approximately eighty-five contractors throughout the period 1709 – 1725. At any one time, the monies outstanding ranged in total from £6,000 to £11,000. Single contractors were owed as much as £1,200.⁴⁸ At Westminster and Greenwich payments were typically made 15 to 30 months after the work was carried out. For example, the mason Edward Tuffnell's work at Westminster Abbey between October 1712 and February 1713 was measured on the 29th of October 1713, the bill was allowed on December the 29th 1713, and payment signed for on May the 4th 1714.⁴⁹ Tuffnell's outlays of wages and materials costs were not recouped for 19 months. This was apparently not a bad credit period compared to the financial issues at St. Paul's.⁵⁰ At St. Paul's payment initially was only running 6 months behind completion of work.⁵¹ By the mid-1690s however, coal tax revenues delayed payment to such an extent that Wren was forced to convert the money owed to contractors into a bond.⁵² The rate St. Paul's paid for this line of working capital was six per cent per annum from this point, after a significant delay in payment already.⁵³ Remittance records do not show any compensation for delays before the 1690s, and this system was not found at other sites.

⁴⁶ BL MS 27587 pp.4-5

⁴⁷ Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford "; Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. P. 39 – 46. It is recognised as a cost for all commercial operators in the early modern period. Pat p.104.

⁴⁸ TNA WORKS 5 /56 Abstracts of accounts 1709 – 26.

⁴⁹ Westminster Abbey Muniments, 34513.

⁵⁰ Campbell, *Building St Paul's* p. 66 – 67, p. 73.

⁵¹ Ibid.p.66

⁵² Ibid.p.67. See remittance records at CLC/313/I/B/014/MS25483/001.

⁵³ Ibid. p.69

Colvin wrote of a similar system for other major supplying creditors to the Office of King's Works. Apparently, no works account was ever audited, (and final sums paid) within less than two years of finalisation of work, and delays of ten years were not uncommon. "It was the artificers who bore the problem".⁵⁴ Some contractors were owed thousands over many years. In 1670, to deal with the problem and maintain credit, officers of works were allowed six per cent interest on works outstanding which were traded as a loan but only if they loaned a further sum. In 1692 the same deal was offered to contractors who would advance double the amount outstanding to him by way of a loan to the works.⁵⁵ In other words late payment was so bad the Office of the King's Works was forced into paying interest to maintain credit – but the interest rates were only available to those who would put more capital in.

Whilst they waited for payment contractors were paid in tickets or vouchers, a sort of promissory note arrangement. Those who could not afford the outlay any further could sell these on at a discount and apparently a secondary market developed, with some unscrupulous officers of the works taking advantage.⁵⁶ The consequences for the works of perennial lack of cash and late payment were "bad credit and disadvantageous terms"⁵⁷

What was the cost to contractors of supplying this credit? Annual interest rates or discounts on trade bills of exchange were commonly between six per cent and fifteen per cent in the period, suggesting that a commonplace eighteen-month delay in payments cost a contractor about ten per cent of his bill.⁵⁸ The loan system outlined above negated this cost for contractors with their own ready cash at disposal to lend. Those who did not have considerable sums to invest (double their sums outstanding), or to lend bore the six per cent cost of credit.

Suppliers further down the supply chain may have shared some of the pressure, but building contractors could not hire workers on credit. Experienced contractors would have

⁵⁴ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. 'Financial Stress', p.44

⁵⁵ Ibid.

⁵⁶ Ibid.p.45.

⁵⁷ Ibid.

⁵⁸ P. Temin and Hans-Joachim Voth, *Peter Temin and Hans-joachim Voth, "Private Borrowing During the Financial Revolution: Hoare's Bank and Its Customers, 1702–24 1," Economic History Review 61, no. 3 (2008).* p.545, Stephen Quinn, "The Glorious Revolution's Effect on English Private Finance: A Micro History , 1680–1705," *The Journal of Economic History* 61, no. 03 (2001).pp. 593–615.

known the risk and priced work accordingly. The ticketing system, above, may have helped contractor's liquidity, but the given the loan arrangements the tickets must have been discounted by at least six per cent, probably more.

Aside from this, contractors received only token relief for the costs of credit they faced. Advances or imprests were commonly given to key contractors. However, at Westminster Abbey the maximum imprest in any quarter seems to have been £50, whereas contracts in progress in the same period could be worth thousands.⁵⁹ Campbell showed that carpenter contractors receiving imprest money at All Hallows church had small regularly forthcoming payment.⁶⁰ Yet by August 1691, Woodstock, the contractor, had billed just under £1000. That amount of funds had only been paid out to him by May 1693, a delay of almost two years. At Westminster Bridge the system seemed a bit more generous, with payment running only about six months behind bills throughout 1744. On a bill for £6,185 Jelfe & Tuffnell had had imprests of £4000.⁶¹

The amount of time credit was out for likely reflects the differences between institutions and projects. We can see the impact of the need to provide working capital in the Kempster books for St. Paul's, which show the firm using borrowed capital from other family members, as well as from other sponsors, to pay weekly wage bills and keep their team working.⁶² Due to delayed payment by the Fabric Commission, Edward Strong seems to have laid off workers or stopped work at the site in 1702. Minutes refer to workers agitating and the closure of the gates at the east end.⁶³ At Westminster Abbey in 1722 the Abbey was similarly behind in payments to all contractors, but work seems to have carried on regardless, and contractors absorbed the cost of credit.⁶⁴

Although this reduced transaction costs in gaining credit from banks or investors, the cost of financing, if the cash was from those with a share in the profits, was essentially the same. The Bank of England rate throughout the period 1699 to 1716 was 4 per cent, and after that five per cent until 1822.⁶⁵ Usury limits were six per cent, falling to five percent, in this period, but a rate of return nearer 8 per cent annually has been established for two

⁵⁹ Westminster Abbey Muniments, cat. 34513, 34514, 34518

⁶⁰ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction." p.346, Appendix B.

⁶¹ TNA WORK 6/46 throughout and p.47

⁶² TNA PRO 106/145, also Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford".

⁶³ ADM 67/2

⁶⁴ Westminster Abbey Muniments 34517, (December 15th).

⁶⁵ www.bankofengland.co.uk/statistics/Documents/rates/baserate/pdf accessed May 21st 2015.

contemporaneous private lenders.⁶⁶ If credit was priced conservatively at six per cent per annum, then a relatively rapid payment schedule of eighteen months gives a figure of nine per cent. Note, the relevant calculation for credit costs is over an eighteen month not annual period, as I am seeking to evaluate the amount of margin in a bill that would have been dedicated to the cost of credit.

5.5.Discounting.

Contractors' second major risk that would be priced into their margin was the likelihood their bills would be discounted before payment. Measured contracts usually gave the client the right to discount on the grounds of quality. At Middle Temple, Wren discounted the plasterer's bill by thirty per cent in 1682.⁶⁷ Clients wrote this right to discount into construction agreements, as can be seen in Strong's' 1706 mason's contract for Greenwich Hospital.⁶⁸ The client retained the right to discount any work where they had a complaint. The contract did not give reciprocal rights to the contractor.⁶⁹

Day bills were also discounted. The account book of Edward Strong for work building Greenwich Hospital 1698 to 1708/9 shows that his bills were regularly discounted. Strong's day bills were discounted by an average of 15 per cent, his measured bills by 3 per cent.⁷⁰ The discount is shown in Figure 4.b.

In the Strong bill book, eleven day bills out of twenty-five in total were discounted. Two were slashed by more than 55 per cent, the rest were cut by between 17 and 45 per cent. The average day bill discount is 15 per cent. Because his measured bills were discounted less heavily, the total nominal discount by value he took on all his bills was only 3.84 per cent. However, the risk of discounting was possibly perceived and priced by contractors as being greater than that. Since contractors did not have recourse if discount was applied, they must have had some kind of estimation rule of thumb based on experience for allowance. The 10-bill moving average at Greenwich, which is also shown on Figure 2.5a, ran substantially higher than 3.8 per cent for substantial periods, implying that Strong would have been

⁶⁶ Quinn, "The Glorious Revolution's Effect on English Private Finance: A Micro History, 1680–1705." Peter Temin and Hans-Joachim Voth, "Prometheus Shackled Goldsmith Banks and England's Financial Revolution after 1700," (New York: Oxford University Press., 2013).

⁶⁷ Middle Temple Archive MT.6/RBW

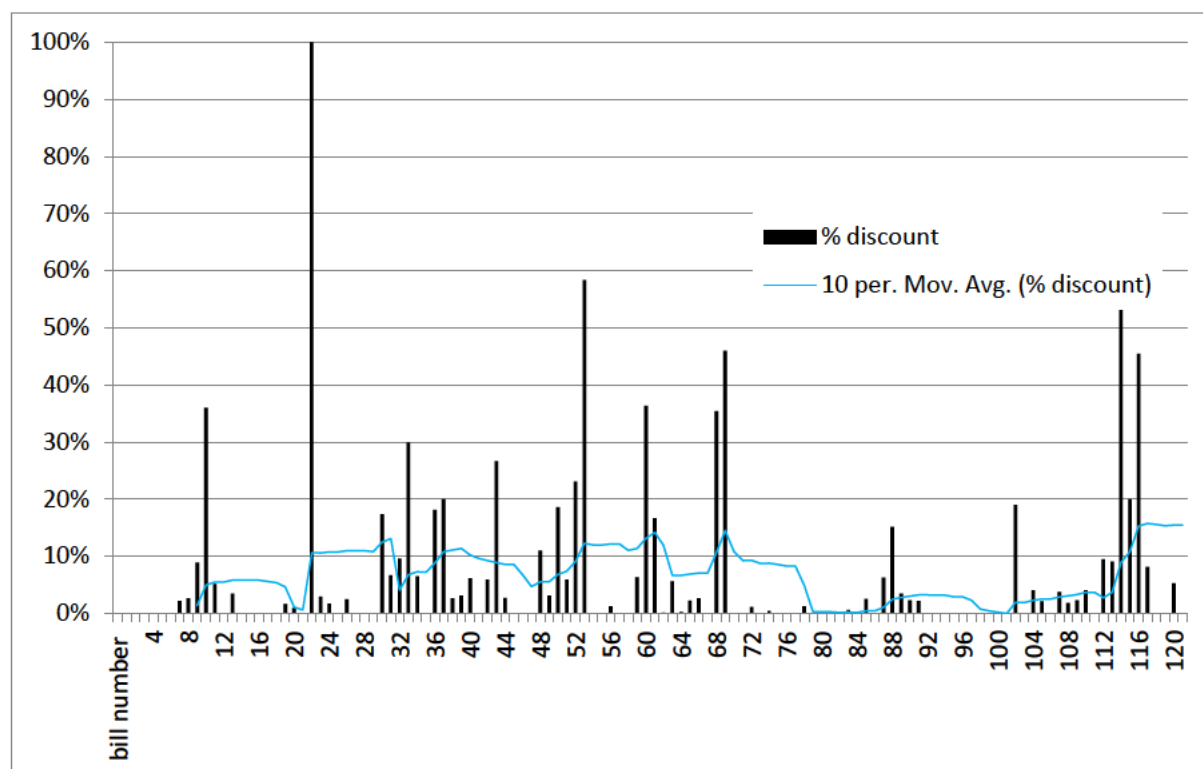
⁶⁸ LMA ref. CLC/B/227-175, formerly MS00233

⁶⁹ A copy of the contract is in Strong's account book LMA ref. CLC/B/227-175

⁷⁰ LMA ref. CLC/B/227-175, formerly MS00233.

sensible to expect a higher discount in his pricing. I therefore allow 3.5 – 7 per cent as the allowance for discounting.

Figure 5.2. Discount of Edward Strong's Bills Greenwich Hospital 1698 – 1708.



Source: bills listed in Edward Strong's account book, LMA ref. CLC/B/227-175, formerly MS00233.

5.6. Additional costs.

Beyond the key ingredients in the costs of doing business enumerated above, contractors faced further additional items that they needed to cover from their margins. Here, I discuss rent, carriage and tools.

Rent:

On top of the costs of operating on site, at least some large contractors maintained separate premises for off-site work and administration, so rent must also be taken into account.⁷¹

⁷¹ Edward Stanton maintained premises at Holborn through the late 1690s (possibly before) to 1720s. We do not know the exact locations of other masons' yards. But the yard would have stored of goods prior to delivery at sites, carving and other work performed off site for task or measured orders, administrative and other. Kempster's is believed to have had premises on Garlick Hill, but these may have been temporary due to work on the Church there.

For example, Edward Stanton maintained premises at Holborn through the late 1690s (and possibly before) to the 1720s. We do not know the exact locations of other mason's yards. But the yard would have stored goods prior to delivery at sites, carving and other work performed off-site for task or measured orders, administrative and other. Kempster is believed to have had premises on Garlick Hill, but these may have been temporary due to work on the Church there. Rents are notoriously difficult to estimate for London in this period. A Figure of 2 per cent is an estimate based on Nicolas Barbon's *Apology*, in which he quotes houses in Bishopsgate at £30 p.a. and in Charing Cross at £60 p.a. in 1685, thus we might expect a median rent of £45 per annum, based on a conservative estimate of turnover at £2,000 for a mason.⁷²

Carriage:

For contractors who were providing materials or final products on contracts by the great or measurement, there were substantial costs of carriage to take into account. Peter Guillery's recent case study of construction at Cavendish Square in the 1750s and 1770s highlighted that as much as half the cost of stone used on such projects was the cost of carriage to site in London.⁷³

Given this, the amounts that institutions accounted for carriage are surprisingly small. At Westminster Abbey 1713- 1720 outwards carriage for the Abbey ranged from £37 to £48 per annum, on an approximate annual expenditure of £3000. Of the total works bill for that seven-year period of £15,789 £290 was billed by the carter, Richard Adams at a rate of 1s. per load. At Westminster Abbey Elizabeth Gregory provided two large mast trees in August 1714 at a total of £10 7s. 8d. and was allowed cash for the purchase. There is no mention of carriage for this in the accounts. There are no purveyor's bills at Westminster Abbey, and no separate bills for stone. Gregory and Tufnell were providing materials, and proving inwards carriage for it. At Westminster Bridge "contracts entered into by the board" include no carriage.⁷⁴ The cost of carriage inwards would have been borne by the

⁷² See note 467, Joshua Marshall had premises at Fetter Lane.

⁷³ Peter Guillery, "Cavendish Square and Spencer House: Neo-Classicism, Opportunity and Nostalgia," *The Georgian Group Journal* 23.pp.75-96. Richard Wilson showed the percentage of the bills appearing in final accounts for country house building in the same period was 4 to 5.5%, Richard Wilson, "The Economic Impact of Building the English Country House 1660 - 1880," in *L'edilizia Prima Della Rivoluzione Industriale. Secc.Xiii-Xviii* (2005).p.997

⁷⁴ TNA Work 6/46

contractors supplying materials. Carriage was required for all inwards goods, stone, mortar, timber and scaffolding and possibly lifting equipment or other items.⁷⁵

The business of carriage was subject to significant risk for contractors. Thomas Gilbert and Thomas Wise's contract to supply Portland to St. Paul's Cathedral discussed above, specifically stated including delivery to a London Wharf.⁷⁶ When they attempted to charge cost for cranes and rope to assist the transport, the Cathedral would not allow the bills.⁷⁷ At St. Paul's some carriage in was recorded, costing between 2s. and 2s. 6d. 'per tun'. Whilst the cost of carriage was undoubtedly built into materials bills, the unpredictability of it necessitated management and a margin for error in financing works.

Tools:

The question of tools is complex. Smiths' bills are a feature of site accounts throughout the eighteenth century, and so are mostly integrated into extraordinary work. Smiths on site charged for tools and tool repairs, but also made cramps and hinges and the other kinds of iron work that were part of construction. Many authors assert that journeymen provided their own tools, in which case their cost would have been met out of their wages directly.⁷⁸ However, there are a number of pieces of evidence that suggest that what was supplied in site by either the client or the journeyman was not the full set of tool requirements. If so, contracting masons, and carpenters and others would have had tool costs as part of their overheads.

When Thomas Wise took over the position of mason to Bridge House in 1685 he was paid a salary of £4 per annum, plus an extra £1 per annum in lieu of edge tools. The edge tools bill prior to this had been more than £1 per annum, so presumably it was expected that Wise's margin on materials or wages would account for further costs. Still, it is clear that Wise was providing his own team's tools. Smith's bills for Bridge House were passed through the purveyor from this point onwards, and are not always regular.⁷⁹ The notebooks of William Kempster show that he made payments to smiths irregularly, mostly small sums

⁷⁵ For lifting items see Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.316.

⁷⁶ Above, page 92.

⁷⁷ See Wren Society Volume XVI page 19, page 51. There is a similar incident at St. Martin in the Fields in 1721 referred to by Ayres, Ayres, *Building the Georgian City*. Page 234

⁷⁸ Campbell, *Building St Paul's*, p. 79. Ayres, *Building the Georgian City*.p.163.

⁷⁹ COL/CC/BHC/10/003

for work on tools. Masons and carpenters with their own workshops faced tool costs. Smith's bills are a small proportion of total building charges, around 10 percent of that of masons at Somerset House.⁸⁰ They cannot be clearly distinguished from other costs at St. Pauls, however. At Westminster Abbey, the accounts do include smiths' bills. The smiths' bill was £78 in 1712 – 13, £103 the following year, and £57 in 1716; it never exceeded 3 percent of the cost of construction, but the bills specify that the charges were for items used in building, not services such as mending tools, so it seems that the cost of tools and maintaining them was borne by contractors or their workers; either way they added to the effective overhead in day bills. If a client such as St. Paul's or Westminster Abbey were willing to leave the employment and deployment of labour and work to the direction and autonomy of contractors, then it is highly unlikely that they could have effectively managed the contractors' tool requirements – even had they been willing to.

5.7.Profit

The question of profit now arises. Whilst the various costs listed above offer some support for Campbell's calculations by showing that contractor's operating overheads fit with his estimate of a margin of between twenty-one and forty-one per cent, they do so before any actual profit is allowed for the contractor.⁸¹ Here we are largely in the dark.

Campbell used the high accumulated wealth of men like Edward Strong to infer that they took a substantial rate of profit from their work. Joshua Marshall left £14,000 on death; Jelfe £30,000 and a country house.⁸² While it is likely that there were some contracts where profits exceeded twenty per cent, it is hard to believe that they were much higher than this. There were competitive tenders for most projects, and it was the stated aim of many a commission for a public project to take the lowest estimate possible. If margins had been that big they would not have survived the tendering process.

There is not a great deal of available data on profit margins for seventeenth century business people that would allow us to set a comparative benchmark. Grassby estimated that an acceptable profit margin to seventeenth century merchants was thirteen to twenty

⁸⁰ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*.p.467.

⁸¹ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p.334

⁸² Ibid.p. 341. Colvin, *A Biographical Dictionary of English Architects, 1660-1840*.p. 3

per cent.⁸³ My working estimate of profit margin is thus set at ten per cent, which should be read with the proviso that it will probably have varied around this figure by a large margin.

5.8.Overall margin.

This examination of the accounts and organisation of building work on extraordinary public projects in London from 1660 onwards suggests that the operating margin that contractors worked with could have been as substantial as a quarter of their turnover. The different elements of the margin are set out in Table 5.1. Allowing for profit, it must be concluded that contractors' mark up on goods and services on average or cumulatively was in the region of approximately a third over prime cost.

It is not likely that this margin was applied uniformly to all labour and services, however. The incentives of measured contracts will have called for high levels of skill at certain times, and lower at others. Changes in prices and conditions of the materials supplied will have allowed a large margin sometimes and a much thinner profit in others. As will be seen in chapters 5 - 7 of this thesis, this operating margin was reflected in the difference between craftsmen's and labourers' pay, and the rates they were charged out at.

Table 5.1. Calculation of operating margin for 'Extraordinary' day work

Type of cost	% share of bills
Credit	6- 9
Discounting	3.5 - 7
Measurement, estimation, agency, overseeing	5
Accountancy	2
Rent	2
Tools	1
Total before profit	19.5 - 26
With Profit of 10%	29.5 - 36

Source: See text

⁸³ Grassby 'The Rate of Profit in Seventeenth-Century England'

5.9. Ordinary work and margin.

Did the same set of conditions apply for the more mundane “ordinary” repair work that went on throughout the period on all building types? The benchmark case for ordinary work in this study is that recorded at Bridge House. Ordinary or regular work, like that conducted on the bridge, had several differences to extraordinary work in terms of financial operations.

Firstly, Bridge House contractors were paid a retainer or salary of kinds. In the receipt books of the 1680s, the salaries for the Mason (Wise) and the Carpenter (Gray) are listed at £4 per annum. Second, as mentioned above, Wise also received an extra £1 per annum in lieu of edge tools.⁸⁴ Third, contractors were also paid weekly for their bills, so they did not have to run long credit lines and associated costs for payments. Nonetheless, if the salaries were meant to ensure a reduction in profiteering, at this level they were too low to be successful; as a result, contractors were profiteering on bills for materials.⁸⁵ Nevertheless salaries might be taken into account as incentivising contractors to moderate their margins.

Bridge House work did not necessitate many of the overhead costs that affected contractors working on extraordinary work. They did not have the same costs of estimation and measurement, nor did they face the risk of discounting. Search and operating costs in ordinary work were not as large as in extraordinary work. The requirement for labour was steadier, large numbers of workers did not have to be gathered and let go at short notice. Thus, the search and logistic costs of variable labour were not as large a consideration for Bridge House contractors, and the foremen involved in managing the labour were retained at day rates. In short, the justification for a margin on wages might seem much weaker in ordinary work.

On the other hand, Bridge House’s contractors still faced considerable financial or credit costs. They paid large sums to obtain their position, sums that only make sense if they were

⁸⁴ LMA CL/007/FN/05/7, 8.

⁸⁵ Latham, “‘The City Has Been Wronged and Abused!’: Institutional Corruption in the Eighteenth Century.”

able to profit from them. The post of Land Carpenter ‘sold’ for £322 in 1706, (to Thomas Wilmor), that of Tide (water) Carpenter £450 in 1710, (to Bartholomew Sparruck), that of Mason in 1720 for £520, and £546 in 1725.⁸⁶ Mark Latham has made a compelling case that there was corruption and false billing and shown that the price the Bridge paid for materials was higher than elsewhere.⁸⁷ The Tide Carpenter justified such practices in 1742-3, by claiming it was customary to seek profit through inflated bills.⁸⁸ The question that concerns us here is whether the craftsmen and labourers working on the bridge for the contractors were party to the corruption and enjoyed the rates paid as recorded, or whether their masters discounted a margin from the weekly wage payments that were made to them before they paid their teams.

Taking Thomas Wilmore’s case as an example: he paid £322 for the position of Land Carpenter in 1706. The interest per annum alone on that sum would have been nearly £20 if priced at a six per cent rate, which given the salary of £4 per annum would leave a £16 per annum, or just over 6s. per week shortfall on interest. His labour bills were in the region of £5 to £10 per week in 1707.⁸⁹ Assuming he hoped and worked to recoup his investment, he could, of course, also take a mark-up on his supply of materials to the Bridge. But the remittance books show that at least some payments for materials and task work was not forthcoming every week, but rather evaluated twice annually, so any monies outlaid for this would incur costs of credit. Given these constraints, it seems probable that like Richard Jenings at St. Paul’s, men like Wilmor normally took a margin from the rates they charged out.

The composition of Bridge House bills, which charge out apprentices at 9s. a week, and other groups at uniform rates also suggest that the amounts listed are charge out rates. But the variation and real rates cannot be known without further records. It is unlikely that William Wilmore received the same as his elder master for 6 days work, however.⁹⁰ While those Bridge House contractors who were supplying materials did so under separate contracts to the main labour work, their weekly bills include no carriage, and some or most

⁸⁶ Ibid.p.1044. Table 1.

⁸⁷ Ibid. p.1046, p. 1051. Latham, "The London Bridge Improvment Act of 1756: A Study of Early Modern Urban Finace and Adminsitration".pp.166, 178, 169, 171

⁸⁸ Ibid.

⁸⁹ LMA CLA/007/FN/06/01/014

⁹⁰ See Image7.1.b, page 194 below.

of the tool costs were met by the purveyors.⁹¹ The costs that the contractor *did* have to bear, and would have sought to recoup from wage payments and other bills, were the costs of purchasing the position, the costs of financing that investment, the cost of meeting audits, and a small allowance for tools and other supplies that could not be passed to the Bridge.⁹² This assumes that the large amount paid for the position would be recouped through the sale of materials.

But after 1731 Bridge House contractors could no longer buy or sell their positions; an Act of Common Council banned sale of place. In a new system contractors - no longer position holders - had to bear audit costs, although they also gained the right to charge interest at four per cent if their bills were outstanding for more than six months.⁹³ All accounts were audited, and all materials and bills had to be passed by the Comptroller, and possibly the Surveyor. Notes in some accounts give the impression that contractors may have had to pay for this 'service'.⁹⁴ As Table 5.2. shows, these costs would have been smaller relative to those of extraordinary contracts, with profit making up the largest component.

Table 5.2. Operating margin for contractors supplying weekly labour at Bridge House – Ordinary work.

Type of cost	% share of bills
Cost of finance	6
Accountancy and sundry	1.5
Total before profit	7.5
Profit margin	10
Total	17.5%

Source: See Text

This chapter has shown that contractors who supplied labour to large sites and institutions in London faced a number of operating and finance costs just as any other business. These included costs of finance, the costs of running networks of suppliers and associated agents, accountancy and audit, rent for premises, and tools and sundry supplies. If these costs were

⁹¹ COL/CC/BHC/10/006, 003 Bills Accounts and sundry papers includes purveyors bill for years 1718 to 1730

⁹² The final bill books for Bridge House are 'audited'. Later books show that Wilmore was paid in lieu until his books were audited. CLA/007/FN/03 22 – 27, and CLA/007/FN/10/007

⁹³ LMA COL/OF/02/173

⁹⁴ Ibid. notes beside amounts are signed off by the surveyor.

not built in to the prices they charged clients, they would have lost money. The operating costs were up to 25 per cent before any profit margin, and over a third, or up to 40 per cent depending on profit margin. The following chapter shows what this meant for the pay of ordinary craftsmen and labourers, and how the difference between charge out rates and real pay worked on real sites.

Chapter 6. Pay in Practice

6.1. The employment relation context.

While the previous chapters have discussed the way in which building projects were contracted and organised, the following chapters will look at the effect that this organisation had on the pay and working practice of ordinary craftsmen and labourers. In order to put the pay data in to context we should first examine the means of employment and the characteristics of the work men were paid for. The most obvious one to address is that of skill. Was skill across the different sites relatively homogenous or not? If Woodward found that labourers and craftsmen did not always work together was this the case in London also?

The chapter will also deal with the formation of the wage, which was a topic of much research in the late 1980s and early 1990s, with its focus on non-monetary payments. In this section I discuss the evidence pertaining to whether we should consider masons', carpenters' and other building workers' money wages as their sole source of income. The question is essential to our views of living standards, and to the costs of hiring and deploying labour for business. Lastly the chapter will examine pay in practice in three cases; firstly, the fragmentary sample of call books and pay from Middle Temple in 1614. Secondly, the pay records of the Office of the King's Works London sites in the early 1660s.¹ The records seem to have been possibly some of the last to record direct payments to men. Thirdly, the detail of masons paid by Andrews Jelfe in the early 1730s disclosed in his biweekly personal accounts in his letter book.²

The following sections will discuss the skill level of workers on the sites that are discussed here, their means of pay, and the hours of work, and what can be known of the employment relation.

¹ TNA WORK 5 / 1 - 2

² BL MS 27587

6.2.Skill levels

“A related issue that arises is the difficulty of defining skill. One tactic commonly employed by economists and economic historians to finesse the problem of definition is to measure it by wage differentials between various groups. However, this still presents the difficulty of distinguishing between the "real" quantity of skill versus the premium the market assigns per unit of that skill.”

David Mitch, ‘Learning by doing among Victorian farmworkers’. LSE working paper 16/94, 1994.³

David Mitch’s point is never so true as for building workers in early modern England. Although the “law of one wage” that underpins wage series since Bowley requires that the relationship between the skill level and pay be comparative and representative, the skill level of building workers may not fit the standard assumption that it is comparable by trade. Furthermore, as only charge out rates have been recorded in wage series, the underlying levels of skill deployed have not been reflected. There is very little existing literature on how skilled building craftsmen were, or exactly what their skill entailed.

The skill level of London workers generally in the early pre modern period is most memorably described as flexible. Schwarz, for example, concluded that the eighteenth-century labour market in London was typified by a flexible and skilled workforce who possibly had experience and knowledge of more than one trade, and who were ready to take up new work readily.⁴ Existing literature on the work and skill of masons, carpenters and other building craftsmen in the early-modern period has mostly been within the framework of guild regulation and apprenticeship training. The most detailed study to date; Woodward’s *Men at Work* examined northern England through the period 1450 to 1750.⁵ This periodisation led to an inevitable framework of masters, journeymen and apprentices, but within that framework there is little discussion of how skilled craftsmen were.

Woodward noted that the straightforward progression from apprenticeship to mastership was not operating as expected, and that many journeymen worked for many years without

³ David Mitch, "Learning by Doing among Victorian Farmworkers: A Case Study in the Biological and Cognitive Foundations of Skill Acquisition," (Department of Economic History, London School of Economics and Political Science, 1994).

⁴ Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*.pp.11-30

⁵ Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*.

becoming masters. If skills are developed further with experience then some of these journeymen must have been very skilled, but no clear relationship between that and pay could be made by Woodward.⁶ Woodward found wage differentials within trades and noted a premium for foremen who were managing workers.⁷ He also noted that labourers' work and skill was frequently independent of craftsmen – they were hired for jobs discrete from those which skilled craftsmen were. Knoop and Jones wrote extensively on descriptions of work from the late medieval period, and whilst they show that quarrying techniques and skill remained largely unchanged from early times through to the nineteenth century, they also highlighted the impact that better transportation had on masons' work offering the opportunity for contractors to economise on workshop and site work.⁸ They too found that contracting methods in the seventeenth century obfuscate an attempt to categorise skill levels effectively.⁹ James Campbell also noted that the hierarchy of workmen in St. Paul's could not be known.¹⁰

Some earlier literature, by proposing that some pay was non-monetary, by implication assigned status and custom as determinants of pay as much as skill.¹¹ The relationship between skill, pay, capital and technology is not clearly understood for the early modern period.¹² The lack of data and clarity on relative skill levels in our sources has not stopped economic historians from using recorded charge out rates to calculate a 'skill premium'.¹³

What emerges from the analysis of organisation in the building trades in this study is that skill in the building trades was much more complex than the binary model used in wage series, and by Van Zanden. If contractors charged clients charge out rates and paid labour less than this, then there were two distinct prices being set in the market for skilled and unskilled labour. The first was defined by what clients were willing to pay contractors for producing a particular element of construction and the price that contractors were willing to accept. The second was defined by what contractors were willing to pay to workers to carry

⁶ Ibid.

⁷ Ibid.p.4

⁸ Knoop & Jones, Douglas Knoop and Gwilym Peredur Jones, *The Building of Eton College, 1442-1460 : A Study in the History of Operative Masonry, Transactions of the Quatuor Coronati Lodge* (S.l. : 1933).

⁹ Knoop and Jones, *The London Mason in the Seventeenth Century ...* . pp18 – 66.

¹⁰ Campbell, *Building St. Paul's*, p. 78.

¹¹ The argument was reiterated by Leonard Schwarz, "Custom, Wages and Workload in England During Industrialization," *Past and Present* 197 (2007).

¹² See Claudia Goldin and Lawrence Katz, "Technology, Skill, and the Wage Structure: Insights from the Past," *The American Economic Review* 86, no. 2 (1996).for debate summary.

¹³ See chapter 1 above.

out that work and what workers were willing to accept. Until now there has been virtually no evidence of this second price, which is what was really the wage, but what of the skill levels? How skilled were building workers on London sites? How much investment in their skills had they made?

a. Skill of craftsmen.

There is a body of work in architectural and construction history that details the kinds of skill that are used in the building trades, and it holds that the skill level of building workers was extremely high and the inputs to be both creative and craft oriented.¹⁴ The bible for current architectural historians on skill in the building trades in the eighteenth century is *Building the Georgian City* by James Ayres.¹⁵ Ayres's sources are archival records, contemporaneous trade guides and early nineteenth-century trade manuals. For the economic historian, the notable features are the wide variety of sub-occupations within our broad taxonomies of 'carpenter' or 'masons', and Ayres's frequent assertion that mechanisation of the building trades occurred outside of Britain first due to the British craftsman's resolute rejection of any technology that would displace labour.¹⁶ Ayres's core study is of craftsmen's skills in the production process, and he proposed that their creative 'art and mystery' was a fundamental contribution to what they built.¹⁷

The evidence from the skill manuals and secondary literature is that workers in the construction trades invested heavily to acquire specialist skills. In the taxonomy deployed and proposed by Joel Mokyr in his analysis of the role of knowledge in technological change, the specialist skills of construction had both propositional and prescriptive; *episteme*, and *techne*, elements.¹⁸ Firstly, knowledge of materials, the properties of different types of stone, their composition and wear and subsequently, knowledge of processes to quarry, cut, hew, and lay that stone. For wood; the properties of different trees, wood, and age, and the processes for preparing and cutting the wood to either weight bear or present aesthetic properties.

¹⁴ see Ayres, *Building the Georgian City*. chapters listed by trade.

¹⁵ Ibid.

¹⁶ Ibid.p.125

¹⁷ Ibid, p.11

¹⁸ Joel Mokyr, *Gifts of Athena : Historical Origins of the Knowledge Economy* (Princeton, N.J.: Princeton University Press, 2002).p.3

The literature is clear that masons had the propositional *and* procedural knowledge about such aspects of engineering as how walls sustained loads, the requirements of foundations, the weight bearing capacities of arches and vaults, to be able to construct structures to bear loads and span heights and widths.¹⁹ This knowledge had limited application in other trades or businesses, and could not be replicated easily by those who had no such training. The skilled practice or *techne*, required physical strength and dexterity, which again, once learned were not transferable to other trades. To acquire the same skills now takes a minimum of three and more likely six years workshop-based training and further years on the job.²⁰

There are a number of stages or parts of masonry. Quarrying, or cutting stone from the ground required knowledge of rock and geological formation, understanding of the stone bed, working knowledge of tools and experience of and strength in cutting techniques. Christopher Wren's instructions to Thomas Wise and Thomas Gilbert for St. Paul's Portland show that quarries cut to order and some of the hewing and scappelling was done at the quarry before the stone reached the site.²¹ Sawing stone was a physically arduous and technically dangerous operation performed in pairs (top and bottom dog), with long curved saws and cutting sand.²² Pay was 5/9ths in favour of the top dog. "The saw weighs 88 pounds" reads a small note among piece rates in William Kempster's day books for 1700.²³ The top dog would be raising more than half a proportion of that weight on each pull of the saw. Having sawyers on site meant that exact measurements could be altered if needed, but also minimised carriage costs.

For the stone to bear the weight of its place in the construction and weather well, it must be cut to the right facing, and that required knowledge of how a wall or structure was to be formed. Hewers cut and shaped the stone, layers fit it to the facings, but for very fine surfaces hewers and carvers then finished the stone when in place. Special sheds at sites

¹⁹ Ayres, *Building the Georgian City*.p.66-81

²⁰ By way of example see Bath City College stone masonry courses spec.

<https://www.bathcollege.ac.uk/product/stonemasonry-introductory-programme>

Some of this information was based on a conversation with Andy Dean, Stonemason, Somerset, England, April 2015.

²¹ LMA St. Paul's MS 25,623

²² Ayres, *Building the Georgian City*.p.126-7. Sand is in the accounts of St. Paul's in early months of construction at 1s. per load.

²³ TNA PRO C145/106

such as Greenwich were set up for the purpose of carrying out carving and finishing.²⁴ Iron work was a key part of stone fitting, with ‘dog irons’ referred to frequently for securing corners of construction. Ironwork and tooling were crucial auxiliary trades to masonry. Labouring for masons would have comprised hauling stone from the place of cutting to fitting, and supplying cutters with tools and sands and fitters with irons and mortars.

The timber trades are usually written about by economic historians as falling into two categories, that of carpenters and joiners. Carpenters were responsible for structural building in timber, including external work, roof trusses, beams and joists, whilst joiners worked on more complex small carpentry for internal woodwork and furniture. It is sometimes asserted that the fortune of carpenters declined after the Great Fire and the demise of building in wood in London. But carpenters on stone-built projects were crucial because they formed the ‘centering’, supports and scaffolding for the formation of stone arches and vaulting and weight-bearing loads. Joiners’ day bills at St. Pauls were for making the moulds that stone was cut to; there is an association between joiners and carvers in many records. Scaffolding at Greenwich was subcontracted by Edward Strong (mason) – to an unnamed carpenter contractor.²⁵

Ordinary building work descriptions reference ‘work done’, and sometimes imply a lesser level of skill to that at St. Paul’s, for instance such as that done by Joseph Kinleside on London Bridge in 1752, “making good ashlar on the bridge”, “clearing the holes of tarr and fitting ashlar”.²⁶ When a specific repair is not described the description is more general still, for example for “mason’s work at the yards and about the south abutment”. In the same accounts the land carpenters bills were for merely “work done and other jobs at the Bridge”.²⁷ The skill level of the ordinary work described cannot be determined however; some maintenance may have been highly-skilled.

It is clear that masonry on London sites in this period covered a wide range of ordinary hewing and fitting, and more complex carving, and some advanced engineering and fitting. Some of the sites discussed in this study, St. Paul’s, Westminster Bridge particularly were cutting edge projects of their day. The work at Middle Temple, and Bridge House would

²⁴ Adam White, "A Biographical Dictionary of London Tomb Sculptors, C.1560-C.1660," *Walpole Society* 61: 1-162. (1999).

²⁵ LMA CLC 227 – 75 17 40 - 60

²⁶ LMA CLA/007/FN/04/003 Masons bills.

²⁷ Ibid.pp25 - 36

have been more usual maintenance. Chapter six uses pay evidence of masons at St. Paul's who cut and fit the geometric staircase among other work. Such work would have involved basic masonry skills of cutting, hewing, more advanced carving, and the fitting required advanced propositional understanding of the engineering of individual treads and the whole structure.²⁸

b. Skill of labourers

In the building trades the term 'labourer' covers many different levels of skill. As Woodward noted, in northern towns labourers were frequently employed for jobs independent of craftsmen.²⁹ Traditionally, economic historians have gathered data of both those classed as labourers and those assisting craftspeople into a single category, assuming the skill levels of each would have been the same. But as discussed earlier, some authors see the roles as having different skill levels.³⁰ Labourers had a general roles on a building site, responsible for demolition and moving loads, whereas those assisting craftsmen may well have been training in that trade, and could have had trade-specific skills. As this section will show, general labourers could also have some kind of security or managerial or non-production responsibility too.

There are good descriptions for labourers' tasks at St. Paul's between 1674 and 1710, and at Westminster Abbey from 1712 to 19. All contractors in whatever trade list labourers in bills at one time or other, but labourers are not always present in bills. At the same time, clients or sites hired labourers through a labouring contractor, or through a clerk of works. Some contractors specialised in supplying labourers. William Meredith was a major contractor to the Office of King's Works for paving and labourers after 1770 on many sites. At Bridge House, there were generally two types of labourers on the books. The first were those regularly employed by Bridge House at 7s. a week.³¹ The contracting trades also detailed a small number of 'labourers' in their bills at Bridge House either paid by the tide or, more usually, the day. We have no information on what relationships lay behind the hiring of

²⁸ <http://www.buildingconservation.com/articles/stonecantstairs/stonecantstairs.htm> for a description

²⁹ Woodward, *Men at Work : Labourers and Building Craftsmen in the Towns of Northern England, 1450-1750*. P. 175 - 176

³⁰ I refer to my discussion of Rappaport's taxonomy and Woodward, above, pp.29-31.

³¹ LMA CLA/007/FN/04 Bills.

labourers, but it seems likely that contractors had a pool of labourers familiar with their work that they called on either regularly or casually.

What did labourers do on site? At Westminster Abbey in the 1700s, labourers were employed in a set of varied, skilled roles. Moving loads of building materials about was certainly a large proportion of labourers' work, but they were expected to be able to assist both masons and carpenters knowledgeably. In 1712 to 1714, labourers employed by Ralph Sims were detailed as "throwing down Rubbish", and also bringing molten iron to the masons, "making moulds for joiners", "bringing and carrying molt and ironworks to the masons".³² Sims's bill charges them out at 20d. per day. In other words, the labourers were assisting masons in joining and laying stone. Tuffnell, the mason contractor, billed for mason's labourers also - we cannot know if it was for exactly the same work or the same week.

This mix of roles is also apparent in the descriptions of work carried out by labourers at St. Paul's' Cathedral in October 1675, who were employed in:

"making of mortar, in screening and sifting fine rubbish, in wheeling rubbish to several places, in wheeling drudging and carrying stones from the West end of the Church to the masons work, in pumping and carrying water to the mortar heaps, in tallying the lime sand and rubbish carts and dores and like work".

In February 1676 they were again employed "making mortar sifting rubbish carrying and wheeling, digging up old stones, clearing ground for ye foundation". In November 1675, they were employed in "removing and carrying stones from outside of ye old rubble wall. in to the masons work, ... in helping the carpenter to make the scaffolds and wheeling off rubbish to lay under the inside of the wall for the stones to be thrown down upon".³³ As they were also responsible for tallying carriage and looking after the 'dors' (checking what arrived on and off site) at least some took on a position of accountability too. By April 1676 they were doing all of the above and, what one would expect of labourers, moving heavy goods about, removing "great quantities of stone along the west end of the portico into ye street for a cartaway, landing baulks and timber at Pauls' wharf and setting them up in St Gregories Church yard... ", But they were also busy "In cutting hewing down digging up and disabling the out walls of the south side Isle of the nave of the church and the out walls

³² Westminster Abbey Muniments 34513

³³ Wren Society, Vol. XIII, pp.159,163

of the W. side of the South Cross Isle nere the Convocation house”, which sounds quite like masons work. There were dedicated contractors for demolition who got paid by the measure. “To J Parker and John Simpson taking down 365 cubical yards of the foundations of the outward wall of the old church from the foundation of the old steeple westward at 18d. per yard.”, and “taking down 5 pedestal stones at 5s. a piece”³⁴ We cannot know what Parker and Simpson paid their men.

It is apparent in examining these tasks that labourers’ roles could require both propositional and prescriptive knowledge, and physical strength. That of the properties of the materials they were working with, and how to manage materials, tasks, tools and themselves on a busy site. Assisting joiners with moulds for masons, carrying molten iron and iron works are all tasks that have a fundamental impact on output. Bricklayer’s labourers were hod carriers but also responsible for the missing of mortar and the handling of bricks to the layer, again their speed and skill determining output. In assisting craftsmen, they would need knowledge of the basic procedures of masonry, joinery, ironworks and carpentry and scaffolding technique.

Probably the most direct evidence that labouring could encompass a range of skills is found in the pay records themselves. Labourers’ pay was *not* the lowest on site. The term ‘labourer’ in accounts or bills refers to a very wide range of skill and strength. At St. Paul’s the cathedral paid 16 – 18d. a day to labourers, but 12d. to ‘men’.³⁵ There are some descriptions of wholly unskilled work which contrast with the tasks labourers took on of mixing mortar, assisting bricklaying, ironwork and joinery. At Westminster Bridge in 1744, Jelfes and Tufnell’s charged out masons labour at 24d. a day, while ‘diggers’ were charged out at 18d. per day by Sam Pries, ‘Bridgemaster’ and also, contracting providing labour and materials for sundry tasks, (The Allen series’ rate for labourers for 1744 is 24d. per day).³⁶ The same contractor, Sam Pries, in 1744 “paid two men taking up one of the floats adrift and looking after it two days 2s 6d”, implying a day rate of 6d. to 7d. per man for utterly unskilled work.³⁷ For comparably unskilled work we might consider watchmen, who were paid a shilling a night at St. Paul’s in the early eighteenth century; watchmen were still paid 7s a week for a 6 day week at Bridge House in 1784.³⁸ The presence of charge out rates

³⁴ Ibid, XIV p.77

³⁵ Wren Society, XVI, p. xiv - xvii

³⁶ TNA WORK 6/46 pp.30-45

³⁷ Work 6/46 pp. 39, 41

³⁸ LMA CLA/007/FN/10/007

lower than that of labourers implies that labourers were paid a premium for strength, experience and responsibility. What we don't know is if they can be thought to have made any investment in their skill acquisition, or were any skills just learned on the job.

For both craftsmen and labourers, the level of skill underlying the charge out rates is difficult to determine, and the terms 'carpenter' or 'mason' cover large variations in skill, from basic craft to the highest levels of engineering and aesthetic skill. Examining charge out rates only gives us information about the amount that clients were willing to pay for a certain type of skill deployed. Real records of what craftsmen were really paid are needed if we are to understand the returns to labour of investment in skill.

6.3. Wage formation.

It should be stated that there is a very good reason why not many authors have identified day rates in institutional account books as charge out rates before. There is only fragmentary evidence from actual contractors' records to compare them to. This is to be expected; modern day builders and construction workers are not renowned for the meticulousness of their paper record keeping, so it would be unlikely that contractors in the seventeenth and eighteenth centuries were any better.

The lack of contractors' actual records limits the knowledge we can have about two things that crop up in discussions of early modern wage formation that have relevance to living standards: the frequency of payment and the means of payment. Earlier literature on pay in early modern London is dominated by notions of 'exchange entitlements', and perquisites.³⁹ In all the accounts examined for this study I found practically none of either.

The notion of exchange entitlements, originally advanced in relation to workers near poverty in developing economics by Amartya Sen, was developed by L. D. Schwarz as an economic explanation of non-monetary payments to workers in the early modern economy. Schwarz argued that as real wages, on his calculation, dropped in the later part of the eighteenth-century, non-monetary payments and behaviour such as pilfering of goods made up the

³⁹ L. D. Schwarz, "The Formation of the Wage: Some Problems," in *Real Wages in 19th and 20th Century Europe*, ed. Peter Scholliers (Oxford: Berg, 1989); Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*, pp 164- 165.

slack.⁴⁰ The putting out system was held to engender the most persistent type of fraud or misappropriation where the remoteness of owner monitoring almost encouraged such misappropriation, but it was also apparently rife in London dockyards in the eighteenth century.⁴¹ Schwarz speculated that institutions that could not raise wage rates without forms of approval would have needed non-monetary means of reward to keep workers.⁴² Jan de Vries asserted that in the early modern Dutch Republic secondary labour agreements for extra 'shoften' (the unit of work time between breaks, there being four in a day) fulfilled the need to raise remuneration without raising a day rate which it would be difficult to lower again.⁴³

If building craftsmen were benefitting from perks of materials and goods the evidence, of course, would not appear in account books, but there is one compelling reason why it is not plausible that masons, carpenters, plumbers or joiners were making a substantial additional income from perquisites: contractors were charged for goods that they took offsite. Both tide carpenters and land carpenters at Bridge House had to record waste, and had it deducted from materials bills. Plumbers at Westminster Abbey and the Office of King's Works had to discount old lead from bills for new. In 1712 at Westminster Abbey old lead was charged to be taken off site at 12s. the lb, and new lead purchased at 15s. the lb.⁴⁴ At the Office of King's Works in 1779 new lead was priced at 19s. 6d. the lb, and old at 16s.6d. the lb.⁴⁵ Materials bills on sites were greater than labour bills, if workers had been able to take materials off they would have seriously affected a contractors' margins. The issue of wastage is taken very seriously indeed in accounts, and watchmen were hired to prevent it.⁴⁶ This is not to say that a length of timber, or tool, or nail never made it off the site in someone pockets, but it is to say that it was difficult enough to do that we can safely assume

⁴⁰ Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*. p165, Amartya Sen, "Starvation and Exchange Entitlements: A General Approach and Its Application to the Great Bengal Famine," *Cambridge Journal of Economics* 1, no. 1 (1977).

⁴¹ J. Styles, Embezzlement, industry and the law in England, 1500 – 1800, in Maxine Berg, Pat Hudson, and Michael Sonenscher, *Manufacture in Town and Country before the Factory* (Cambridge: Cambridge University Press, 1983). pp 173-205

⁴² Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*, p165.

⁴³ Jan de Vries, "An Employer's Guide to Wages and Working Conditions in the Netherlands, 1450-1850," in *Hours of Work and Means of Payment: The Evolution of Conventions in Pre-Industrial Europe*. Eleventh International Economic History Congress, Milan, , ed. Carol Leonard and B.N. Mironov (1994).pp.60-61

⁴⁴ Westminster Abbey Muniments 34513. Plumbers bills.

⁴⁵ TNA WORK 5 /67

⁴⁶ See Wren Society accounts, all years, all months.

that perquisites made no substantial difference to the welfare of workmen, and so none is added to the wage data presented.

The next question to examine in relation to means of pay is whether workers were regularly paid or whether they had to accumulate or save to survive periods without pay or indebt themselves. What intervals were craftsmen and labourers paid at? There is plenty of evidence of weekly payments, but it cannot be substantively proved that all workers were paid weekly, as there is also evidence of other kinds of payment schedules. Schwarz cited the example given by Styles that dockyard workers waited for pay when contractors were paid late by the Crown in the mid eighteenth century.⁴⁷ If payment was as late as the fifteen months cited at Chatham Dockyard, the effect on welfare would have been considerable. The evidence that men were locked out at Greenwich whilst work was delayed by late payments of the Hospital to Edward Strong may be indicative of practice more generally, or may be an isolated case.⁴⁸ It is notable however that the men chose to stay at Greenwich and await work at the hospital rather than seek work elsewhere.

Weekly payment schedules are observed in St. Paul's records and in references to the carpenters at St. Paul's in the 1711 correspondence relating to Richard Jenings. Contractor day books discussed in the section on Pay at St. Paul's are clearly marked "paid this week", and show at least one contractor borrowed to pay staff weekly, presumably to keep skilled labour on site.⁴⁹ At Greenwich Hospital, however, it seems that Edward Strong suspended pay to workers when the Hospital Commissioners were late in paying him.⁵⁰ Confusingly, the Wren Society accounts talk of labourers being paid weekly at St. Paul's, but they are accounted for monthly.⁵¹ Westminster Abbey's biannual accounts (at Lady Day and Michaelmas) of payments to contractors report payments for labourers in weekly portions or instalments. At Bridge House, record-keeping was weekly for the entire period until 1785, but if contractors' accounts were not audited or up to date the amounts paid were 'in lieu'.⁵² Labourers and those paid directly are also accounted for as paid weekly in the purveyor's

⁴⁷ Schwarz, *London in the Age of Industrialisation : Entrepreneurs, Labour Force, and Living Conditions, 1700-1850*. Quotes John Rule, *The Experience of Labour in Eighteenth Century English Industry* (New York: St. Martin's Press, 1981).p.130.

⁴⁸ See ADM67/2, pp.4-15

⁴⁹ TNA C 145/106, Wren Society, Vol XVI 109-111, 149, 163-5

⁵⁰ ADM 67/2 as note 538, and Mobus, "Surviving Late Payments: The Strategies of Christopher Wren's Masons from Burford".

⁵¹ Wren Society, Vol. XVI, Introduction.

⁵² Wilmor bills paid on account until audit, see LMA CLA/FN/04/018, 019

bills.⁵³ It would be fair to reason that most other workers who were hired by the day were also paid weekly. At the Office of King's Works, record keeping was monthly. Furthermore, days were totalled monthly. Contractors were owed large sums, sometimes over a period of years. It may be that contractors paid workers weekly and absorbed the costs, or that they paid them monthly to fit in with salaried labourers in trust and other directly paid clerks and officers who were paid monthly.⁵⁴

There is no evidence of anything being used in remuneration except money; it was exclusively cash that workers were paid in. There are four small exceptions that very much prove this rule. Some rare references to the cost of workers' boots exist in accounts, breakfast was charged out in contractors' bills in a couple of instances, and credit was given to regular workmen in one case, while we can identify one incidence of sick pay. The first exception, for boots, is the emption bills of city surveyor Nicholas Duncombe in the late 1690s.⁵⁵ A number of the regular emption bills list "boot money" and the bill is an astounding amount of 17s. for three pairs of shoes.⁵⁶ There is also one line "pair of shoes" in Kempster's books, but again, this was just for one pair, not for all of his workers' shoes.⁵⁷ Shoes are not listed in the St. Paul's accounts for the churches' own labourers for instance, nor in any other accounts at Greenwich, Westminster, in the Office of the King's Works or elsewhere. Boots, or workwear, were not generally issued.

Alternative explanations to the paternalistic care of workers' feet is that the boots were special protective or occupational shoes for certain types of rare jobs, or site shoes for contractors and surveyors, who would have been wearing finer leather shoes (and perhaps pattens on the street).⁵⁸ So although there are indications of a small number of shoes in accounts there is no support for the idea that workmen got shoes as usual or standard issue. Shoes are only found in the Bridge house accounts in relation to horses.

⁵³ LMA COL /CC/BHC/10 /003, 006, Purveyors bills.

⁵⁴ TNA WORK 5 1- 26 and beyond, Account keeping is monthly at all sites.

⁵⁵ Emption in accounts of the time is akin to 'expenses' today, it refers to items purchased.

⁵⁶ LMA COL/SJ/09/003

⁵⁷ TNA PRO /145/106 1708 day book (no page numbers)

⁵⁸ F. W. Fairholt, *Costume in England : A History of Dress to the End of the Eighteenth Century*, ed. Harold Arthur Lee-Dillon Dillon, 4th ed. ed. (London: London : G. Bell and sons, 1896). Fig 283 , p.373 offers an example, of an arrangement of a fine slippe and protective clog. It is likely that workmen in this period would have worn clogs, not boots. I am grateful to Alasdair Peebles, an independent researcher of early modern men's clothing for this reference. As he has pointed out the history of occupational wear is an ill-researched subject.

The second exception is food, lodging or provisions. It was known for journeymen hired on long term contracts in other trades to be remunerated partly with board. In the London accounts there are a small number of instances. Paviour's bills at Bridge House in 1721 and 1722 include breakfast, charged at 1d. per person. This was for day and night work, in winter mostly. In 1722 the tide carpenters had drink on one occasion. None of the tide carpenters, the land carpenters, or the masons who were working on the bridge 1685 – 1788 were paid in kind in any way. There are two Tide Carpenters' bills that include drink for the men in the 1730s, but there are no other references to this elsewhere, nor do purveyors' bills include any food for workmen.⁵⁹ Unless contractors fed their men out of their own operating margin (in which case that would have to be increased), it was in no way common, routine or normal practice for London building workmen to receive payment in any sort of kind 1660 – 1780. At St. Paul's there are no accounts for food, nor at Westminster Abbey.

The other examples of contractors supplying food or drink are similarly exceptional. At Westminster Bridge, William Etheridge, carpenter, charged for breakfast for men working in the water in December 1743, but breakfast is not reported among other bills there. Presumably the conditions justified the incentive. Likewise, carpenters working in "the wet and the cold" in January in 1744 were given the universal analgesic of the eighteenth century; gin.⁶⁰ The effect on their living standards and that of their families is debateable. The mason Andrews Jelfe's letter book implies that drink was offered on exceptional occasions. He recorded "gave four men to drink for travelling to Cambridge one night after they had done their days work... £0, 1s. 0d."⁶¹ There is also one instance of lodging paid for two men in October 1734, at 1s. per man. It is not clear for how many nights this was paid. The account is for work over two weeks.⁶²

The third exception is contractors' offering of credit in cash to employees. There are small notes showing that Kempster loaned at least one man money. Thomas Knagg may have borrowed five pounds from William Kempster in 1708. A note from May 12th of that year has his signature as promising to pay five pounds upon demand.⁶³ Notes throughout April

⁵⁹ COL/CC/BHC/ 10 003 - 006

⁶⁰ TNA WORK6/46 p.19 and Etheridge's (carpenter's) bills for winter only.

⁶¹ BL MS 27587, p. 4.

⁶² Ibid.p.6

⁶³ TNA PRO 145/106, Day book. Page of June 9th 1709.

1708 in the same book refer to 17s. due to Kempster from Edward Bibby, (one of the masons). These transactions are not referred to anywhere else, however. It does not seem that credit to employees or workers was common.

The fourth exception is sick pay, pensions, or other forms of financial welfare to employees. There is practically nothing to suggest there were any such payments or rights. J. Mordaunt Cook described the employment practices of the Office of the King's Works in the later eighteenth century as 'genuine paternalism', noting that those injured as a result of work were frequently looked after by the Office of the King's Works with funds found from the sale of old building materials.⁶⁴ At St. Paul's the commission gave pensions to the families of those injured or killed on site.⁶⁵ There is one mention of sick pay found in all the records examined in this study; that of John Keane, sawyer, working for Thomas Wilmore, in 1721-22 at Bridge House. In the weekly bills for 1722, in most weeks there is a note "John Keane being sicke", for two weeks the rate is 8s., the rest 6s.⁶⁶ John Keane and mate are also listed in the same bills when working six days at £1 4s., so it's not clear whether he was working and the 6s. was some form of insurance, or payment for treatment, or whether it was sick pay, and the man working under the "John Keane and mate" line was a substitute. I have found no other sick pay record. It does seem as if contractors as well as institutions felt obliged to pay some form of temporary support in cases of death or injury, but not enough for workers to feel that they had any form of social insurance. The letter book of Andrews Jelfe gives details of "Nov 5th gave a poor women whose husband was killed in my quarries that day I gave it her, she was left with 3 children... £0, 7s. 0d."⁶⁷

There are some other quirks of payment or forms of payment by trade that should be noted. Bricklayers mostly worked in pairs. Throughout most of the eighteenth century, 4s. a day was the rate for a bricklayer and his labourer or mate for most of the eighteenth century (£1, 4s. a week for the pair). Sawyers were similarly paid in pairs, apparently 5/9^{ths} in favour of the "top dog", but they largely disappear from the records by the second half of the eighteenth century. It is also important to recognise that we only have rates for a sub-section of the building trades. Smiths, glaziers, and plumbers, only rarely charged a day rate as their

⁶⁴ J. Mordaunt Cook in Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*, pp.107, 108, 110

⁶⁵ Campbell, *Building St Paul's* p.39

⁶⁶ LMA. COL/CC/BGC/10/003

⁶⁷ BL MS27587 p. 12.

bills more usually specify work done by the piece, or measured work, detailing the weights, items, materials and work done to the price. If day rates were charged it is probable that they represent higher labour rates than usual, due to having to be hired in.

In summary, construction workers were paid in cash, mostly weekly, and they were not paid anything other than the cash for their work. There is, unfortunately, no way of knowing when or where men were paid. Even the St. Paul's accounts are obscure on the subject of where the pay was issued from, at what time or on what day.

Economic historians have used the day rate as the measure of pay for building craftsmen throughout the early modern period. But as will be seen in the case study of the Office of the King's Works in the 1660s below, and of Bridge House in Chapter 7, there were other units of accounting for craft and labour time. In the first case it will be seen that hours and nights also made up a portion of workmen's pay, but that this did not make a substantive impact on craftsmen's pay. In the second, in Chapter 7, we will see that many workers who worked at London Bridge were paid by tide not by day.

6.3. Pay at The Office of the King's Works in the 1660s.

As described in chapter two the “Office of the King’s Works” covered a complex system of sites, surveyors, clerks, positions and allowances. At each site a clerk was employed, on both a salary or allowance and a daily rate, the clerk also had accommodation, and in many cases travel riding charges.¹ But the craftsmen or labourers they employed to carry out works did not have such benefits: they were paid by the day if hired directly, or else they were paid by the contractor who charged them out.

Knoop and Jones asserted that the direct labour model had disappeared by the mid seventeenth century if not before.² There seem to be a few records at the Office of King’s Works from the 1660s that possibly represent direct payments. Up until the mid-1660s some accounts for work carried out on some of the sites managed by the Office show indications that men may have been paid directly. They name individuals; there are varying number of days worked per man; the rates they record for individuals are varying; they are presented as pay, not as bills; and there is no signature from a contractor acknowledging receipt, as with later payments. Accounts from the Tower of London and Whitehall in 1660-61 list all the men by name and record the numbers of days they had worked. The accounts show a varying number of men and days worked throughout the year. Some men are also listed as paid for nights, and some by hours, making calculations of rates problematic, but day rates are sometimes clearly provided.³ The accounts seem to have been input by the clerk, who would have planned the work and assigned and organised the workmen also.

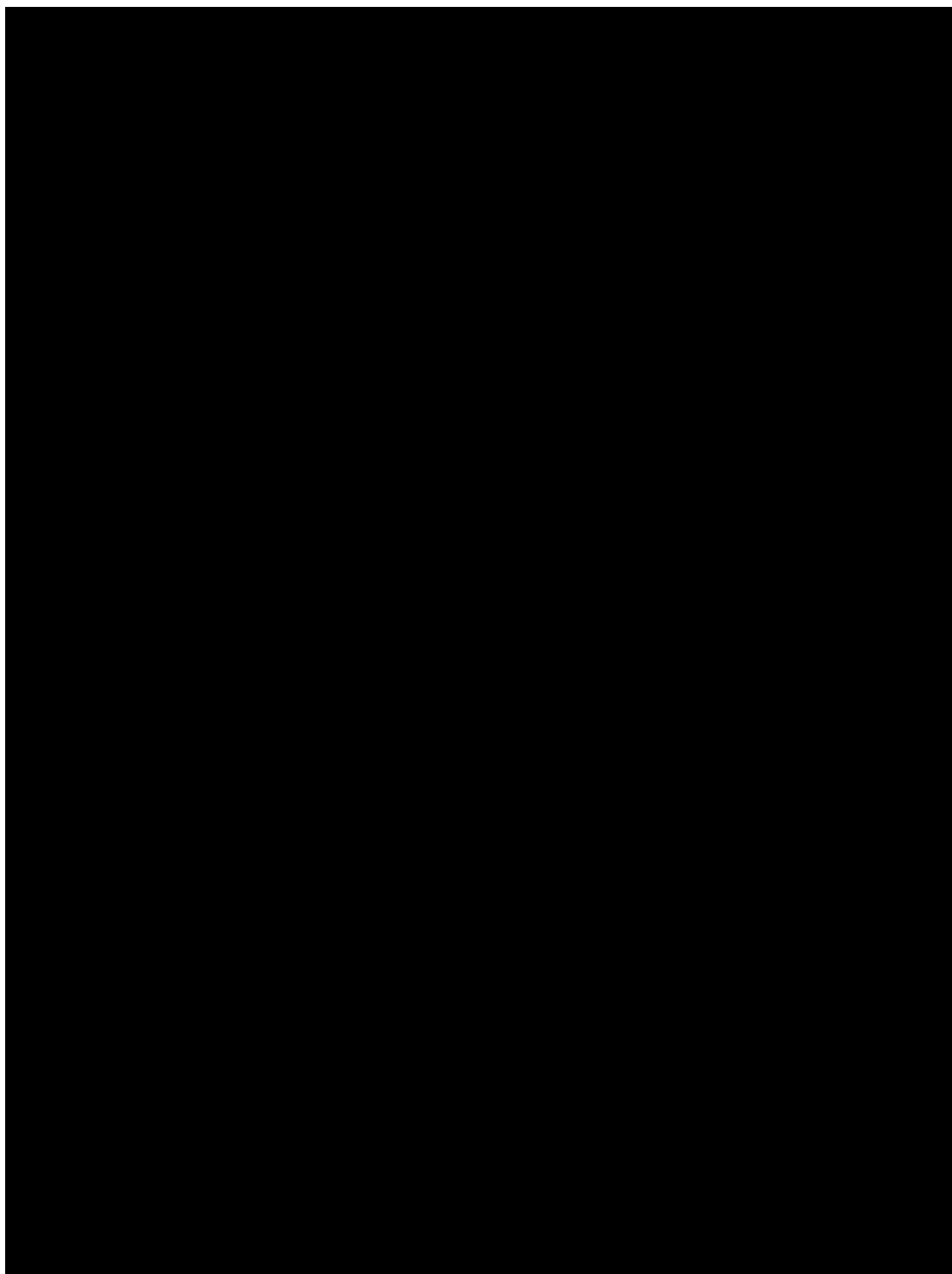
The characteristics of this system can be illustrated if we consider the accounts for work at Whitehall in the autumn of 1660. At this point, thirty carpenters were employed intermittently, at rates ranging from 22d. to 33d. per day (with one at 14d.). The number of days worked per month ranged from twenty to thirty-one. The mean day rate (as opposed to amount earned) was 25.2. But due to overtime – extra hours - sixteen of the men received more than their day rates. About half of the entries for the men are for days plus hours or nights also. The hour’s rates are 1/12th of a day rate. Obviously there is the possibility that the number of ‘days’ worked was a composite of hours worked and fewer days or vice versa.

¹ TNA Work 5 / 1 - 146

² Knoop and Jones, *The London Mason in the Seventeenth Century ...* , p. 19.

³ TNA WORK 5/ 1 Carpenters rates from pages 164 -/ 5.

Image 6.1. Carpenters pay, Whitehall, December 1660.



In the same accounts the rates for masons, labourers, and masercrowers are also present. (Masercrowing was a type of labouring job. Masercrowers literally cleared the earth and prepared it for building work.)

As Image 5.3.a shows, many of the men were paid for hours or nights over and above their day rates. Later bills or payment records do not have the same combinations. The accounts for the Office of the King's Works from the 1680s onwards only denominate labour costs in days or built in to measured costs. There are no hours recorded in the records for sites after the 1670s for the Office of King's Works, nor at St. Paul's, Westminster Abbey, or Westminster Bridge.⁴

The day rates found in the 1660s records for Whitehall are much lower than found in previous series, ranging from 14d. to 30d. per day. It seems that extra hours were paid at the same rate. For those earning 28d. per day, the rate for 3 hours was 7d., implying that overtime was paid the same rate as ordinary time, including a time for breaks.⁵ The addition of hours or nights raises pay by as much as 10 per cent overall. But not everyone received the overtime. With the addition of overtime, the distribution of the average pay per calendar day worked (e.g. the total pay divided by the number of whole days only) paid, is shown below in Figure 5.3.b

The low day pay might indicate that these were direct payments, without contractor margin added. Indeed, the layout and content of the account books suggest that these were actual pay records kept by the clerk-of-works, recording individual payments. In the account books there are no allowances for food or drink, but there are materials listed separately, under provisions, so it seems this was work carried out under a system of direct labour, with the clerk purchasing materials and paying day rates directly. These rates are observed for workers engaged in what seems to have been a large project, which did not continue beyond February following. It may well have been 'extraordinary'. In the same book more regularly observed 'ordinary' work for maybe one or two masons is at 28d. or 26d. per day.

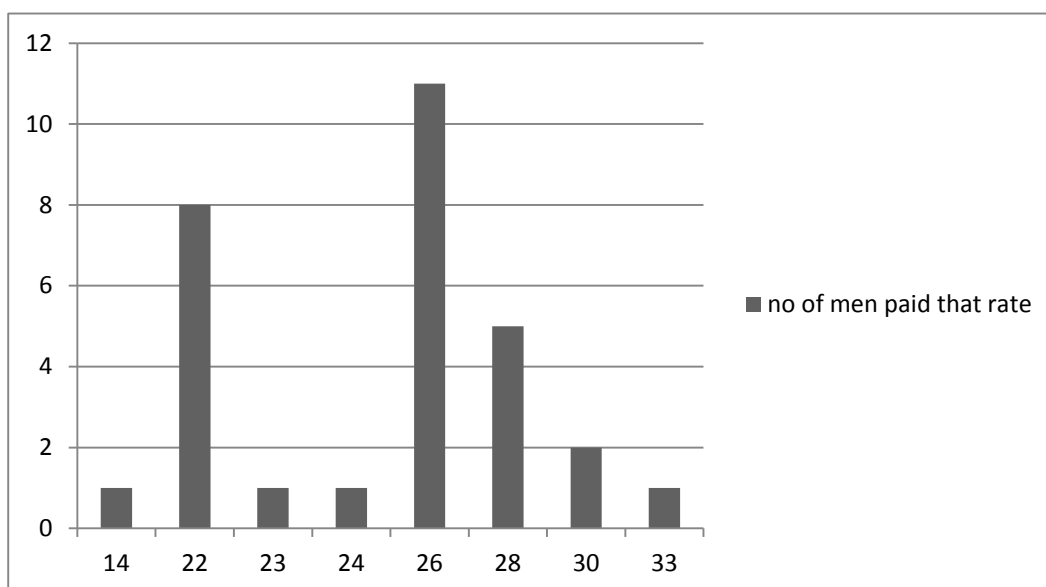
Sixteen bricklayers were employed alongside the masons. Their day rates vary from 22d. to 30d. per day. The mean was 25.6. The joiners have a similar range of rates, with the

⁴ See TNA WORK 5/

⁵ TNA WORK 5/ 1 p. 166.

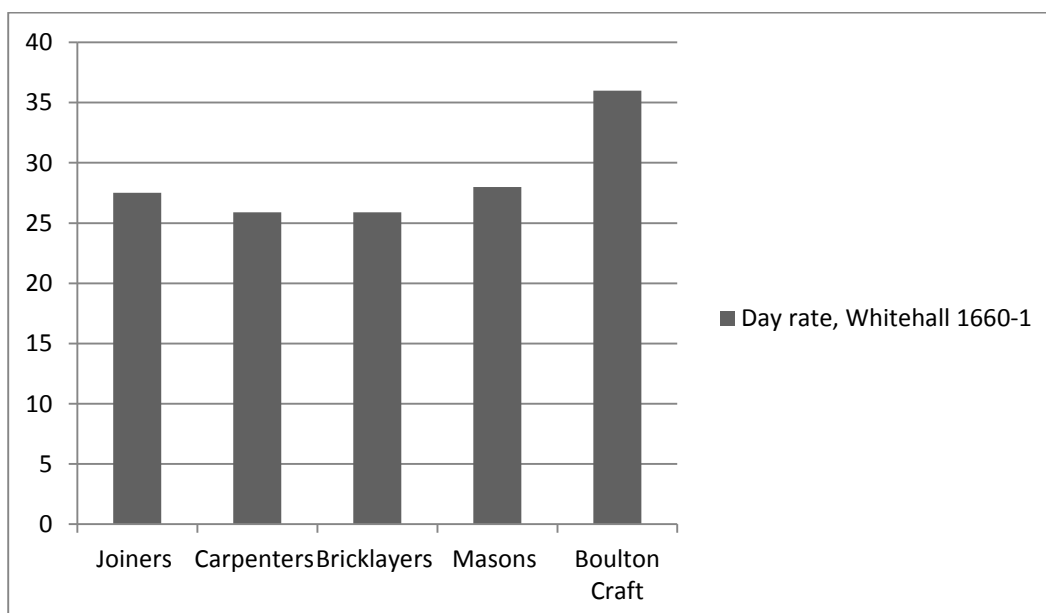
distribution illustrated in Figures below. The mean rate was 27.2. It cannot be determined whether the joiners were better paid or whether it was simply a more skilled team working.

Figure 6.1. Distribution of day rates paid, Office of The King's Works, Whitehall, Carpenters, 1660.⁶



Source: TNA WORK 5/1 Whitehall, December 1660 to March 1662.

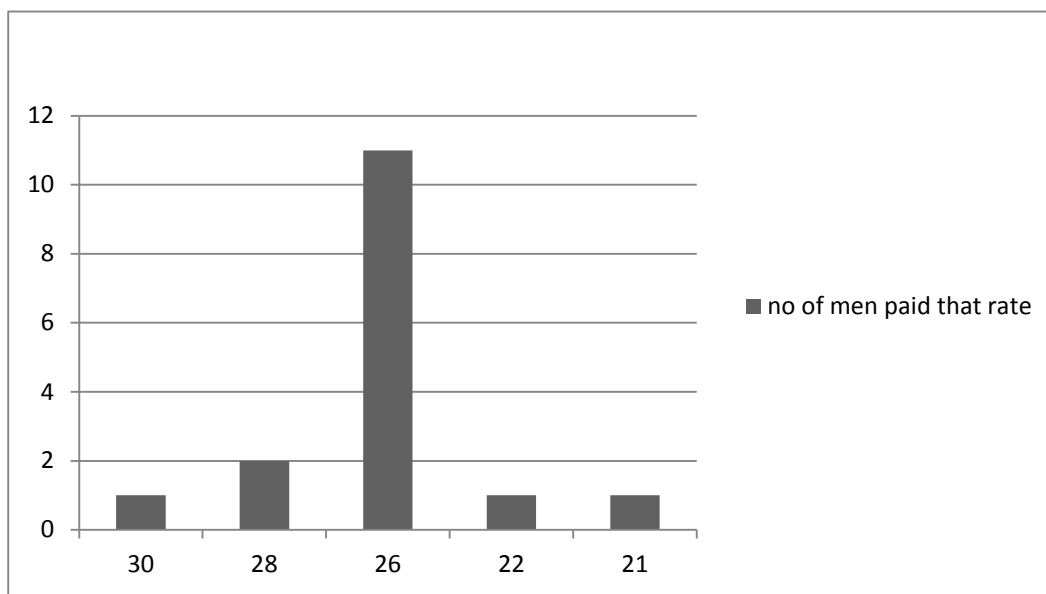
Figure 6.2. Distribution of mean day rates paid, Office of The King's Works, Whitehall, all trades, 1660.



Source: TNA WORK 5/1 Whitehall, December 1660 to March 1662.

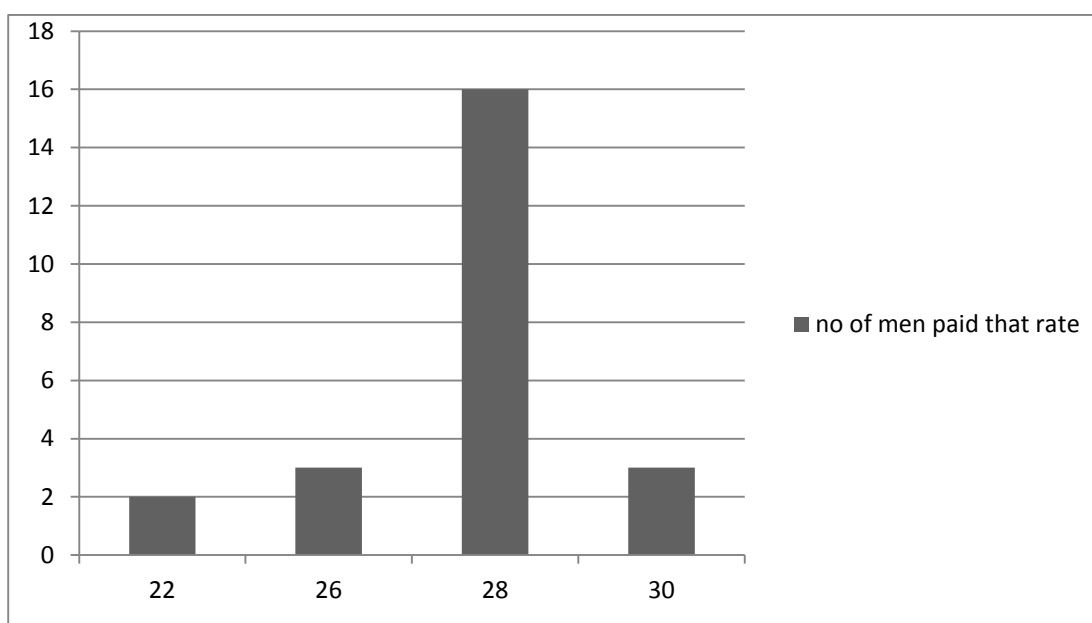
⁶ Source 5.3.b – e is TNA WORK 5/1 Whitehall December 1660 to March 1662, chosen because of the large team of carpenters and joiners. Teams over 5 men are rarely found in the sources.

Figure 6.3. Distribution, Office of The King's Works, Whitehall, Bricklayers day rates, 1660.



Source: TNA WORK 5/1 Whitehall, December 1660 to March 1662.

Figure 6.4. Distribution of day rates paid, Office of The King's Works, Whitehall, Joiners, 1660.



Source: TNA WORK 5/1 Whitehall, December 1660 to March 1662.

Masercrowers were paid the flat rate of 24d. per day, labourers the flat rate of 16d. per day, twenty per cent less than the figure Boulton has for labourers' day pay that year. If an average of the craft means is taken, a representative average day rate for craft was 26.8d. This is 25.5 per cent below the Boulton / Allen rate for this period.

Table 6.1. Day Rates at Whitehall 1660 – 61, Office of the King's Works.

Whitehall 1660	n=	mode	mean	median
Masons	9	28	28	28
Carpenters	30	28	25.9	26
Joiners	24	28	27.5	28
Bricklayers	16	26	25.9	26
Mazercrowzers	12	24	24	24
Labourers	8	16	16	16

It is difficult to discern when the direct rates ceased to be paid on Office of the King's Works sites. Throughout the 1670-80's, typically there were just one or two men in any one trade recorded in some months at any London site, interspersed with slightly higher volumes of work.⁷ In the 1670s and 1680s, some rates in the account books are higher – carpenters and masons and plasterers are noted at 30d. per day, as previous authors have found. In fact, in the early 1670s some rates recorded in the books are even higher: carpenters were priced at 37.5 d per day, masons at 35d per day and bricklayers at 31d. per day.⁸ There are not enough observations to calculate modes and means for these years, however, and the rates are not sustained, this could have been exceptionally skilled or difficult work, rather than indicating an increase in rates overall.

In the books for the later part of the seventeenth century the nature of the accounts change. Men are observed at several sites and the amounts and monthly accounts are not signed for by the men named but rather by contractors. The signatures beside the amounts – which usually signify receipt or agreement in account books of this time are not signed by the men listed as paid. Rather, Charles Atherton signed for the amounts for the plumbers, labourers and masercrowers on several sites. John Grove similarly signed for plasterers' pay. Both

⁷ See WORK 5 /1 - 45

⁸ WORK 5/22. Also see Hutchins, "Notes Towards the History of London Wages." 1899, 1900.

men were office-holders and contractors in their own right.⁹ Atherton was sergeant plumber to the Office of King's Works, but seems to have contracted many services there and, of course, had a private business; he is associated with Robert Hooke.¹⁰ The records are voluminous, but day rates to those not employed as clerks etc. are hard to discern in many of the records. Table 5.3.g shows sampled rates observed using the sources referenced in sample years, where rates were found, giving merely the highest and the lowest figures observed in the book.

Table 6.2. Sampled range of rates observed by trades Office of The King's Works 1660s to 1690s.¹¹

Source	Year	C'ter	Mason	Labs	B'layers	Plumb.	Joyner	M'crw
WORK 5/6	1664-5	24- 36	20 -30	16-18	24-30		30	20
WORK 5/10	1667- 8	30	30	16	36	30		
WORK 5/15	1671-2	18-26	30	20	30-36	30		
WORK 5/19	1672 -3	24-37		16-24	30 -36			20
WORK 5/22	1673-4	30-37	30-35	16-24				
WORK 5/28	1676 -7	18-30	30					
WORK 5/35	1682	6-30	30	20	30	30	30	
WORK 5/45	1691/2	30	32	20-22	30	30	30	20 -24

Source: TNA Work 5

⁹ Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*. See Appendix D, p471-3

¹⁰ Beard, *Craftsmen and Interior Decoration in England 1660-1820*. Calendar of State Papers Domestic: James II, 1686-7 details payments made to Atherton and his procurement of further position

¹¹ These rates are taken from a sample of the accounts only – the highest rate observed was taken, and the lowest rates observed was taken in three months where there were observations were present for Whitehall, The Tower of London or St James's. There are duplicate accounts for the some of the sites for some of the years, so a full statistical table has not been carried out as only one set of accounts was consulted for the rates. Also see Hutchins, "Notes Towards the History of London Wages." 1899, 1900.

The decrease in day rates for the masercrowers and craftsmen is marked, especially given that the payments no longer seem to be direct. There are four possible explanations. The first is that the contractor charging out the men was offering them more regular work by operating on several sites, so men working for them accepted lesser day rates. The second is that the decline in rates was real, and that the demand for masercrowers and craftsmen had fallen to such a degree that the rates had dropped by fifteen to twenty per cent for masercrowers and twenty per cent for craft since the early 1670s. The third is that the level of skill being charged out at in the 1670s was higher, and the final one is that rates rose due to a high demand for labour after the Great Fire of London, and fell back again after demand died down in the early 1670s.

For most of the eighteenth century, there are only abstracts, not full accounts for sites in the records of the Office of King's Works. Rates were set by the Board of the Office of the King's Works, the Surveyor general, the Comptroller and the Paymaster, so individual clerks of works had little wriggle room for negotiation or allowance. According to Colvin, contractors complained in 1742 that rates were too low and negotiated higher charge out rates.¹²

Full accounts are again available from 1778. The day rates that appear in the books are made up of rates from contractors. For instance, charges for labourer's days on several sites are provided by William Meredith who also provides pavours. Image 5.3.i and 5.3.j show the nature of the accounts. Rates are highly uniform in this period. Much of the work is measured work so the labour costs cannot be clearly seen. Thus rates shown here in 5.3.h are modal charge out rates from up to five London sites, where day rates are charged. Strangely there are observations of winter and summer rates in these books, although they are not observed in accounts before this at any site.

¹² Colvin et al., *The History of the King's Works Vol. V, 1660 - 1782*.p.93.

Table 6.3. Charge Out rates London sites Office of the King's Works 1778 – 1799.¹³

Rates per day	1778	1780	1793	1797	1799
Paviour	36	36	36		42
Paving labour	24	24	24		27
Labourer	22	22	22	27	27
Carpenters / Joiners	36	36	40	40	42
Bricklayers	36	40	44	40	
Bricklayers labour	24	26	28	26	
Masons	36	36	42	40	
Masons Labour	27	33		27	
Plaisterers	36	36	42	42	
Plaisterers Labour	24	27	27		
Bricklayers/ Summer					48
Bricklayers Winter					42
B'layers labour Summer					30
B'layers labour Winter					28
Plumber	36	36		36	
Plumbers labour	24	24		24	

Source: TNA Work 5.

The Allen/Schwarz rates for 1799 are 50d. per day for craftsmen, and 36. for labourers. Yet the modal craft charge out rates here are fifteen per cent under this for craft, and more than twenty per cent lower for labour. From the rates given here it seems that the Office of King's Works rates perhaps moved later than other areas of the market.

In summary, The Office of the King's Works records are vast. In the early part of the period under discussion there are records of what is probably direct pay. This shows varied levels of day rates and named men, paid rates much *much* lower than previously thought. Mean pay of circa 25d. for craft compares as thirty per cent lower than Boulton's rates. 16d. for labour compares as twenty per cent lower. In the later period, where charge out rates were

¹³ These are modal rates. They are taken as modes because the data is extremely uniform. The sources were checked for rates in two occurrences, and then a random control of another month and bill for the same contractor taken in the same year for each

submitted by large contractors who would have taken mark-up on the bills, the day rates are still substantially lower than rates previously collected, even before discounting the mark up.

Image 6.2. Plumbers' bill Whitehall, September, 1779, showing 63 plumber days at 36d. per day and labourers days at 24d. per day



Image 6.3. William Meredith's bills, Tower of London, March, 1779, showing bills for labourers and paviours and 59 days labourers.

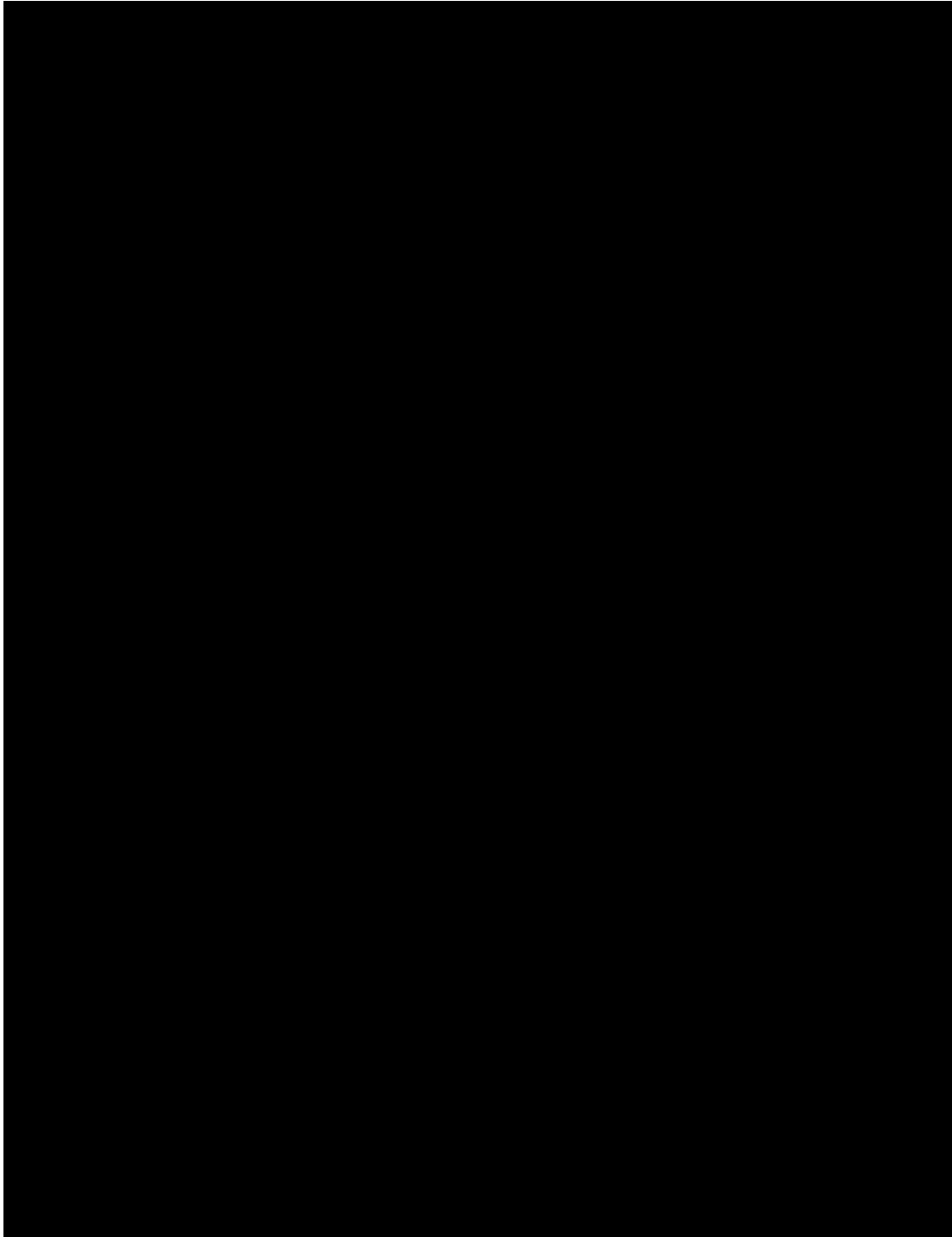


Image 6.4. William Meredith's bills Whitehall, March, 1780, showing bills for labourers and paviours and 512 days labourers.

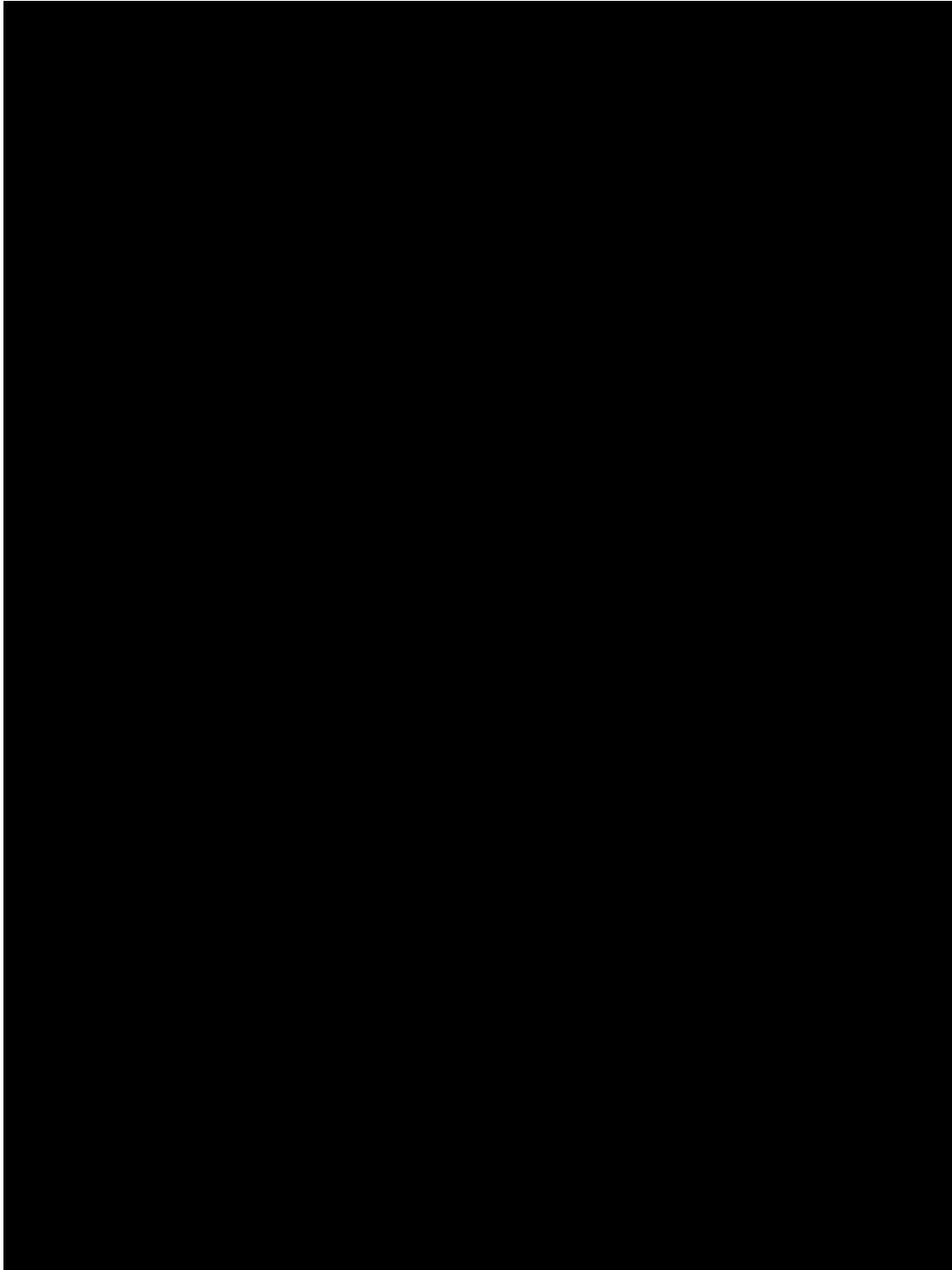
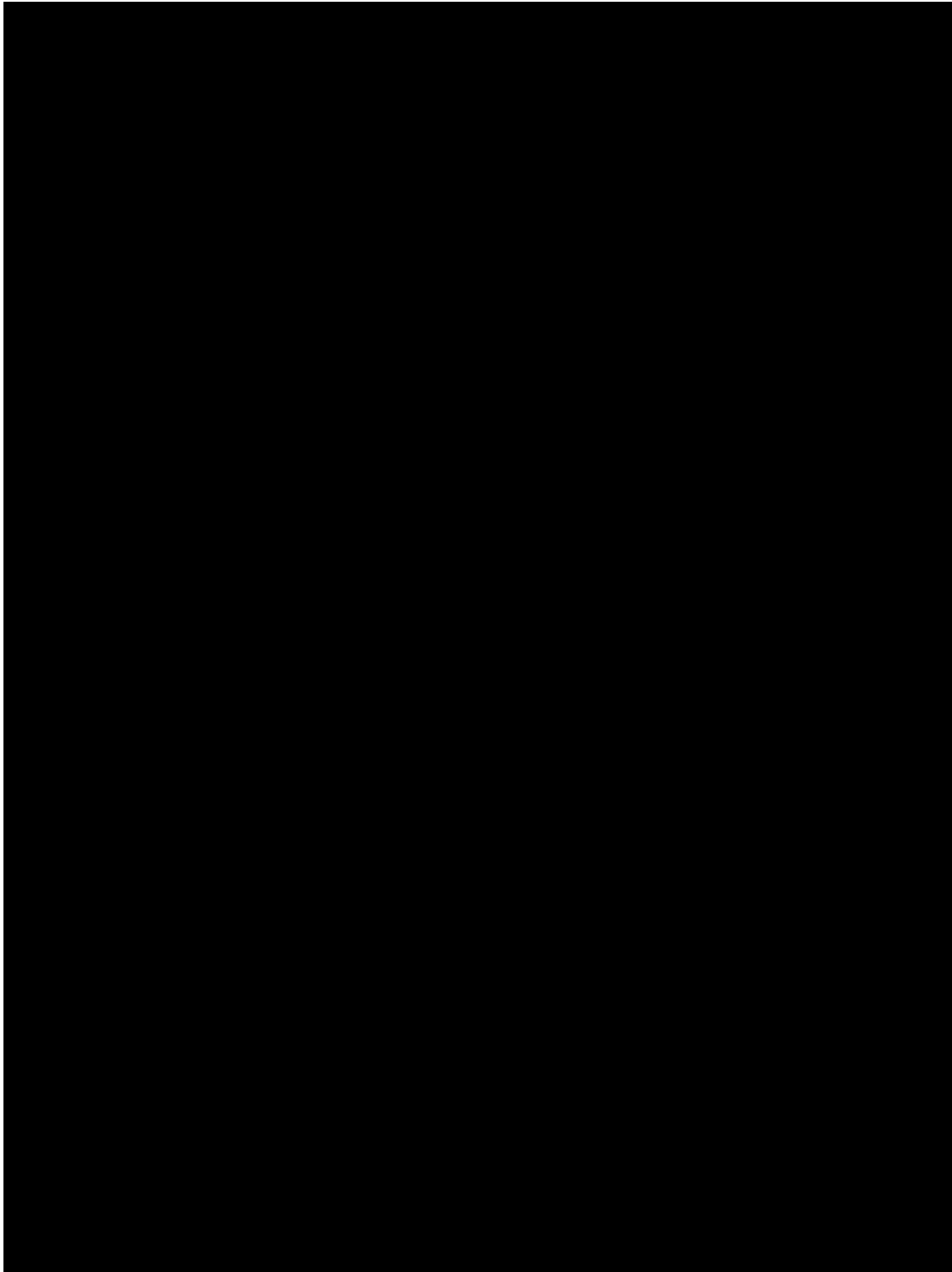


Image 6.5. John Devall, Mason's bill, Whitehall, March 1779 (2 pages)





6.5. Pay at Westminster Bridge and under Andrews Jelfe.

At Westminster Bridge there are no direct payment records, all pay was to contractors. TNA Work 5/4195/1 shows 'contracts entered into by the board' and include those varying from a man and three horses, to drive piles for £27 for the quarter, to the masonry for the first piers at £27,000 with Andrews Jelfe and Samuel Tufnell. In the contractors' bills there was only limited day work, as the largest contract, to the masons Jelfe and Tuffnell, was for task work. Charles Labelye was the consulting engineer and pioneered the use of caissons in constructing and sinking the piers. Work on the site was year round.

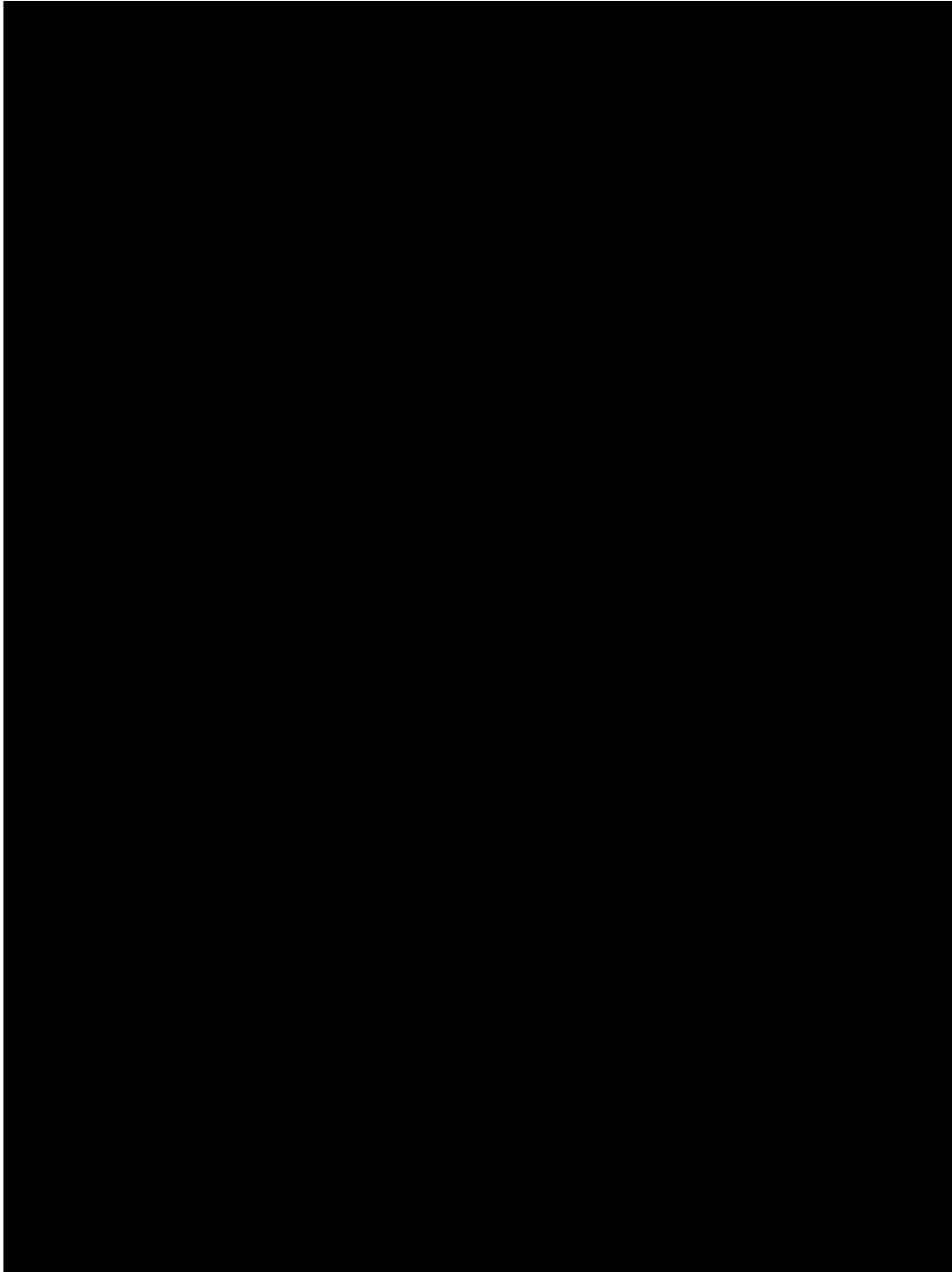
There was apparently a dispute between Labelye and William Etheridge, the carpenter responsible for the support frame and centring of the arches over Etheridge's progress despite a large number of day rates. The engineering of the support and centring of the untried masonry arches, and the sinking of the piles, were challenges which many surveyors or engineers tried to solve.¹⁴ It seems Etheridge, the designer of the mathematical bridge at Queens' College Cambridge, had come up with a solution which was not adopted, and Labelye's, which was, bore resemblance to his. There are hints that Etheridge took his revenge through non-progression on day rates, knowing that this would financially pressure the commission, who would seek explanations for the expense from Labelye.¹⁵

One feature of Westminster Bridge's pay structure is that the majority of day rates were for carpenters. Most other contractors billed by task, not by day. Jelfe and Tufnell, masons, billed large task or measured bills, with little or no labour detailed within them. Where they did bill labour costs as a discrete cost they were very small bills compared to the task bills. For instance, in April 1745 their bill was for £6,185, 15s. 5 ¼ d., all in measured tasks (See Image 5.4.a). Another bill from October 1744 is for only just over £16 and it details masons' and foremen's costs by the tide, and labourers by the day. (5.4.b) These bills are not regular, so we must assume that the vast majority of labour costs are within the measured rates found in the task bills. (5.4.a).

¹⁴ Cross-Rudkin, "Centres for Large Span Masonry Arch Bridges in Britain to 1833."

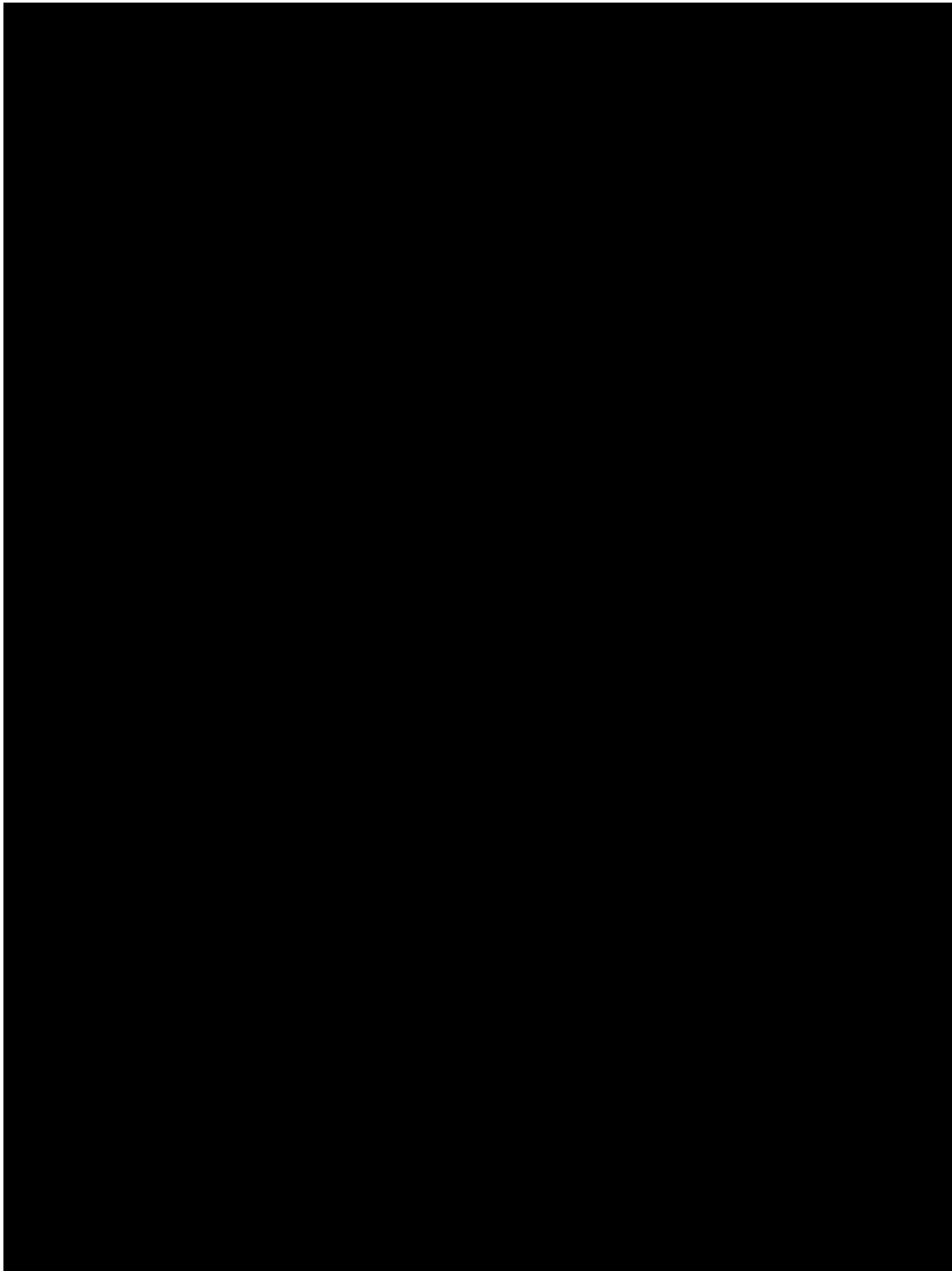
¹⁵ Skempton, *A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830*, p.217

Image 6.6. A Jelfe & Tuffnell bill, Westminster Bridge 1745.



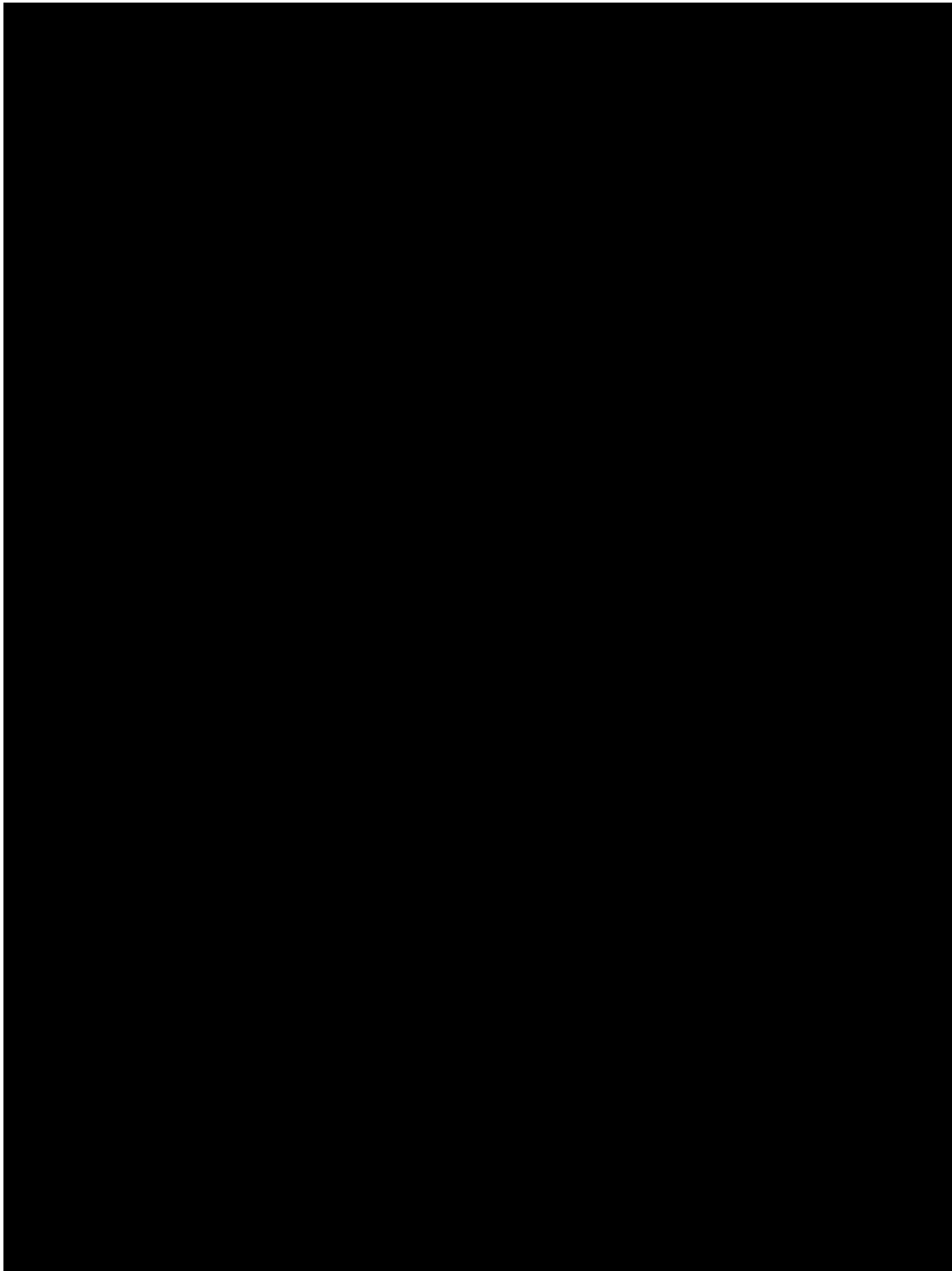
Source: TNA Work 6/46 p.37

Image 6.7. A Jelfe & Tuffnell bill at Westminster Bridge, October, 1744, showing labour costs by tide.



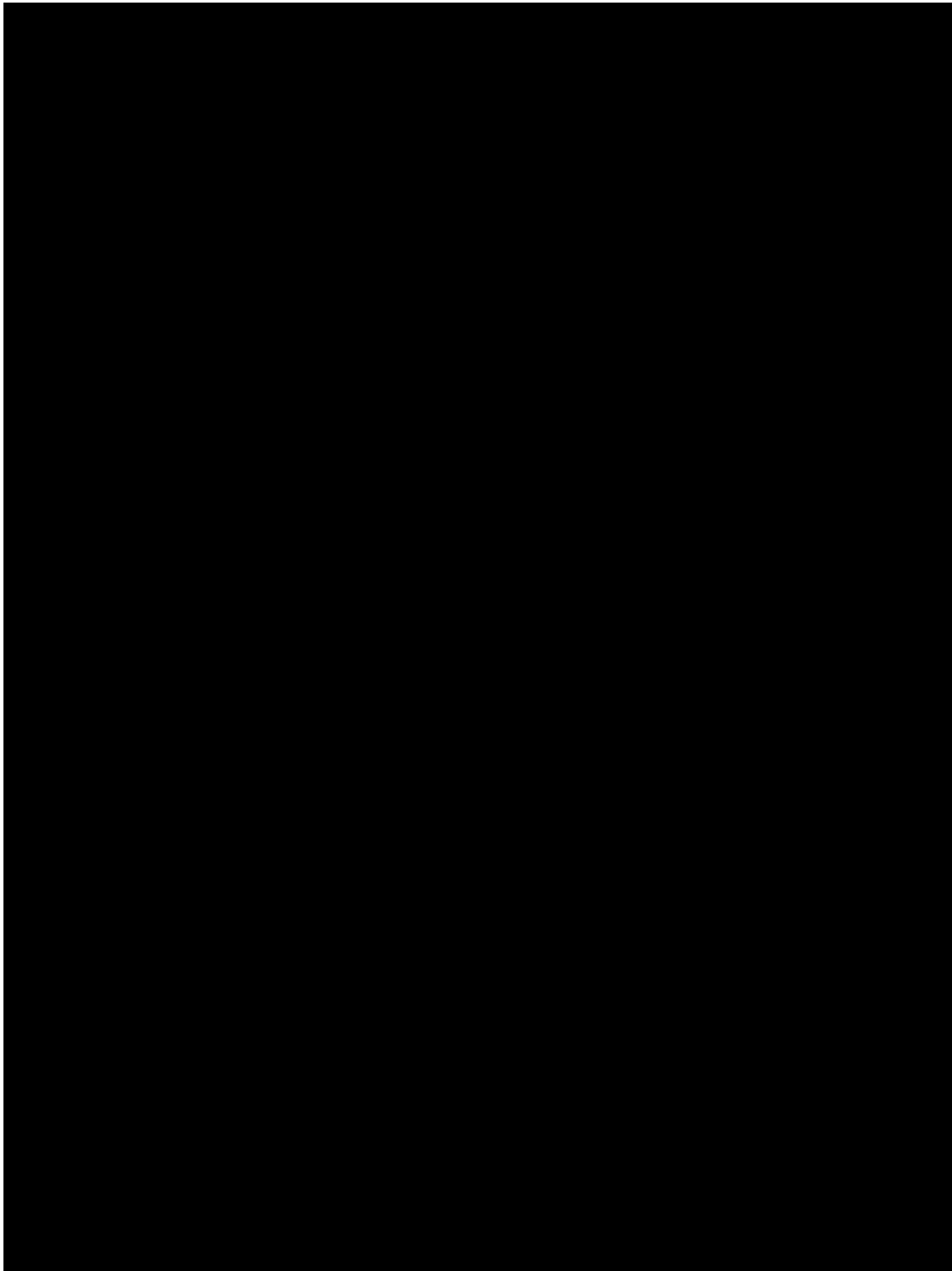
Source: TNA Work 6/46 p.41

Image 6.8. A William Etheridge bill at Westminster Bridge, February 1744, day rates for carpenters.



Source: TNA Work 6/46 p.35

Image 6.9. A William Etheridge bill at Westminster Bridge, October 1746, showing day rates for carpenters, and others.



Source: TNA Work 6/46 p.57

The carpenters' charge out day rate found in Etheridge's bills (5.4.c, and 5.4.d) at 32d. per day, is below that of the Gilboy/ Schwarz series. The foremen's rate is 42d. In September /October 1744 there were 293 days of carpenters billed. Etheridge also billed for watermen (at 24d. per day), a gate keeper (at 18d. per day), a pair of sawyers at 72d. the day per pair, and a named man, Thos. Blackwell at 24d. per day. Etheridge's bills include materials and sundry supplies such as nails, but there are no charges for his time, not for his overhead costs.

These rates are persistent or stable for nearly all of Etheridge's bills observed, with one exception; in March 1745 there were different levels of charge outs for carpenters on site. For 'preparing and driving piles' a foreman was paid 48d. for two and half days, and carpenters 36d. a day for twenty-seven days. In the same bill, for 'striking the centre' the foreman's rate was the usual 42d. and the carpenters' 32d.¹⁶ The following bills for April and subsequent months return the rates to 42d. for a foreman, and 32d. for a carpenter. It seems that the higher rates only pertain to a small portion of work that required extra skill or incentive. Etheridge charged out labour at 24d. a day, but the others are observed at lower rates. For instance, Robert Smith had a contract to drive piles worth around £300 per month.¹⁷ His work in 1745 included "digging the foundations and the drain from the causeway and drain to the western abutment". He charged himself out at 30d. per tide, and his 'men' at 18d. per tide throughout December and January 1745-6.¹⁸

Andrews Jelfe, one half of the Jelfe Tuffnell partnership, was known previously for his work as a statutory mason, and in partnership with Christopher Cass¹⁹. One of his letter books is at the British Library and contains several months of weekly running costs and payment details for 1734 – 5.²⁰ These are not from Westminster Bridge, in fact at this time Jelfe seems to have been running several projects and tidying up the affairs of his partnership with Christopher Cass, who died just prior. The rates seem to be from varying locations but for the year 1734 there is a regular band of men who appear. Cambridge is mentioned, as is travel to and from there. The regular wage payments to various men are accounted for bi-weekly and paid by the day. The number of days varies widely from five to twelve in a two-week period. Several notes suggest there is another book that other wages are listed in. The

¹⁶ TNA Work 6/46. p.43

¹⁷ Work 5/195/1

¹⁸ TNA WORK 6/ 46, p.182-6

¹⁹ See biographical details in chapter 2.

²⁰ BL 25587. pp. 1- 20

accounts are written straight into the book and some are phrased as payments, not written up as bills. They look likely to be his records of actual wage payments. Although it is clear that some of these payments refer to work done in or near Cambridge, entries also show that these masons were travelling. They may have been retained by him at a number of locations including London.

Table 6.4. Day rates found in Jelfe letter book, May 1734 – March 1735.

John Ogle	50d.
Rob Whitening ‘mason’	30d.
Theo Roper ‘mason’	20d. 22d. 24d
R Hobbs, ‘mason’	20d.
Isaac Taansley	16d. 18d.
Rob Jenin	14d.
Will Impy	14d.
Richard Day	20d. 24d.
Robin Wright	14d.
Joseph Monigan	30d.
Geo Trubshaw	30d.
Robinson, Carver	34d.
Richard Hammon	22d
Miles Plumsley	24d.
Edward Poings	16d.
Richd Goo	15d.

Source: authors transcription of BL MS27587

A typical weekly or biweekly account gives the number of days worked by each man paid, then piece rates paid to others, and then expenses. For instance the record for August 5th to 19th 1734 lists Ogle, Whiting, Monigan, Trubshaw, Rope, Bottomly, and Hobbs at 12 days each, then details a piece rate to Hobbs for rubbing 88 foot superficial of Portland Stone paving, then lists 6 ¼ days for Tannersley, then two days of Poings, then three days of Day, then a sawing piece rate to Wright, 3s. 9d. for rope bills, some bills for carriage amounting to 1s, a quire of paper at 9d., a letter from Mr Chalk at 1.d., and, ‘a drink for a waggon man’. From the 19th August to the 4th September 16th costs included lime, candles, a shilling to a man for recommending him for a job, 4s. for a horse and ‘expenses to Abingdon, a shilling for four letters from London’. From the 16th September to the 30th there was also “paid four

porters for helping to carry paving and steps from water side to chapel, 1s. 9d.”, and, paid 7 men for loading paving and steps into the boats at crane and taking ditto out below great bridge, 1s. 2d”. In the same entry Richard Hobbs was paid 20d. per day for 12 days, but also a piece rate for sawing marble on dates prior to the entry, another 6s. and 10d.²¹

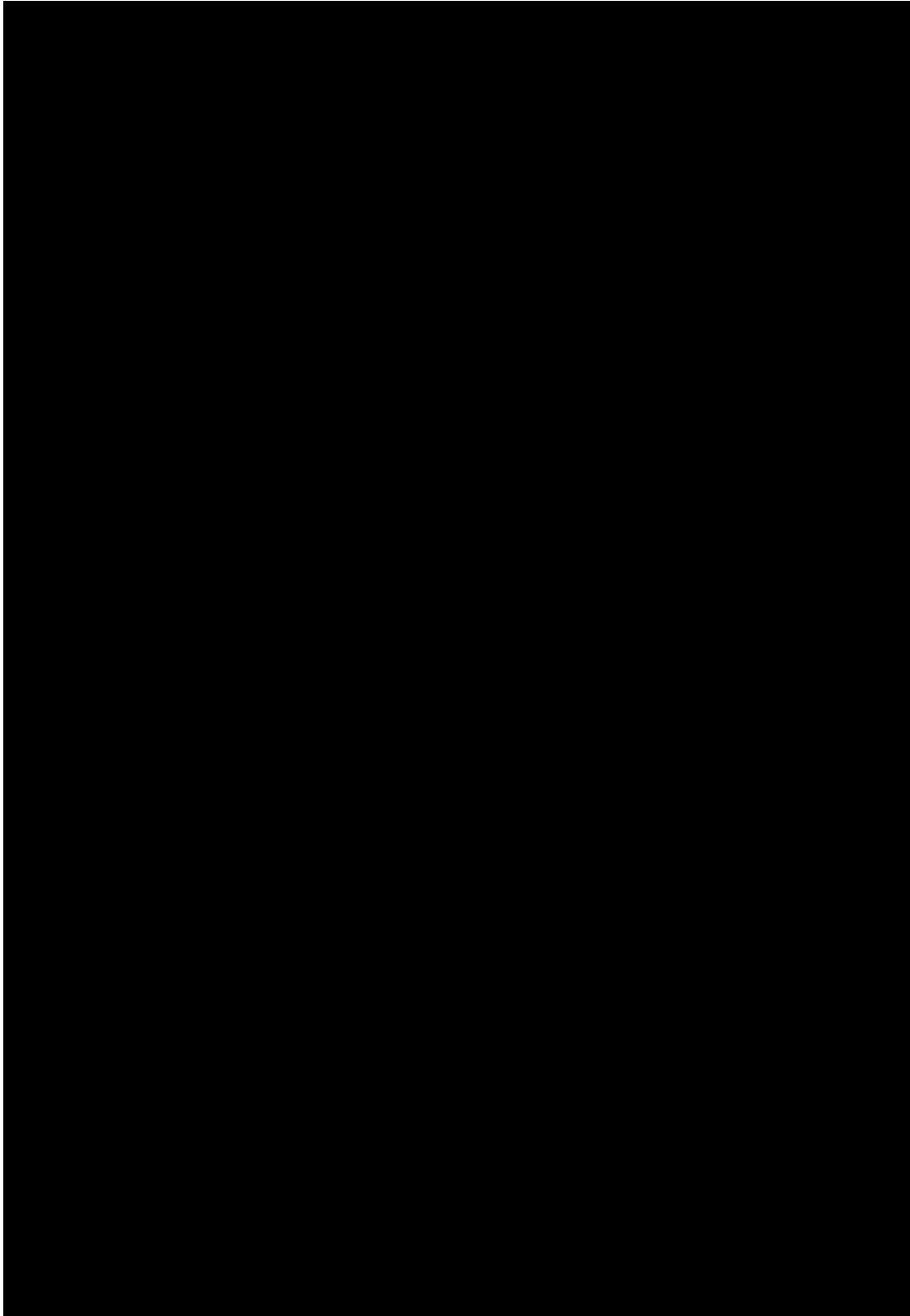
The rate from Schwarz and Gilboy for craftsmen per day in London in 1734 is 33d. per day, in Southern England from Phelps Brown Hopkins 23d. per day. The wide range here implies that skilled masons were available for 20-30d. per day, and that men also worked at different rates for different work.

Because we don’t know where the men were working except for the references to Cambridge in two of the weeks, and because, apart from the reference to a carver, we don’t know what kinds of masons each of the men were or their skill level, it is very difficult to put the day rates into context. However, we can derive two things. Firstly, there was a large variance in pay levels in the team, and that variance in rates occurred for individuals too. For instance, Theo. Roper is found working at day rates of 20d. 22d. and 24d. in the same book in the same half year. Secondly, some men were paid in a combination of day and piece rates. Without more data and work it cannot be discerned whether piece rates improved pay over day rates or not.

²¹ BL MS27587, pp, 4, 5, 6

6.6. Middle Temple

Image 6.10. Middle Temple call and wage details, August 1614.



Source: MT2/TUT/3/2 loose papers at Middle Temple archive.

Middle Temple supplied more than half of Boulton's day rates observations. At Middle Temple archive there are records of direct employment on building work in the early seventeenth century. Image 5.5.a. shows names of men who worked each day in August 1614. The labourers pay is uniform at 14d. per day, and the 'workmen' at 24d. for the foremen (only one man is paid that rate), and 20d. for the rest. Boulton's rates for that year were 13d. and 20d. respectively. There were double the numbers of labourers on site as craft or 'workmen'.²²

Following this observation however, all pay at Middle Temple is in bills from contractors. In the 1640s and 1650s mason John Young submitting bills charging measured rates. George Goldstone, bricklayer charged a workman out at 30d. per day, his man at 24d. per day, and labourers at 18d. per day as per the Boulton series, in 1647.²³ Receipt books in the Treasurers accounts show charge out rates found as per Boulton's series. Contractors found elsewhere submitted bills, many by measure, rather than by day. Edward Stanton carried out masons work there in June 1722.²⁴

6.7. Summary of pay in practice.

This chapter has presented evidence of pay at two sites where direct payments are discerned in the earlier period, Middle Temple and the Office of King's Works and a third case where I have shown the difference between the variance of pay in a contractor's record and that on site. Whilst direct pay was not practiced at Middle Temple after the very early seventeenth century, it seems to have continued at the Office of King's Works sites such as Whitehall and The Tower of London to the 1660s. Whilst the rates given by Boulton match closely the Middle Temple records, the pay at the Office of King's Works in the 1660s is dramatically lower than the series. The direct rates are approximately twenty per cent lower for craft, and thirty percent lower for labourers. The explanation for the difference is that the Office of King's Works figures are direct pay and those of Middle Temple are charge out.

²² MT2/TOT/3/2 loose papers at Middle Temple archive. ACCVOUBI MT.2/TUT /51 1

²³ MT2 / TRB/. No.5.

²⁴ MT.2/TRB/1721-22 (Treasurers receipt books)

The evidence from Westminster Bridge and Andrews Jelfe shows the difference between contractors' real accounts and charge out rates. Jelfe's own accounts show a wide range of rates paid to different men. The Westminster Bridge accounts show uniformity of rates.

Westminster Bridge, Jelfe, and the Office of King's Works show that day rates are not the whole story of pay for building craftsmen. Real craftsmen's' and labourers' pay was varied, in terms of rate, and in terms of unit of account, something that is completely at odds with what Gilboy found at Westminster Abbey for instance. Pay in practice was more complex than fixed day rates. Day rates were augmented or paid alongside hours, tides, or piece work rates. It has not been possible to show that these extra or augmented payments brought pay up to the levels previously thought. The next chapter utilises much more substantial direct payments data from St. Paul's Cathedral to show similar patterns, and similar lower levels of pay.

Chapter 7. Pay at St. Paul's Cathedral

7.1 St. Paul's and William Kempster in context.

St. Paul's represents some of the highest levels of craft skill and architectural ambition in the seventeenth century. Volumes of modern literature attest to its place as Wren's masterpiece and the jewel of the city, and there are good accounts of the process and organisation of the rebuilding, including one by Campbell.¹ The process of its construction spanned more than 35 years and the site dominated not just the London skyline, but local and national supply chains and markets. Yet the wealth of prices and wages within the records of its construction have not previously been tapped by economic historians, possibly because wages are not always readily observable in the records except for labourers, as most craftsmen were employed by contractors not the cathedral. This chapter draws on the official records and the Wren Society's transcriptions of them, but largely focuses on a new source; the day books of one of Wren's mason contractors, William Kempster.²

This chapter will show that craftsmen and labourers did not receive the day rates that contractors billed institutions, or the amounts that institutions' accounts show. Rather, major contractors charged out one rate to their clients, and paid their men another. It will show that labourers and craftsmen working on building the new St. Paul's were paid between 16 and 35 per cent less than those charge out rates, and that there was a large range of skill and day rates paid.

Due to the size and scale of the Cathedral, it was feared that no single mason contractor could manage the financial aspect of the whole contract, so it was decided that the project would be split between a number of them.³ The mason contractors operating at St. Paul's were Joshua Marshall, Thomas (and then Edward) Strong, Edward Pearce, Jasper Latham,

¹By way of a very short bibliography, see W. Dugdale and H. Ellis, *History of Saint Paul's Cathedral, in London, from Its Foundation Etc. With a Continuation and Additions...* (London: Lackington, 1818). K. Downes, *Sir Christopher Wren: The Design of St. Paul's Cathedral* (Trefoil, 1988). Campbell, *Building St Paul's*; Lang, *Rebuilding St. Paul's after the Great Fire of London* 988. M. Moffett, M.W. Fazio, and L. Wodehouse, *A World History of Architecture* (Laurence King, 2003), pp392-419.. Beard, *Craftsmen and Interior Decoration in England 1660-1820*, pp.117-120, Volumes XIII to XVI of the Wren Society.

² TNA C106/145.

³ Campbell, *Building St Paul's* p.72.

Thomas Wise Senior, Christopher Kempster, Ephraim Beauchamp, Nathaniel Rawlins, Thomas Wise Junior and Thomas Hill, John Thompson, William Kempster, Samuel Fulkes.⁴

St. Paul's contracts undertaken with masons, carpenters and others for the main allowed set charge out rates for measures or days, but the contractors were expected to hire their own skill at their own rates.⁵ Most contracts with masons were by measure or task, but there was an unusually large amount of day work for carpenters; this was on Wren's instruction due to the nature of the arches and vaulting, where not just efficiency but safety was a consideration.⁶ Where they were working on day rates, workers' names and attendance were entered in call books so that the number of days could be accounted for. If workers were attending to carry out task or measured work, however, they were not entered in the call books. The Commission agreed rates that they would pay for day work, and those rates seem to have been set throughout the entire period of construction, in the main 1675 to 1711.⁷

We would expect to find that craftsmen carrying out highly specialised work at St. Paul's would be paid more than an average wage in a series derived from more 'representative' kinds of building projects. Surprisingly, the rates paid by the Cathedral were lower than that found in the Boulton series. Boulton found that rates for craftsmen were 36d. a day in the early 1670s declining to 30d. a day through the early 1680s, and ranged 30 to 36d. a day throughout the 1690s and 1700s. The cathedral paid 30d. per day for craftsmen. Boulton found labourers day rates were mostly 20d. a day until the late 1690s when they rose to 22d., 24d. and above.⁸ Allen's series, comprising a moving average, gives a modal day rate for labourers of 24d. through the 1690's, and 22d. per day from 1700 to 1737.

St. Paul's was unusual compared to other sites because the Cathedral, and the clerk of works, directly hired and paid its own labourers for general work on site. Contractors also had their own labourers on site. The Cathedral's labourers were paid 16 – 18d. per day. (Boulton noted as much).⁹ These were still the rates being paid at the Cathedral in 1720.¹⁰

⁴ Ibid. pp. 103-4 gives the most accessible visual schema of the contracts.

⁵ Ibid. p. 8, 7, Lang, *Rebuilding St. Paul's after the Great Fire of London* pp. 85 – 87,

⁶ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction." p. 332, quotes, Wren Society, Vol XVI p. 151.

⁷ See Wren Society, Vol. XVI pp. xlvii-xlviii

⁸ Boulton, "Wage Labour in Seventeenth-Century London." p. 289.

⁹ Ibid. p. 274.

¹⁰ After the bulk of the work was completed, Wren Society, Vol. XX, pp. 224 - 5

Table 7.1 gives the range of rates paid by the cathedral. Notably, the cathedral had a discrete rate for foremen, at about twenty per cent premium to craftsmen or journeymen.

Table 7.1 St. Paul's charge out rates for day work in d.

Trade	Foremen/ Masters	Journeymen	Labourers
Carpenters and Joiners	36	30	18
Masons	36	30	18- 20
Labourers	18 – 30 (mostly 24)	16– 18	12
Carvers	40	36 - 38	

Source: as note 7.

As is highlighted above, there were two types of labourers paid at St. Paul's. Contractors' own who assisted craftsmen, and the cathedrals non-craft or general labourers, paid individually by the clerk of the works.¹¹ In the course of its dispute with Richard Jenings in 1710 the Commission reiterated that its labourers were all paid directly and without deduction.¹² There is no evidence to suggest otherwise, although it is possible that hierarchies and sub contracts did develop over the long period of construction.

Generally the accounts show that labourers were paid 16d. a day for demolition, assisting carpenters, digging, general labouring work, and 18d. a day assisting other crafts.¹³ The account books show that large teams of men were overseen by a small number of foremen. In September 1695 John Longland, chief carpenter, charged himself out at 3s. a day as foreman to 36 others who were charged out at 2s.6d. per day.¹⁴ In that same month 33 labourers were charged out at 18d. per day each. But in September, October and November labourers working on the vaults were in the accounts for 16d. per day.¹⁵ The two rates for

¹¹ It cannot be determined whether the men were paid individually or whether foremen were paid. The early records show names and days and amounts paid, later records just give the number of labourer's days and the total costs. Campbell, *Building St Paul's* p.36 intimates that the labourers may not have been paid directly, if so their foremen could have taken a cut too. This cannot be proven given the existing known records, and given the level of pay observed compared to other charge out rates in other series and other sources below I assume that the labourers did receive 16d. per day or 18d. per day as listed.

¹² See correspondence in Wren Society VXI, p.18.

¹³ See Wren Society XV pp.18 – 161. p.168 shows both rates in October 1708.

¹⁴ Wren Society, XV p.18 .

¹⁵ Wren Society, XV p.169.

ordinary labourers observed throughout the accounts are 16d. per day and 18d. per day, and 2s. per day for labourers' foremen, and in other cases 2s.6d. The day rate for unskilled labourers or 'men' doing work on site was only 12d.

Given the high level of the output, we would expect the level of skill at St. Paul's to be of the very highest where required, but given what we know of the contracting system we should also expect there to be a large range of skill on site. Work done on task or measured work contracts was solely the responsibility of the contractors. As discussed in chapter four, in order to profit from measured work contractors had to allow for an operating margin and a profit margin in setting prices and wages. Due to the fact that they bore the risk of defective work, yet their profit depended on the price of labour, contractors would probably have hired the best skill possible for the lowest rate, and economised for lesser skilled tasks. Measured contracts incentivised contractors to only deploy and pay for the minimal skill required for each type of work or task.

There is plenty of evidence from previous authors that this was the case. Knoop and Jones showed a mason's company search of the site in September 1694 found 151 men in masons' teams. In John Thompson's team thirteen men; William Kempster, John Magnus, Theo Allen, William Cooper, William Page, Stephen Powell, all masons; (Allen was not free), one foreigner, John Barker, a joiner's apprentice, four other apprentices, a foreigner, and merchant-tailor. In Edward Strong's team of sixty six men there were seventeen apprentices and eighteen foreigners.¹⁶ All of this indicates that there was a wide range of skill on site, some freemen, some apprentices, some very experienced, some less so. Magnus, Allen, Cooper, and Barker all appear in Kempster's day books as masons in 1700-2 and Barker and Magnus in 1708. It seems that Barker may have been a carver. He trained with a joiner (those who made moulds for carving), and payments to a John Barker for carving work appear in a small notebook kept by Kempster that survives alongside his day books in the national archives.¹⁷

The evidence presented in this chapter will show that contractors paid men less than the charge out rates they billed. Until now it has not been possible to corroborate Richard

¹⁶ Knoop and Jones, *The London Mason in the Seventeenth Century ...* .Appendix C, p.75.

¹⁷ TNA PRO106/145 small leather book with fastening. Opposite details of a silver watch purchased. "Paid John Barker £13, 8."

Jenings' assertion that his business practice was normal practice.¹⁸ Those who understand the contracting system have had no doubt, but it has not been able to be confirmed.¹⁹ The Kempster day books allow us to test the hypothesis that the pay craftsmen and labourers received was lower than the charge out rates found in bills, and also look at the distribution of earnings, team formation and days worked in a real working team.

7.2. The Kempster Day books

The William Kempster day books are call and pay records for his team of masons on site at St. Paul's Cathedral for 1700 – 1702 and 1705 - 8, recording the weekly number of days and weekly pay given to his masons.²⁰ Kempster's contracts at St. Paul's were dated from October 1700 and June 1705 to Dec 1708, so they correspond directly with the books. The first period seems to have been when Kempster took over John Thompson's contract.²¹ The second was the construction of the South West Tower, and the geometric staircase within from 1705.²² He also shared in a contract with Samuel Fulkes in December 1708 to flute the pillars of the West End (what we think of today as the West Front of the Cathedral). In the books, for many weeks, the heading reads "paid by my sponsor this week", or "paid by my father". Kempster was borrowing to keep skilled labour at the Cathedral and benefit from his contracts.

As can be seen in images below the work was of a highly engineered and very decorative, specialist kind of masonry. Image 7.2. is of the West Front and South West Tower.²³ Image 7.1. is of the geometric staircase.²⁴ The type of masonry work being carried out by Kempster (in the second contract particularly) was of the highest order of the day, the most skilled and prestigious. For further clarification as to the level of skill involved in these

¹⁸ Above, p.106-7

¹⁹ Campbell, "Seventeenth-Century Bricklayers' Contracts: Wren's City Churches."; Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."; Campbell, "Building a Fortune: The Finances of the Stonemasons Working on the Rebuilding of St Paul's Cathedral 1675-1720. ."

²⁰ Kempster's books are at TNA C106/145.

²¹ Wren Society Vol XVI p.xiv gives a summary of the dates of the contracts.

²² Wren Society XV, picture p. 86, text p.123- 4 <https://www.stpauls.co.uk/history-collections/the-collections/architectural-archive/wren-office-drawings/6-the-western-towers-c16851710> gives pictures and details.

²³ Taken from <https://www.stpauls.co.uk/history-collections/the-collections/architectural-archive/wren-office-drawings/6-the-western-towers-c16851710>

²⁴ An accessible description of the structural geometry and construction of staircases like this is found at <http://www.buildingconservation.com/articles/stonecantstairs/stonecantstairs.htm>

contracts, most of the carving at St. Paul's was carried out by the mason contractors.²⁵ There are no other carving contracts in the St. Paul's records that could be for South West Tower. Francis Bird was responsible for the panel on the West front adjacent for £329 18s. 4d, and the small models at the top of the Tower and the Lantern tops at £8 4s. 6d. (the models are small statues) a few years later, so it seems that all the stonework and carving on the South West Tower after 1700 was carried out by Kempster.²⁶

The official cathedral accounts are only presented monthly or quarterly. In October 1708, the cathedral's accounts show Kempster with 130 days for a mason, and 9 day's work in the library. In November 1708 "125 days in vaults, 5 and half days, altering ye Figures on ye dials, 18 days cutting holes for the clockmaker". All these mason days, irrespective of differing skill and specialisation, were paid at 2s. 6d. the day by the Cathedral. In December 1708 Kempster employed some men on task work and some for day work; he billed 103 days on call and 28 days "not on ye call", along with 212 days for labourers at 18d. All this work was paid for by the Cathedral at 2s. 6d. per day per mason and 18d. per labourer.²⁷ The Cathedral accounts show they paid Kempster himself at 36d. per day on some of his bills, but only the ones where there was a record of 'on ye call', So Kempster charged out his men, and St. Paul's paid him for them, at two rates 30d. per day for masons and 18d. per day for labourers. On some bills Kempster could bill his own time at 36d. per day, but not all.

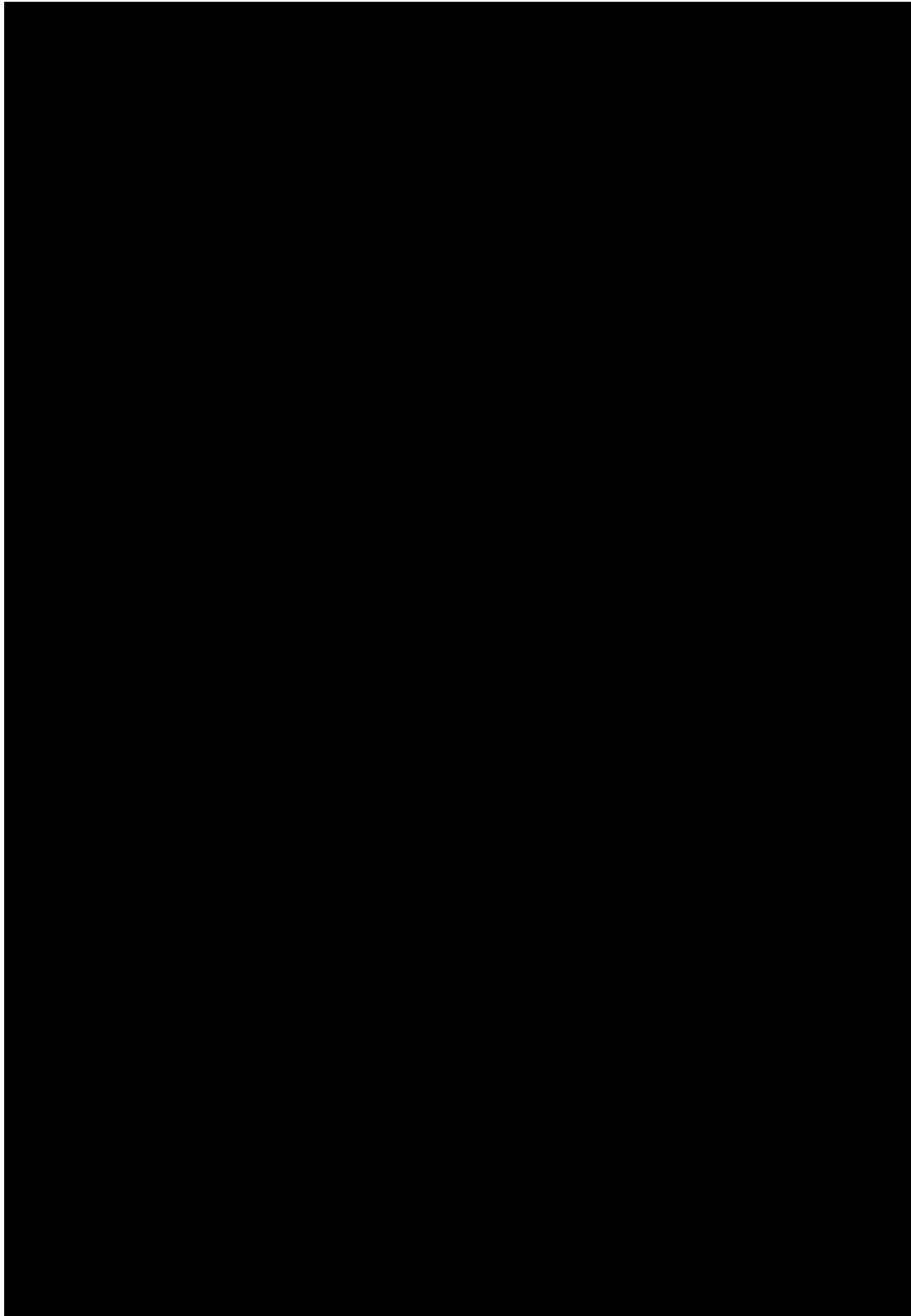
Kempster's books show many more men than that, and many different rates (and no pay for himself). In October 1708 his day books list twenty-three men, only five of them 'on call', or on the call books, working at day work. Of those men "on call", two were paid at day rates of 30d. per day, two 26d. per day and one 28d. per day. Most of Kempster's work was measured and contract work, which would have been just as skilled, if not more so, as day work given the carving components above. So we would not expect the Cathedral's records of days worked to tally exactly with his, but the rates he paid for both were lower than the charge out rates.

²⁵ Wren Society Vol XVI pp. xiv - xv, see notes throughout in measured bill of "masons' and carvers' work" to all mason contractors.

²⁶ Wren Society, XVI p.xxiv

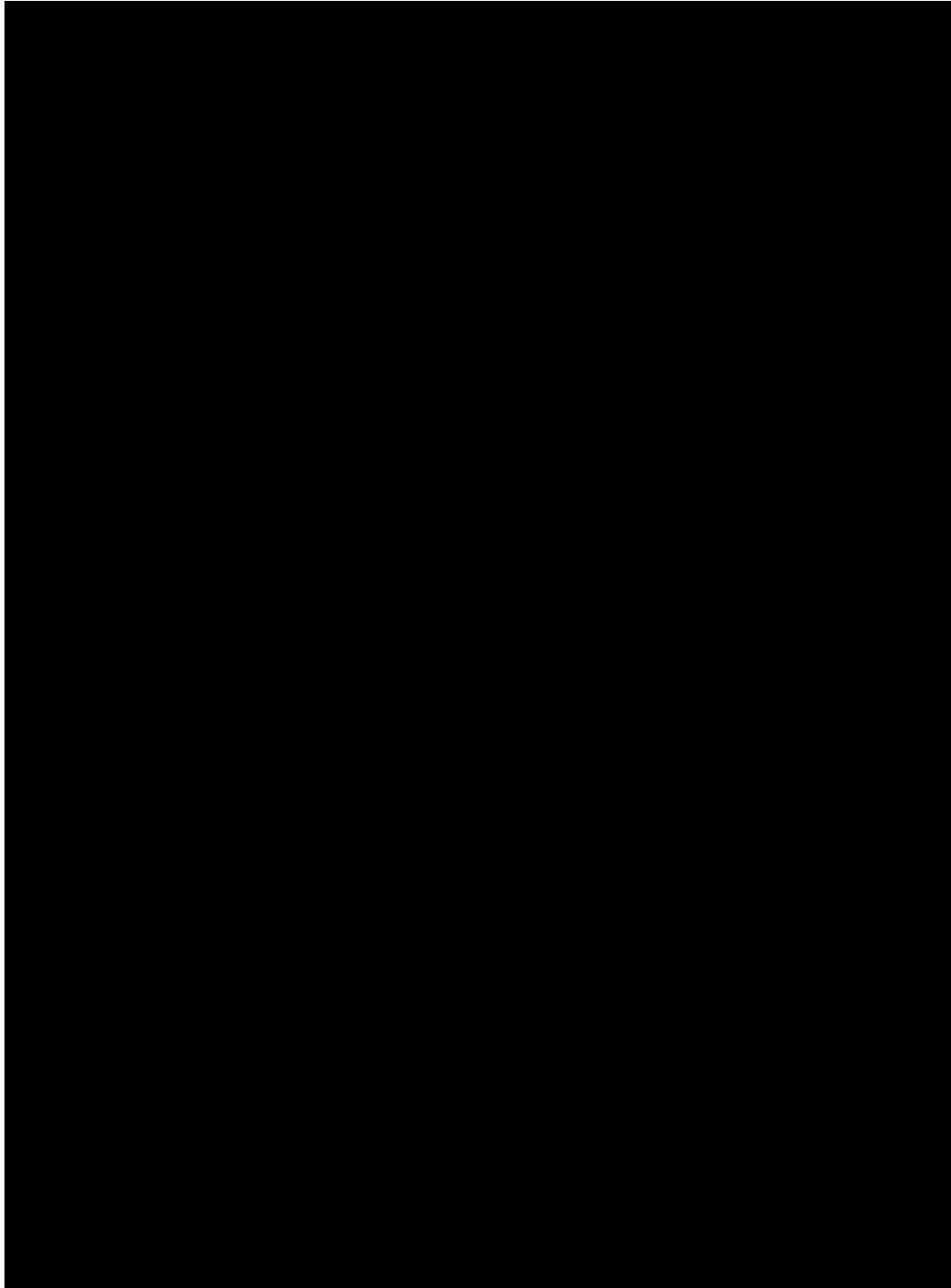
²⁷ Wren Society XVI, p.170 – 172.

Image 7.1. Geometric Staircase, St. Paul's Cathedral, William Kempster 1705–1708.



Source:https://www.stpauls.co.uk/SM4/Mutable/Uploads/imported_media/The_Geometric_Staircase_in_all_its_glory.jpg

Image 7.2. The West Front, St. Paul's Cathedral, South West tower on right of the picture.



Source: <https://www.stpauls.co.uk/history-collections/history/explore-the-cathedral/exterior-and-churchyard>

Image 7.3. shows Kempster's records from St. Paul's for the first week of October 1700. The number of days and pay worked by each member of the team of twenty-one is recorded in units of half days. There is slight variation in the pay individuals received between some weeks. Edmund Healing was usually paid 15s. for 6 days. In this week, he was only paid 14s. and 8d. Thomas Magnus was usually paid 16s. for 6 days, in this week he was paid at a slightly higher rate. This could be miscalculation, or it could be individual wage bargaining, unusually difficult or complex work, or casual overtime. The team worked until the end of December.

No day rates or wages were recorded again until the beginning of February when a team of just seven men restarted work. Over the next few weeks the team grew again, as before December, with one very important difference. Three men took a significant reduction in wage. Thomas Bayley and Thomas Loller had been earning 13s. a week, now they earned 12s. Roger Bliffard who had been earning 12s. a week now received 10s. The new rates were sustained until the records finish in 1702. The average day rates all the men named in the books received 1701 – 1702 are shown in Table 6.2.e. There is no sign of seasonal differences; summer and winter rates are the same.

To interpret the rates shown in Table 7.2 properly it helps to have some idea about the masons' level of skill and experience. From the Mason's Company search of 1694 we know John Magnus and William Cooper to have been freemen at that point. They were qualified enough to be masters, well off enough to have taken their freedom, yet with six years' further experience they were working for a large contractor. Tho. Allen was already working at St. Paul's in 1694, although he was not free then; given that he was certainly more than seven years into his working career in 1701, he must have been a very experienced, and possibly free. John Barker only appears in the books after the beginning of July 1701, but stayed through the year after. We know he was not free in 1694, but he was probably a carver, and by this stage, 1701, an experienced one. Edmond Gibson only appears in November and December 1700 for 6 weeks of observations, as does Peter Marrott, only in September 1701, they may have been hired in for some specialist task, or just did not work out within the team. The only person who was consistently within the team and paid over 30d. per day was Tho. Magnus. He may have been foreman, but for many weeks he was only paid for five and a half or fewer days.

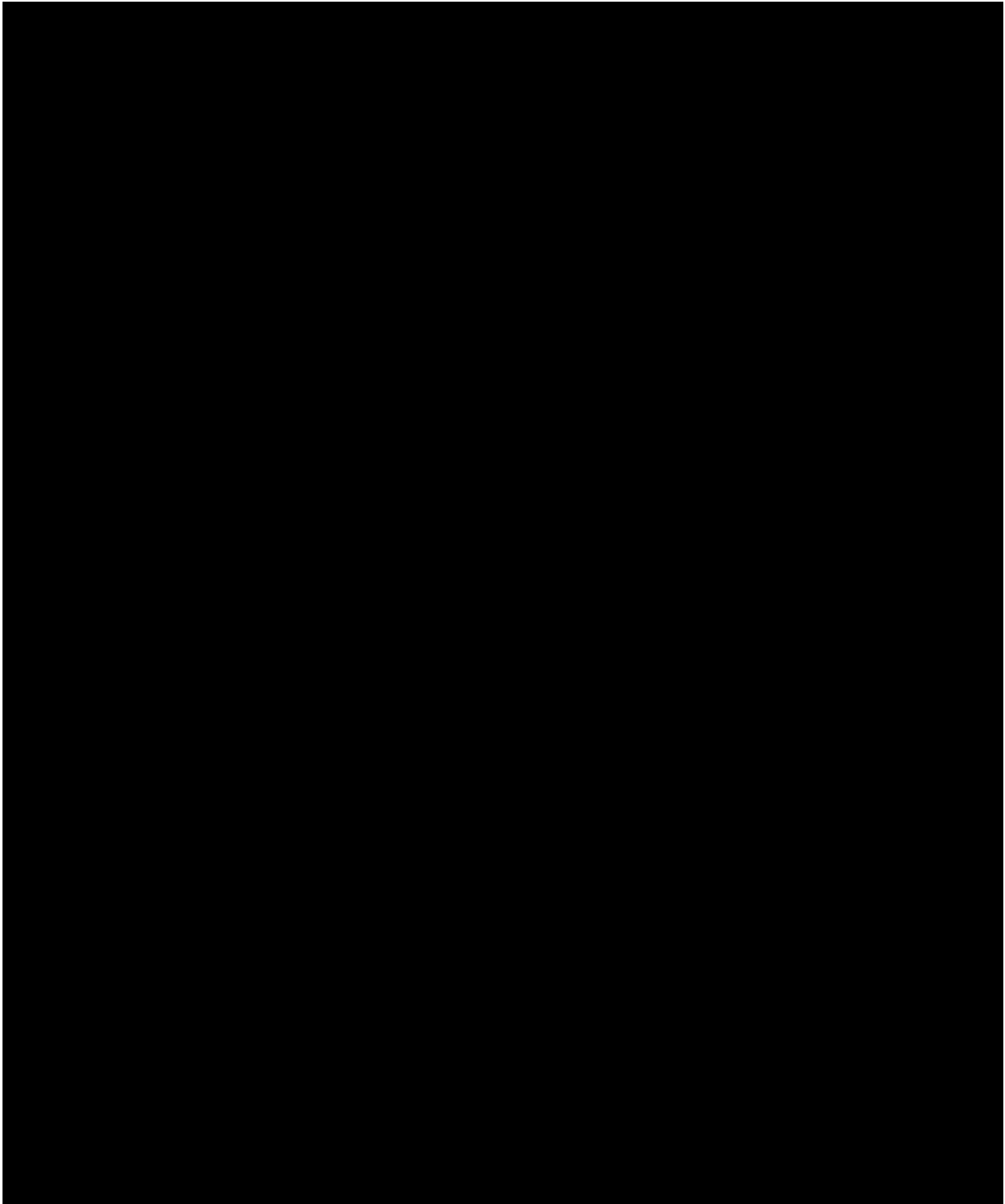
Table 7.2. Day Rates Kempster Team St. Paul's 1702 – 2.

February 1701- December 1702. 46 observations over 52 weeks.	
John Barker	36
Edmund Gibson	34
J Magnus	32
Peter Marrot	32
Ed Healing	30
Tho Knagg	30
Will Cooper	30
R Parinoole	30
Tho Allen	28
Tho Minor	28
Edmund Biboy	28
J Smith	28
Tho Bayley	24
Tho Loller	24
John Slorkly	24
M Turrill	24
John Renn	24
Rog Bliffard	20
James Williams	20
J Garner	18
John Parlour	18
John Foster	18
Jos Shepard	18
G Conaway	18
W Danifour	18
Chs Thurland	18
R Florker	16
R Joanes	16

Source: TNA PRO C106/145. The table reports the mean day rate for each craftsmen based on 46 weekly observations for each individual spread over 52 weeks commencing February 1701

Thanks to notes in the margins against entries for the period 1706 -8 we can know that James Williams, John Parlour, and Charles Thurland, and all listed below them, were labourers. Some paid at 18d. a day may have been apprentices, although a son of Edmund Bibby was listed in May and July 1708 at 7s. for a 6 day week or 14d. a day. This gives us enough information to construct a plausible hierarchy. The most experienced craftsmen and carvers were paid 30d. or more per day, other journeymen ranged from 20d. to 28d per day, a senior labourer received 20d. per day and the rest of the labourers took 18d. per day. Tables 6.2.f and g shows comparisons to charge out rates. Given this categorisation we can calculate both modes and means for each group.

Image 7.3. Kempster day books.



Source: TNA106/145

Table 7.3. Real pay rates and charge out rates at St. Paul's Cathedral 1701-2

1701-2	Range	Mode	Mean	Charge Out
Carvers*	36	36	36	36-40
Journeyman masons	20-34	24	27.6	30
Labour Foremen	20	20	20	18- 30
Labour	18	18	18	18

Sources: See text * Barker is the only man confirmed as a carver

Table 7.4. Real pay rates and charge out rates at St. Paul's Cathedral 1707-8

1707-8	Range	Mode	Mean	Charge Out
Carvers*	36	36	36	36-40
Journeyman masons	20-34	28	26.9	30
Labour Foremen	20	20	20	18- 30
Labour	14-18	18	17.2	18

Source: See text * Barker is the only man confirmed as a carver

In the latter part of 1708 Kempster had more than forty men on site most days. He was also managing different sets of skills. He listed men in his book as 'Masons on call', 'Ruff layers', and 'labourers'. The rates are reported in Table 7.5. By this stage, Richard Richards and Joseph Smith, both experienced masons - Smith was on Edward Strong's call list in 1694, Richards on Christopher Kempster's - had joined the team.²⁸ Thos. Loller had regained the 26d. a day rate he had in 1700.

²⁸ Knoop and Jones, *The London Mason in the Seventeenth Century ...* .pp.75-77

Table 7.5. Day rates 1708, Kempster team, by hierarchy found in books.

July 1708, Kempster team	d per day
John Barker	36
Tho Knagg	30
Peter Abraham	30
Will Ash	30
Charles Cathuron	28
Mean*	29.5
Masons on Call	
Richard Richards	30
Joseph Smith	30
Joh Turkey	30
Mark Abraham	30
E Maslin	30
Ed Bibby	28
Th Bibby*	14
Richard Dufoil	28
W Kempster	24
Richard Day	28
Mark Gronder	28
Mal Wayor	26
Thos Loller	26
Roger Healing	20
Will Stonhouse	20
Mean	27
Ruff Layers & their Labour	
Charles Dray	24
RE Raymond	24
James Bishop	24
John Wren	24
Mean	24
Thom Sawbridge	18
Sam Ledford	18
John Smith	18
John Fullwell	18
Will Brathen	18
Mean	18
Labourers	
Williams	20
Parlour	18

Fofler	18
Walbank	18
Onion	18
Lintall	18
Mean	18.33333
Total mason mean	26.8
Total Labourer mean	18.17

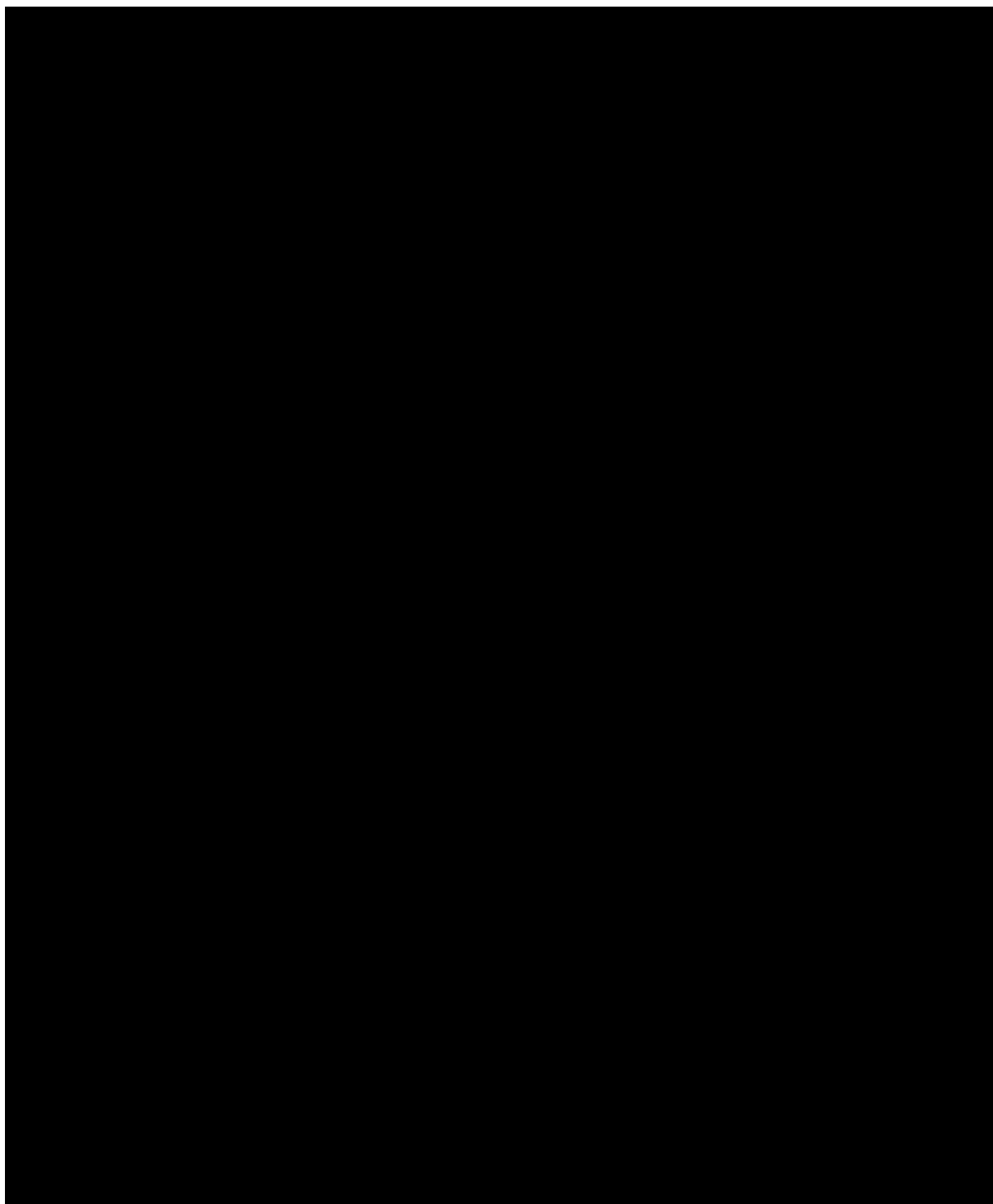
* not included in median, Barker is a foreman or carver, Bibby is son of Ed Bibby, so possibly of little experience.

Table 7.6. Mason's day rates on the columns.

From "An account of masons time it was at the columns" (undated loose sheet)	
Name	Day rate in d.
John Hartnoll	28
Thom Deene	28
Thom Atkins	28
Peter Abraham	28
Edward Bibby	28
Will Sutton	24
Rich Duffell	26
John Panton	28
Matt Warner	26
Nic Abraham	28
Ch Crowther	26
Roger Healing	20
Joseph Smith	30
John Tuckey	30
Andre Lewes	30
Henry Turner	28
Will Ash	30
Mic Growder	30
Will Stonouse	20
Jam. Tille	28
Thom Bibby	18
Gill Huett	14
Thom Bradle	20
Abr. White	28
Thom Jones	28
Rich Day	26
Mean average	26.07
median	28
mode	28

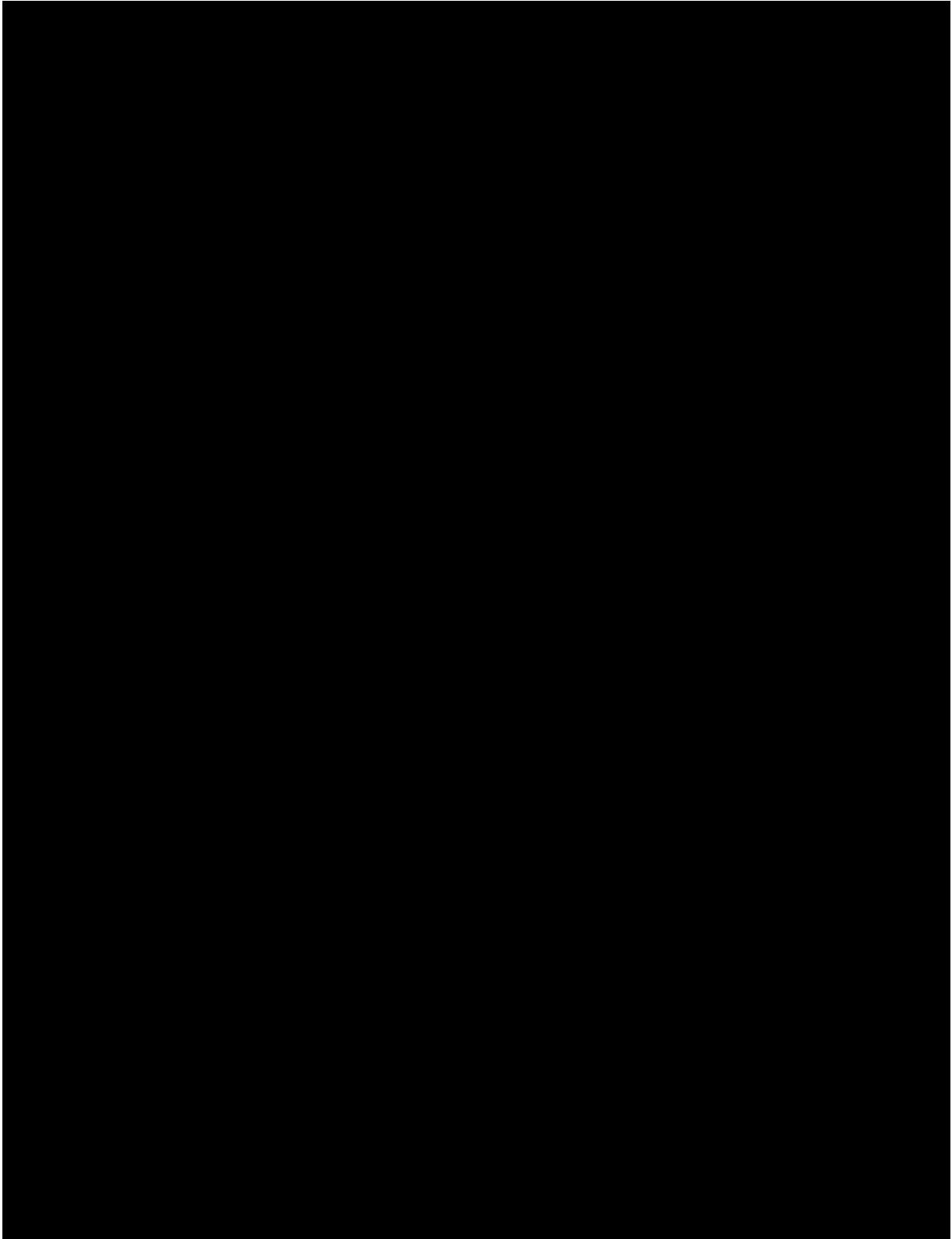
Source: See text

Image 7.4. Kempster book July 1708, showing hierarchy.



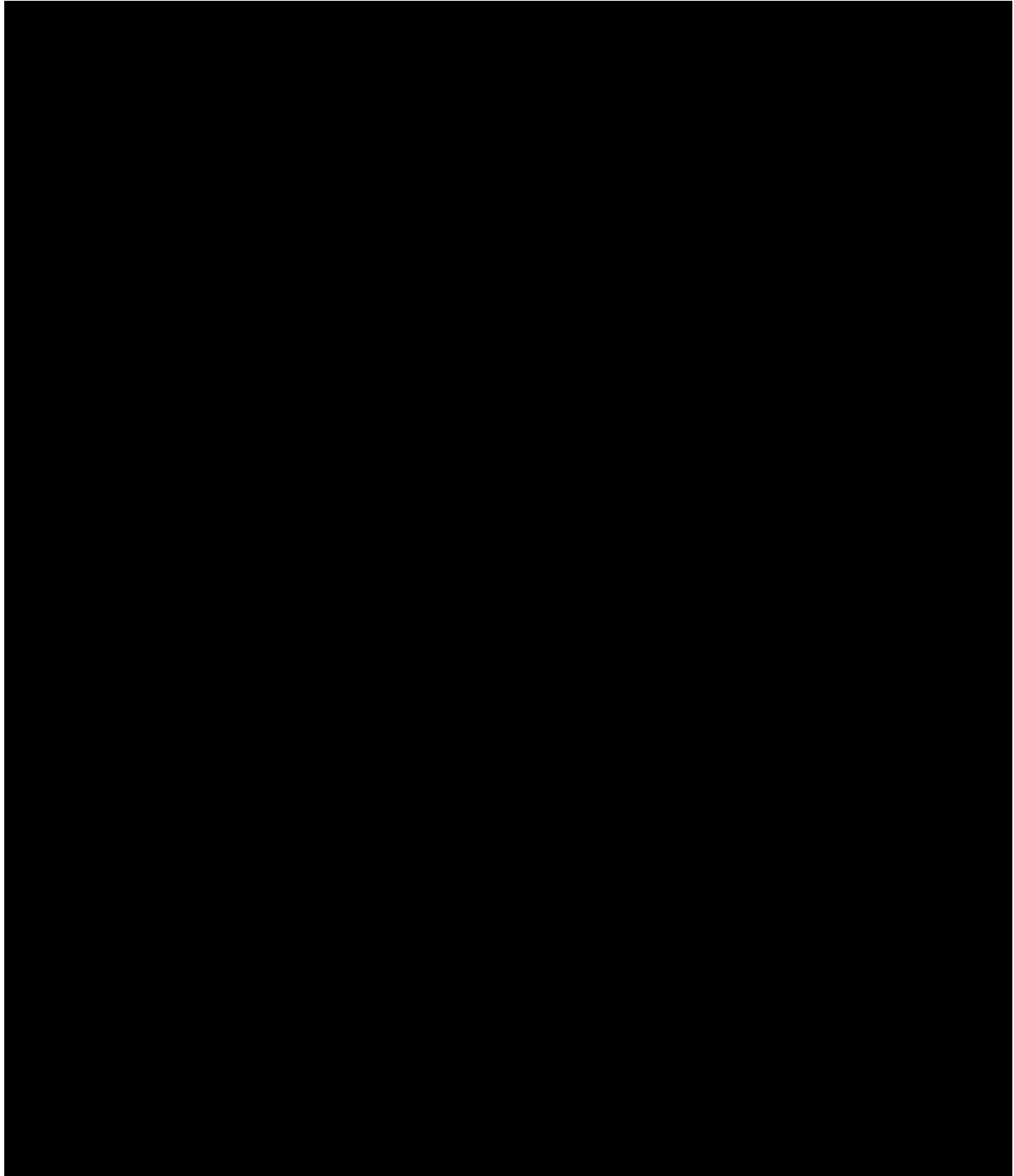
Source: TNA 106/145

Image 7.5. Kempster book November 1708, showing hierarchy



Source: TNA 106/145

Image 7.6. Kempster book “account of the mason’s time it was on the columns”.



Source: TNA 106/145

Interspersed in the pages are single page lists of the “masons who worked on the columns”. These refer to the fluting of the columns of the West front. This would have been not only skilled, but as the special singular page suggests, prestigious. Yet the mean average day rate for those working on them was still 26.5d. per day. Boulton’s (interpolated) modal charge out rates for all craftsmen for the year is 31d. per day. Table 7.6.

The Kempster books provide compelling evidence that contractors paid less than the charge out rates which were listed in the official accounts of the Cathedral. Kempster’s margin on labour costs was entirely determined by the level of skill he had to deploy. Overall the range of pay Kempster gave his men was from 20d. per day to 34d. per day for masons. His mean average pay per man per day was 26d.- 27d. and his masons did not receive any rise in rates paid per man over the whole period he was active at St. Paul’s. If we only take into account masons’ pay, Kempster’s overall margin at St. Paul’s compared to their charge out rate, was thirteen per cent, with a range from zero to thirty per cent. However, the number of labourers in the day books suggests that he could have been substituting labour for craftsmen’s days. This is hard to discern without seeing the bills he actually submitted to St. Paul’s. If this was the case his margin looks far closer to the sort of overhead that was calculated from his costs in the previous chapter. Taking all his men’s wages, into account the average cost per man per day for the year 1700-1 was 21.3d., twenty-nine per cent less than the 30d. charge out rate he was able to apply in his bills for work at St. Paul’s.

Table 7.7. Percentage difference between Boulton series and Kempster pay per day.

Year	Boulton Craft d.	Kempster Craft d.	% difference	Boulton Labour d.	St. Paul’s Labour d.	% difference
1701	32	26	-18.75	24	17	-29.1
1702	36	26	-27.7	24	17	-29.1
1705	34	26	-23.5	25	17	-32
1706	32	26	-18.75	26	17	-34.6
1707	32	26	-18.75	26	17	-34.6
1708	31	26	-16.1	25	17	-32

Source: See text

Table 7.7. calculates the differences found in the Boulton series and the Kempster pay expressed as a percentage difference. I have taken 17d. as the average rate for labourers as at

least half the cathedrals labourers were paid 16d. Kempster's masons, possibly slightly more skilled, were paid mostly 18d. On average the difference between Boulton's rates and Kempster's for craft is twenty per cent, for labour thirty-one per cent.

How representative was St. Paul's? It should be borne in mind that the site was active and probably dominated the market for skilled labour in stone and carpentry in London for over thirty-five years. With this kind of timescale any anomalies of pricing should have worked out. And we know the rates the institution was willing to pay were not unusual. As we know from Boulton's series drawn from other contemporary sources, the charge out rates for craftsmen was 32d. to 36 d. for the years 1701 – 7.²⁹ We also know from Edward Strong's account book, and Westminster Abbey and other sources, that fixed charge out rates were the norm.³⁰ Perhaps the main difference is the type of work involved and the demands it must have made for skilled craftsmen. It seems likely that on work that did not require the high level of skill that work such as the geometric staircase must have involved the margin would have been higher. Work that did not include carving would perhaps have had a different profile of pay. The likelihood is that ruff layers and journeymen on other projects which did not result in The West Front of St. Paul's and the geometric staircase in the South West Tower would have been paid a maximum of 24d. per day, if not less.

The Kempster records show that pay levels were variable depending on the skill and responsibilities of individuals. Highly specialised skill could get as much as 36d. per day like Barker above, and foremen also, but plenty of less skilled masons could command only 24d. and some, presumably those less skilled or experienced, could only get 20d. Labourers did not earn over 18d. a day. The cathedral account shows labourer's foremen charged out at 24d. per day. Yet, James Williams, who, given his position in the accounts, was presumably the foreman of Kempster's team of labourers earned 20d. per day. Charles Thurland and John Parlour, who both worked for Kempster up to six days a week for many years, did not earn over 18d. ever. Many labourers at St. Paul's regularly earned 16d. a day.

²⁹ Boulton, "Wage Labour in Seventeenth-Century London." p.289

³⁰ LMA CLC/B/227-175, Westminster Abbey Muniments 34513, 34514, Gilboy, *Wages in Eighteenth Century England*. Appendices.

Kempster's work is revered as some of the most beautiful and important architecture in London.³¹ The contracts he had called for exceptional skill, in the aesthetics and engineering of stone work. That skilled masters, carving and forming one of the most important monuments in Europe, were paid less than the rates previously thought of as journeyman's or labourers is as unsettling for economic historians who believe that skill was scarce and expensive in England in the late early modern period, as it is for architectural historians who write of Kempster, Marshall and Strong as artists. Yet, the evidence from Kempster's book is compelling. The next chapter looks at another major site source in London over the period; the 'ordinary' maintenance work on London Bridge.

³¹ <http://www.telegraph.co.uk/travel/destinations/europe/uk/london/8780323/The-glory-of-St.-Pauls-Cathedral-is-being-revealed-anew.html>, http://carolineld.blogspot.co.uk/2013/02/st-pauls-cathedral-geometric-staircase_6.html,

Chapter 8. Pay at Bridge House

8.1. Bridge House in context.

Bridge House is one of the richest archival sources for early modern London, yet of all historians of wages in London only Knoop and Jones have previously delved into the archives there, and even they did not look beyond names and day rates in the 1690s.¹ At Bridge House, building craftsmen and labourers were employed maintaining London Bridge throughout the seventeenth and eighteenth centuries. The bridge, it seems, was notoriously “falling down”. The narrowly placed piers created strong water currents that threatened the masonry, and the wooden starlings that were built to protect the masonry from damage were in need of constant renewal.² The masonry on the bridge above the water was also being constantly maintained. The management of Bridge House was in the hands of the Bridge master and the Aldermen of London. It was one of the cities richest and oldest institutions, and, as Mark Latham has recently shown, in the period in question it was rife with corruption.³

Bridge House pay records differ from those of ‘extraordinary works’ such at St. Paul’s, Greenwich Hospital, or the city churches in two important respects. Firstly, the bills for labour and material are wholly separate. There are no “great” or “measured” bills at Bridge House. Instead, there are weekly labour bills in either bill books or audited accounts from the Land Carpenter, the Tide Carpenter, the Mason, and others for most of the years 1660 – 1788.

The second fundamental difference between work at Bridge House and work on extraordinary sites is the way labour was contracted and accounted for. Only a small number of people were contracted, paid or accounted for by the day. Many more were paid by the tide. Those who received day rates were the contractors, the salaried placeholders, their apprentices, and their foremen (sometimes these were sons). Others were paid by the tide and days, and some workers were *only* paid by the tide.⁴ As Boulton has commented, “Rates by the hour, complicated calculations of overtime and Sunday working are all found in such

¹ Knoop and Jones, *The London Mason in the Seventeenth Century* ... shows names of masons at the Bridge in the 1690s, Boulton, “Wage Labour in Seventeenth-Century London.” used their rates

² Gordon Home, *Old London Bridge* (1931).

³ Latham, “‘The City Has Been Wronged and Abused!’: Institutional Corruption in the Eighteenth Century.”

⁴ See TNA ADM 102 for Shipwrights pay in London at Deptford Dockyard in the 1770s.

official records”.⁵ Although the records at Bridge House have this confusing tide/ days aspect, which may be what led to them being excluded from other studies, they also have the advantage that we should be able to estimate closely what particular groups of people were actually paid over the long run. However, in practice a great deal of documentation at Bridge House leads to the conclusion that many of the bills submitted were for work that may not have occurred.⁶

Because there were so many different kinds of roles and trades at Bridge House it is best to be clear at the outset about the terminology for each role and type of worker. The contractors at Bridge House in the late seventeenth and early eighteenth centuries were the holders of positions in the Bridge House administration. They paid large sums to obtain the contracts to become ‘the Land Carpenter’ or the Tide Carpenter’ or ‘the Mason’ to the bridge. The people who paid for the positions held roles at other institutions also. They included, in the 1680s for instance, Thomas Wise, who was also a contractor at St. Paul’s, and William Gray who was also working on the City Churches. The contractors organised the labour teams and billed the Bridge master weekly for labour bills. The labour bills sometimes named men and sometimes did not. Images 8.1, 8.2, and 8.3. give an example of these bills from the early eighteenth century. Taking 8.1. as an example, the first person named in the bill was the contractor, the second person was his most senior carpenter, or foreman, who usually was paid 6 days a week year round, and also was paid for tides. The third set of persons named, charged out at 9s. a week each were usually apprentices. The persons who were listed after these were regular or casual carpenters, in 1722 wholly paid by the tide. Those on the lower tide rates were labourers. Image 8.2. shows a similar bill for 1721 for the Land Carpenter, Wilmor, where Pearstone and Harvey were apprentices.⁷ Image 8.3. for the Mason, William Lesow from 1735, where Mr. Collier was his regular mason and foreman, and Edward Clark a labourer, and others unnamed casually hired or non-regular labour, where there were not regular number of days recorded for them over the year.

The margin contractors at Bridge House may have been taking on wages was discussed in chapter four. The question arises of when the last ‘real’ rates, in the sense of direct pay,

⁵ Boulton, "Wage Labour in Seventeenth-Century London."p.274

⁶ As discussed in Latham, "'The City Has Been Wronged and Abused!': Institutional Corruption in the Eighteenth Century."

⁷ I have derived that those on 9s. a week in this positions in the bills are apprentices because when they are not named they are listed as "two apprentices", and some of the names are known to have been apprenticed to that master.

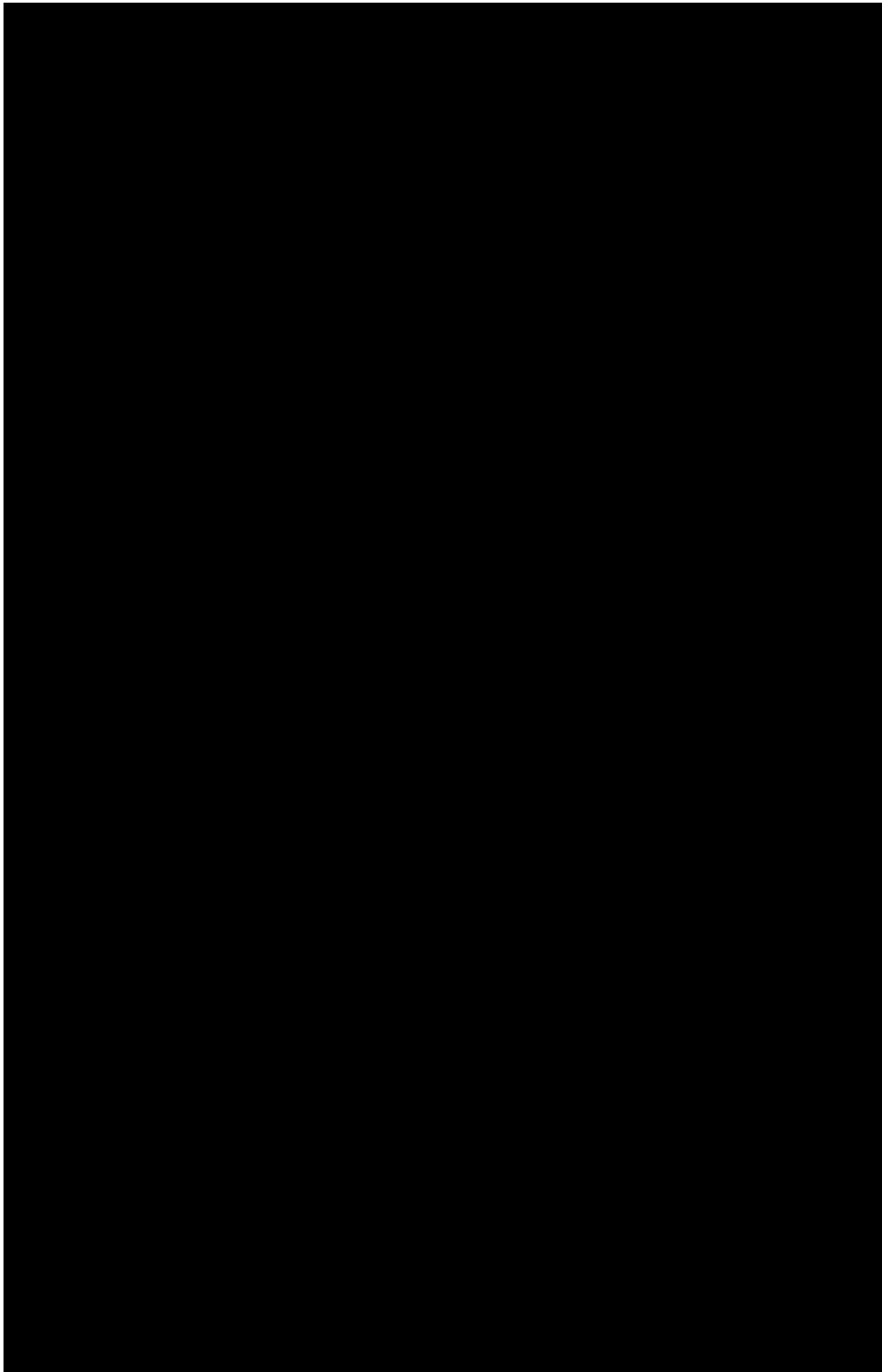
given to workers rather than contractors, were recorded at Bridge House. Despite a great number of hours looking at bills, signatures on bills, and remittance books I have not been able to pin down a date. Employment may have been via contractors using charge out rates from way before the 1660s, but without a different type of research, a date for when rates moved from direct to charge out cannot be firmly concluded.

In 1709 there was a major investigation into fraud at the Bridge. Thomas Veasey, a house labourer, alleged that Jeremy Bower, Land Carpenter only attended twelve tides a year whilst taking 20s. a week salary. Veasey also claimed that Barrow's chief journeyman, Bartholomew Sparruck, received double tide wages and was charged out several times in any one bill, yet had in fact missed three and half days' work in July and more than twelve in August through attending his own business at other sites. Veasey also alleged that materials bought by the Bridge were ending up at the homes and businesses of employees.⁸ Sparruck succeeded Bower to the post of Land Carpenter in 1710, paying £450 for the position.⁹ Given Veasey's allegations, and what we know about Jenings and Kempster, who were doing work of the highest quality at St. Paul's it's more than plausible to take all rates found at Bridge House as charge out rates after 1685, when Wise became mason. It could be argued that the practice began long before, as it had at The Office of the King's Works sites, but from 1685 the likelihood is far greater due to Wise's presence. Assuming that Wise was paying similar rates at St. Paul's as Kempster, it would be highly unlikely that he was paying any more to masons working on the Bridge who were doing less skilled work, albeit on the river. If he had been, any difference would have equalised as men downed chisels at the Cathedral to try and get work on the Bridge. Wise and Gray's rates, and those present in subsequent office holder's bills, should be seen as charge out rates. Yet in order to be clear about the nature of the records, this chapter presents the pay records as they are found.

⁸ LMA CLA/007/AD/01/007

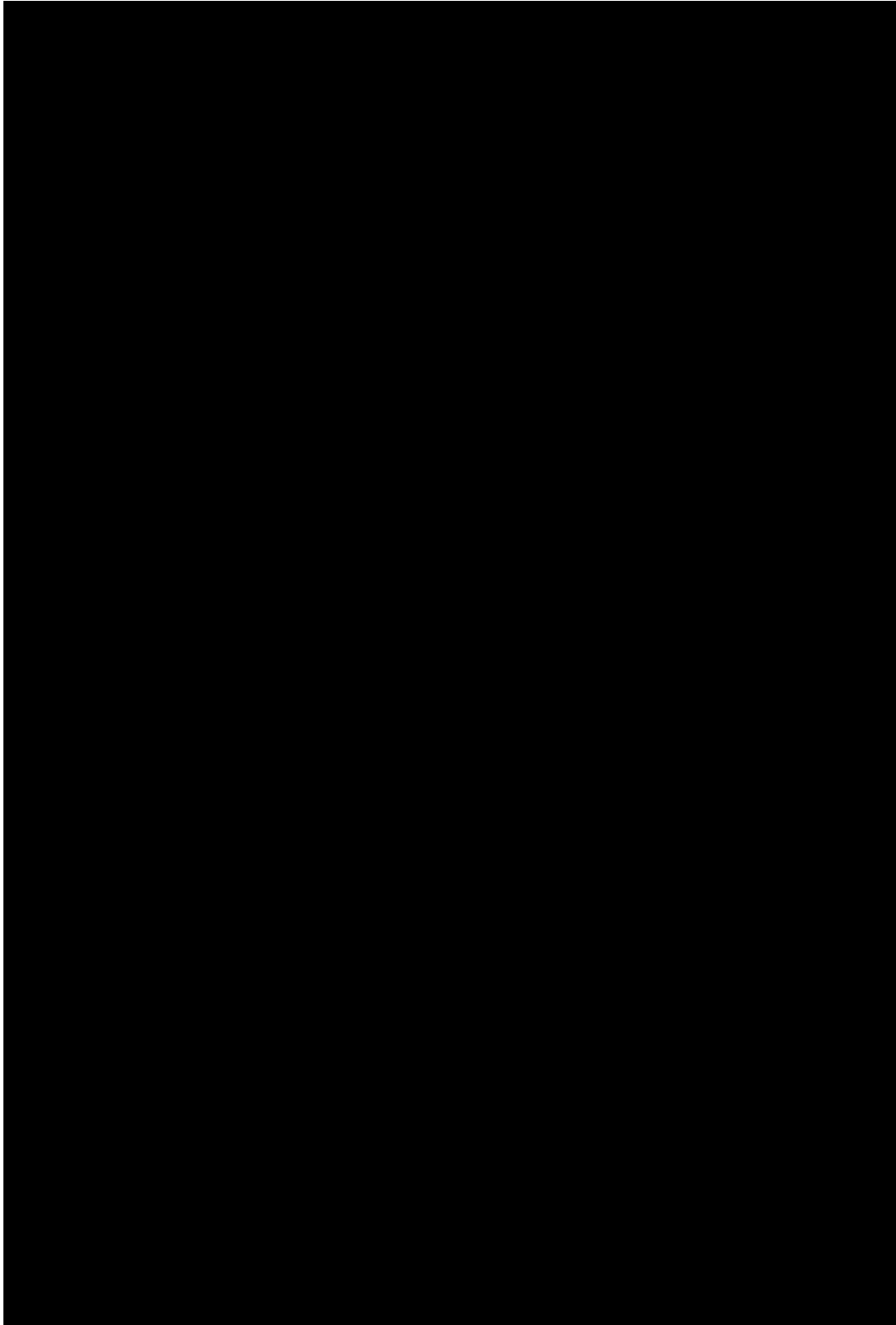
⁹ Latham, "The City Has Been Wronged and Abused!": Institutional Corruption in the Eighteenth Century." p.1041

Image 8.1. Bridge House Tide Carpenter's bill, 1722.



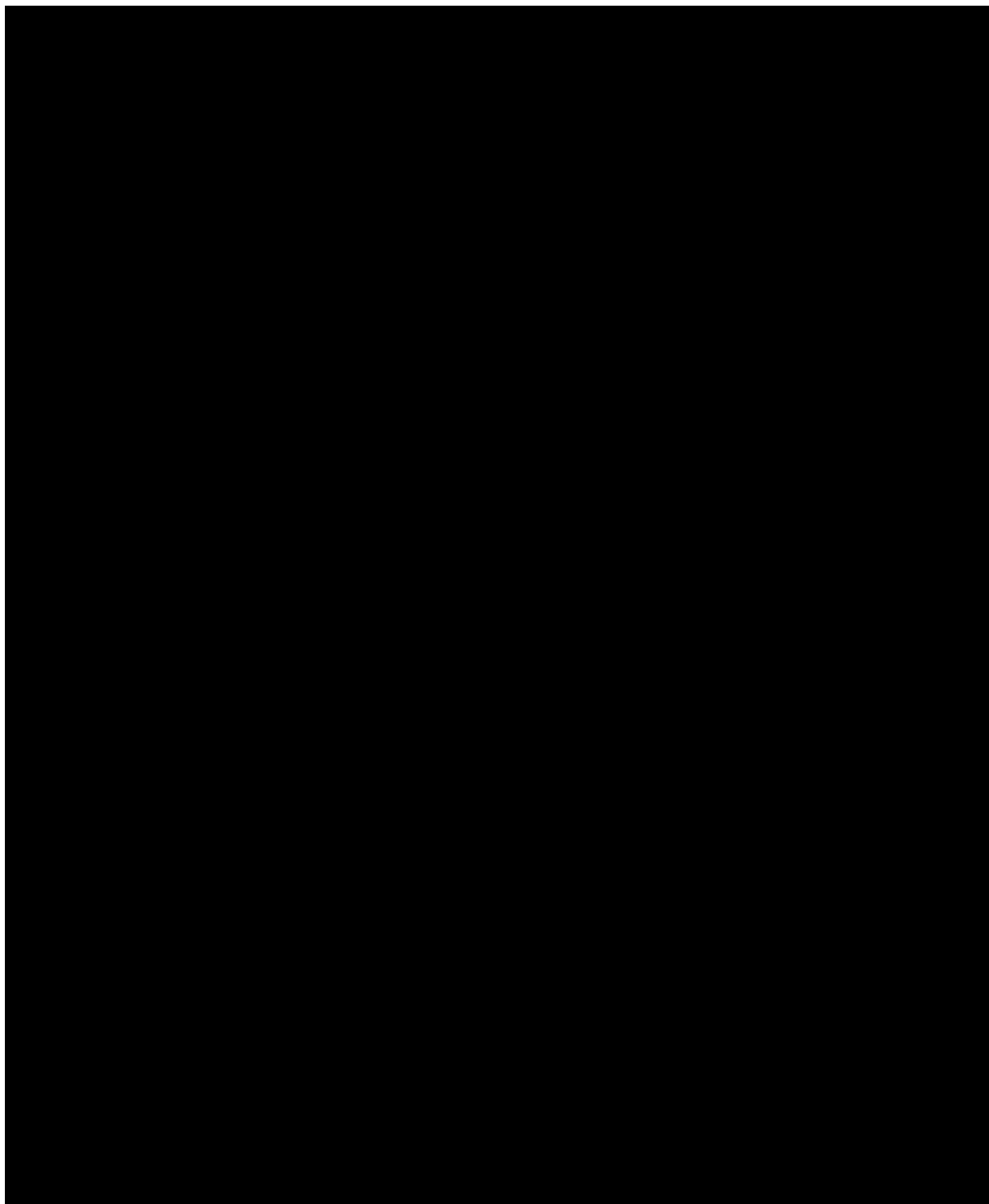
Source: LMA COL/CC/BHC/10/003 – 6

Image 8.2. Bridge House Land Carpenter's bill 1721



Source: LMA COL/CC/BHC/10/003 – 6

Image 8.3. Bridge House Mason's bill 1735.



Source: LMA COL/CC/BHC/10/003 – 6

8.2. Bridge House Pay 1660 – 1685

Bridge House day rates and tide rates are much lower than existing series on London wages would have one expect. Table 8.1. shows pay in 1661. At the point when Boulton's series shows a day rate of 36d. for craft and 24d. for labour, day rates at Bridge House were between 18d. and 22d. for masons and carpenters and up to 24d. for bricklayers.¹⁰ A distinguishing feature of Bridge House pay throughout the whole of the long eighteenth century was that work was conducted literally on the river, and so tide pay augmented day pay for some men, but not all. Tides represented a sort of overtime, but their number in any given week was variable as will be seen in the following sections.

Some payments are low enough for it to be plausible that they are direct payments, and that the whole amount was received by the individuals. The mean wage for craftsmen was 20d. and for labourers 14d. There exists the possibility that some of those listed under the trades were actually labourers. If this was the case, and only everyone paid more than 18d. per day was counted, the mean wage of craftsmen would have been 21.6d per day. This indeed may be the case. In February 1665 there were two labourers detailed in the Land carpenter's bill, at 9d. per half day and 18d. per day. That said, there is also one worker, Abraham Baxton, who is named on the masons' bill at 14d. per day.

In the late 1660s more highly paid masons were regularly on the books, however. There were two masons paid 30d. per day for 4 days a week regularly, as well as others on 22d. and 18d. per day in February 1666. The Land Carpenters bills in the same month show five men on 20d. per day, four men on 18d. per day, and five men on 24d. per day. The carpenters' mean day rate was 20.8d. per day. The masons' mean rate was 27.3d. excluding those on 18d. a day. If the 'ambiguous', or unclassified workers receiving 18d a day are included, and just the single worker on 14d. a day excluded, the mean is 23.6d. per day. In August of the same year three masons were paid days at 22d., 18d., and 30d. respectively, giving a mean of 23.3d. A single man was paid 2s. 6d. for 6 tides.¹¹

¹⁰ Bridge House Estates, Weekly payments: London Metropolitan archive. LMA CLA/007/FN/003 – 19a to 021

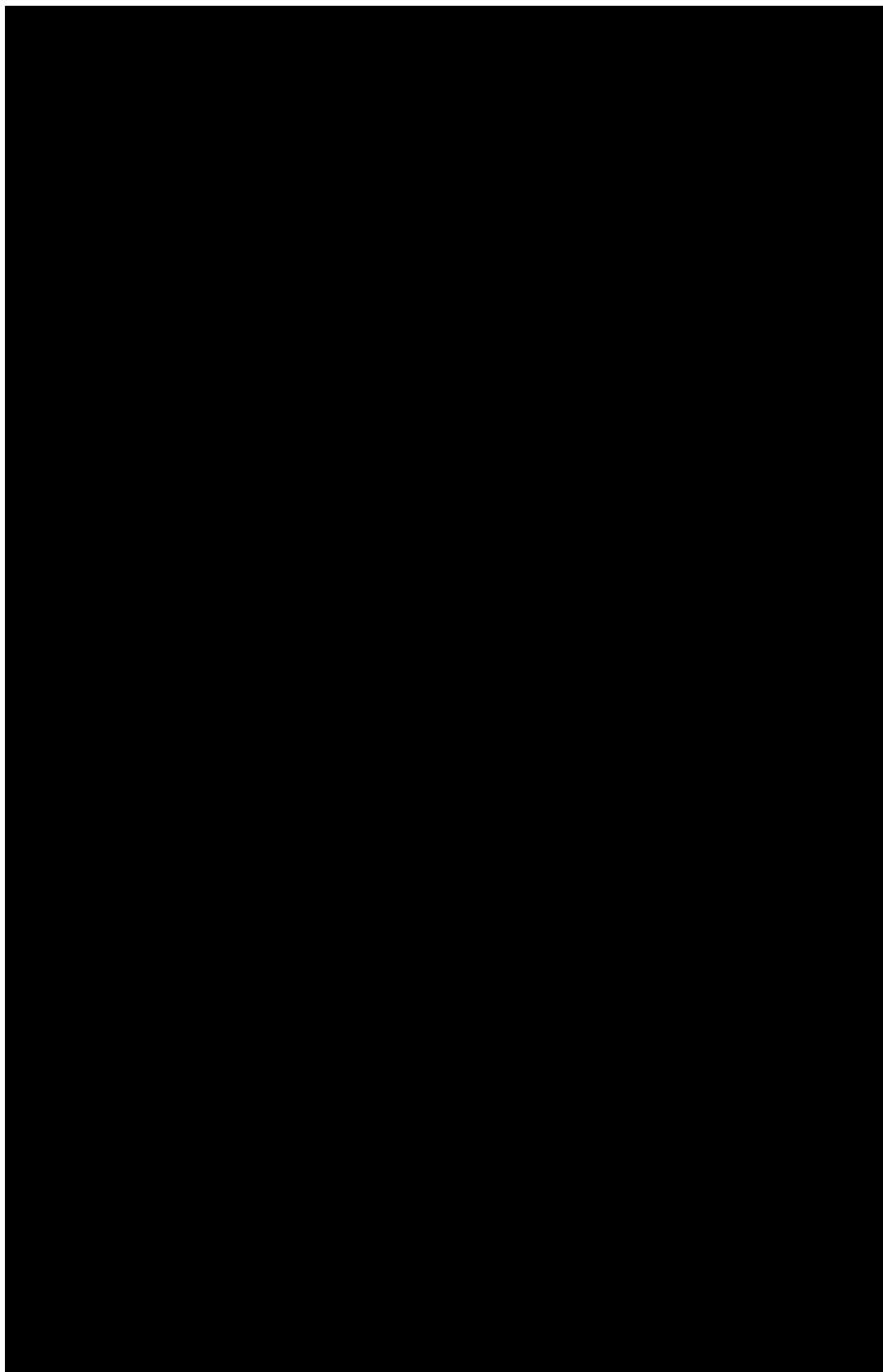
¹¹ Work carried on throughout September 1666 and for the rest of the year and following with no change in rates or numbers.

Table 8.1. Pay at Bridge House in 1661.¹²

Bridge House, Saturday 26th October, 1661			day rate d.	tide rate d.
/ = no number of days given				
Masons				
George Dovewell	/	11s		
John Jones	6 days	11s	22	
John Purder	6 days	9s	18	
John Baker	6 days	9s	18	
Carpenters				
Joseph Deverall	/	11s		
Richard Clarke	/	12s		
Thomas Clarke	6 days	10s	20	
Joseph Graves	6 days	10s	20	
Robert Kendall	6 days	9s	18	
Hugh Harris	6 days	9s	18	
Jeremy Larkin	6 days	9s	18	
Thomas Clarke	6 days	9s	18	
Four Masons six tides a piece		12s		6
Sawyers				
Thomas Randall & his fellow	6 days	24s		
Tide Carpenters				
Seven Carpenters six tide a piece		21s		6
21 Engine labourers 6 tides at 10s 6d per tide	6 tides	39s		6
Two labourers 6 tides a piece		6s		6
The shootsman his tide		6s		12
Watching the boats		3s 6d		
Labourers				
John Whitewell	/	7s		
Wiliam Dewberry	/	7s		
Bricklayers				
John Braithwaite	5 days	10s	24	
Robert Permman	6 days	12s	24	
Jon Preston	6 days	10s	20	
Robert Turker	6 days	9s6d	19	

¹² LMA CLA/007/FN/03/19

Image 8.4. Bridge House Accounts 1661.



Source: LMA CLA/007/FN/03/19

A regular number of days was by no means guaranteed for all men. In August 1669 masons who were only paid by the tide received the rate of 6d. per tide., while four men in the Land Carpenter's team were paid 18d. a day, one earned 20d. and the foreman received 12s. for the week.

In the 1680s rates were higher, and the contracting mason who held the position at a salary of £4 4s per annum was Thomas Wise, also a contractor at St. Paul's. William Gray, a contractor on the city churches was the Land Carpenter. It is these men who were paid the amounts shown.¹³ Their own pay was accounted for at 11s. per week, giving a total including their salary of 12s 8d per week.

Table 8.2. William Gray's Land Carpenter's bill for 3rd October 1685.

Name	days	pay	Implied day rate
William Gray		11s.	
Jord Bower		12s.	
John Daxwell	6 days	10s.	20d.
Tho. LoveJoy	6 days	09s.	18d.
Geo. Collman	6 days	09s.	18d.
Robert Price	6 days	09s.	18d.
J Robinson	6 days	09s.	18d.
T Sanders & his mate	6 days	£1,04s.	48d. (pair)
T Lister & his mate	6 days	£1,04s.	48d. (pair)
Nicholas Collman	6 days	12s.	24d.
Wm Tubb	6 days	09s.	18d.
Wm Noble	6 days	15s.	30d.
Wm Butler	4 days	10s.	30d.
John Cosborne	6 days	12s.	24d.
For 5 men at noon times the drawbridge		05s.	
For taking up one hundred of boats		01s.	
Paid the watermen for bringing boats		01s.	

¹³ Knoop and Jones, *The London Mason in the Seventeenth Century* ... p. 39.

Source:LMA CLA/007/FN/03/24

This was less than some of the craftsmen they were employing were paid, so it is not implausible that they were taking a mark-up on their men's wages. The bills show some variation in rates in the team, and mean for everyone earning over 18d. a day without any mark-up accounted for, of 25.3d per day. (See Table 8.2).

In the week of October 3rd 1685 Thomas Wise collected 11s. for himself, and also charged himself out for 3 tides. Bearing in mind he was having some problems with the supply of Portland Stone to St. Paul's in roughly the same period, this is impressive dedication. Fifteen men were listed in his bill which is for "Masons at land and tide". Ten masons earned over 9s. per week. Two earned 32d. per day, five earned 30d. per day, one 24d. per day and two 20d., giving a mean of 27.8d. They are detailed in Table 8.3.

Table 8.3. Thomas Wise, Mason's bill for 3rd October 1685.

Name	days		tides		Implied combined day rate
Thos Wise		11s.	7 tides	03s. 06d.	(29d.)
Tho Jordan	6 days	09s.			18d.
W Atterbury	6 days	11s.	7 tides	03s. 06d.	29d.
Sam Pearman	6 days	09s.	7 tides	03s. 06d.	25d.
William Howe	6 days	16s.			32d.
William Ruddal	6 days	15s.			30d.
Richard London	5.5 days	13s. 09d.			30d.
John Dobbin	5 days	12s. 06d.			30d.
Daniel Webb	3 days	07s. 06d			30d.
Daniel Honest	6 days	15s.			30d.
Joseph Cattes	6 days	15s.			30d
John Slatter	6 days	12s.			24d.
Thomas Allen	7 tides	2s. 11d. and for great diligence 06d			(6 – 7d)
(total)		£9 06s 02d			

Source: LMA CLA/007/FN/03/24

In this week William Atterbury was also paid 1s. for “extraordinary” work. Including tides, the highest paid man was William Howe, who was charged out at 12d. more than Boulton’s series for the week. It should be noted that Pearman and Jordan were apprentices.

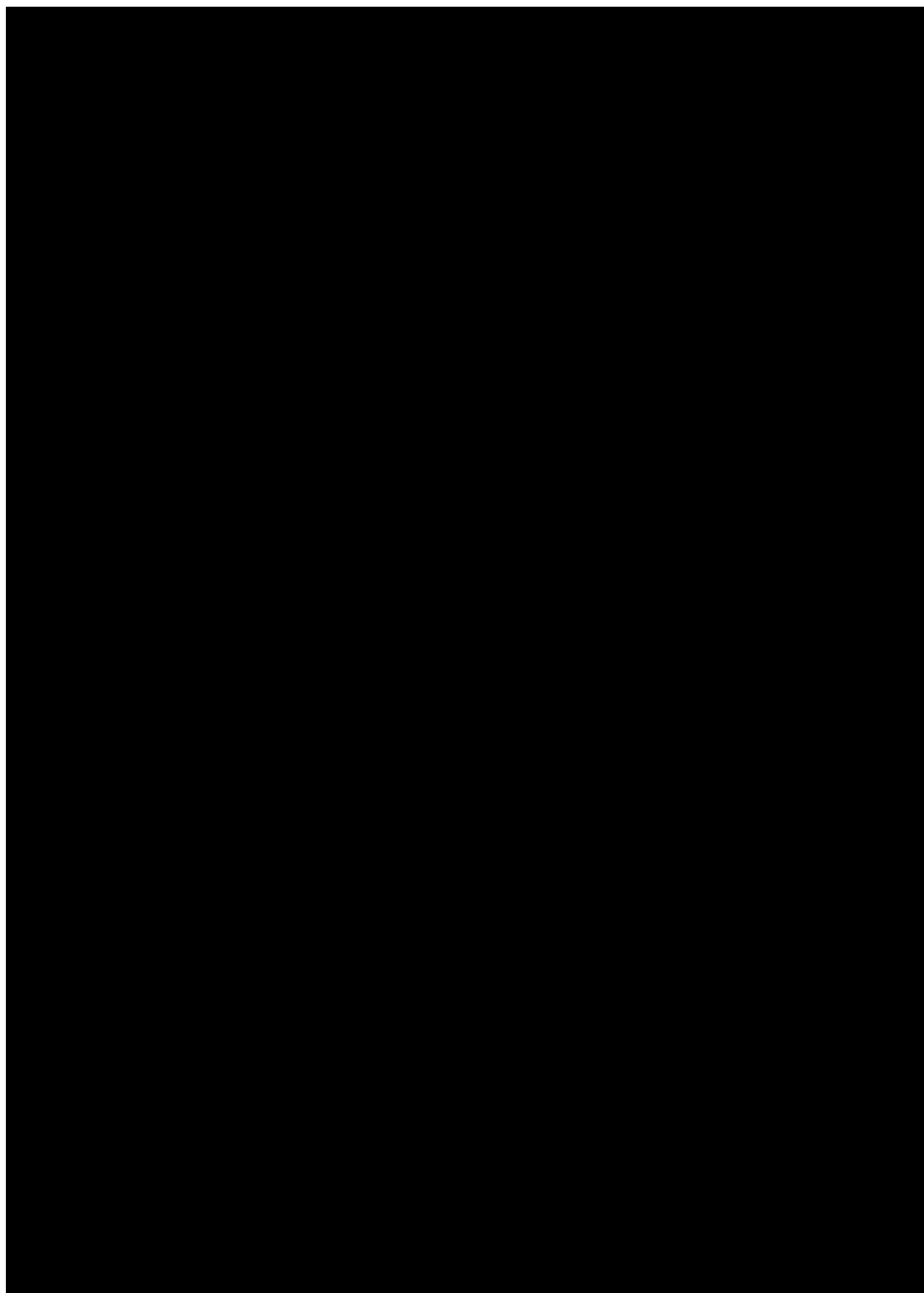
But, this level of pay for the week of October 3rd represents the maximum earnings for the masons’ team at Bridge House in that period. In the week of Saturday 12th November, the total bill was only £5 01s of which £1 05s and 3d. was for materials, and Wise, Jordan, Parman and Allen worked only 3 tides. Only 7 men were charged as on site: Wise, Atterbury, Jordan, Pearman, Dobbin, Cattes, and Allen. The same team were found through November and January and only Wise, the apprentices and Allen were working tides. The implication is that the work for Ruddell, Dobbin, Howe, Webb, Honest and London was casual, and they would be looking for work elsewhere, or perhaps on another site for Wise. In the week of 12th November including tides median pay for the week was 13s 4d. or 26.8d. a day.

In the week Saturday 16th February 1688 two masons were charged out at 30d. a day for 6 days, (of which one was Atterbury), one apprentice (Pearman) was charged out, and Allen had been replaced by Tho. Veasey at 5d. a tide for six tides. Gray’s Land Carpenters bill charged out Jeremy Bower (who was to assume the tide carpenters contract later) at 24d. day, one man at 20d. a day and four at 18d. a day. The tide carpenters bill included an extra 3s. to Bower, but also eight men, who are not named anywhere else for 6 tides at 6d. a tide. The pattern continues throughout 1688 – 1690, with frequent weeks where only 3 tides were worked by these eight, or others. Presumably these men had some sort of by-employment that allowed them to earn other sources of income around the tide times at the Bridge. If they worked regularly at the Bridge their maximum earnings would have been 6s. a week, equivalent of 12d. per day, and their average likely earnings (assuming 6 tides a week) no more than 3s. a week or 6d. a day.

Some of the rates are higher than those found in Kempster’s records of direct payments to masons doing much more skilled work at St. Paul’s in 1700 and 1706-8. Bearing in mind it is Wise and Gray billing them, these are likely to have been charge out rates, not real payments. Again, it is useful to look more closely at the income this would have left the contractor,

William Gray.¹⁴ If he was not taking mark up on these amounts at all, but making his living from a wage of 11s a week and his £4 per annum then his income would have been under £33 per annum, or 26d per day, which, again, would have been less than some of his employees. Of course Gray had income from business elsewhere, and profit from adding a mark-up to materials, but this may not have precluded him from taking up labour at a lower cost to that charged out and pocketing the mark up. The implication of the evidence from St. Paul's is that was normal practice, and that the skill was available at this level. Overall, evidence from Bridge House in the late seventeenth century is, as Boulton intimated, of a different level of wage rates for building craftsmen than those collected by others.

¹⁴ Gray is in the remittance books for the 1680s receiving £4 per annum salary. LMA CLA/007/FN/05/006

Image 8.5. Bridge House Accounts, October 1685

Source: LMA CLA/007/FN/03/24

8.3. Bridge House, 1706 – 1757.

For the 1710s, 1720s and 1730s I have consulted the contractor's bills rather than the audited accounts, as they are available, and more detailed.¹⁵ Pictures of example bills from this period are above in 7.1.a- c.

Tide carpenters: As can be seen from the details above, tide work was a small part of work at the Bridge in the late seventeenth century. At that time, only water or tide carpenters were paid by tides. However, in later years the amount of tide work grew rapidly, particularly through the years 1720 – 1757. Image 7.3.b and c shows a Sparruck bill from 1735 which differs from the 1722 bill (71.a above) in the listing of “4 tidesmen”. Tidesmen were carpenters, who worked by the tide on the Bridge (7.3.c).¹⁶ Until the Bridge was redeveloped in the 1740s and 1760s the wooden starlings needed constant attention. The numbers of men contracted by the tide were in this period were far larger than those by the day.

Tide work was limited by the season and the tidal clock. The Port of London authority helpfully give tidal times and heights for the London Bridge area for days throughout the year.¹⁷ Observing their tables it can be seen that it is virtually impossible to work two low or two high tides in one twelve-hour working day. The maximum tides that could be worked within a working day of 6am to 6pm in one week is seven, of course more tides could be managed if a 15 to 18-hour day is considered with a break between. The maximum number of tides worked per week observed in the Bridge House books is twelve, which implies an 18 hour day in some cases, perhaps with a break in the middle of the day. It is also possible that more tides were available if one worked tides at both sides of the bridge (which given the levels of the water might have been a possibility).

The maximum number of tides per week that any one individual was billed for was twelve throughout the period under discussion (which is a nigh on impossible feat if sleep is to be taken). The lowest was four. As will be seen, a modal average in the winter months was six tides, and in the summer eleven or twelve. In this period the Tide Carpenter also took over

¹⁵ All bills used in this analysis are at London Metropolitan archive, COL/CC/BHC/10/003 – 6. As sundry papers, they are stored loose, and they do not have page numbers, and as can be seen from the photographs they are fragile. The referencing throughout shall be to the date of the bill and the file it is contained in.

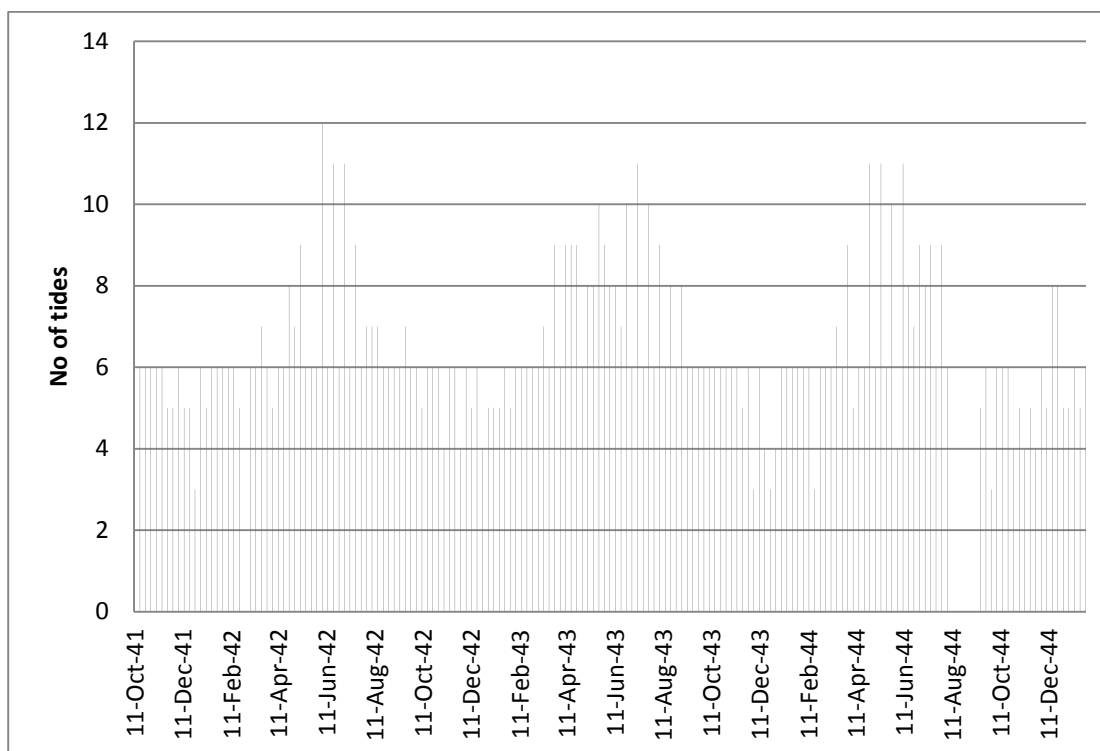
¹⁶ They are listed in call books recording their attendance only as “carpenters”

¹⁷ <http://www.pla.co.uk/assets/towerq22015.pdf> give tables for London Bridge Pier for 2015.

responsibility for the ‘gin men, who worked in large teams of nine or ten men tending the water wheels under London Bridge.¹⁸ They worked tides only also, not days.

So for tidesmen, who were carpenters, and ‘gin men who may have been labourers or semi-skilled, pay was solely determined by the number of tides which could be worked. Figure 7.3.a shows that that was a seasonally driven phenomenon.

Figure 8.1. No of tides worked, Bridge House, Tide carpenters, 1745 -1748.



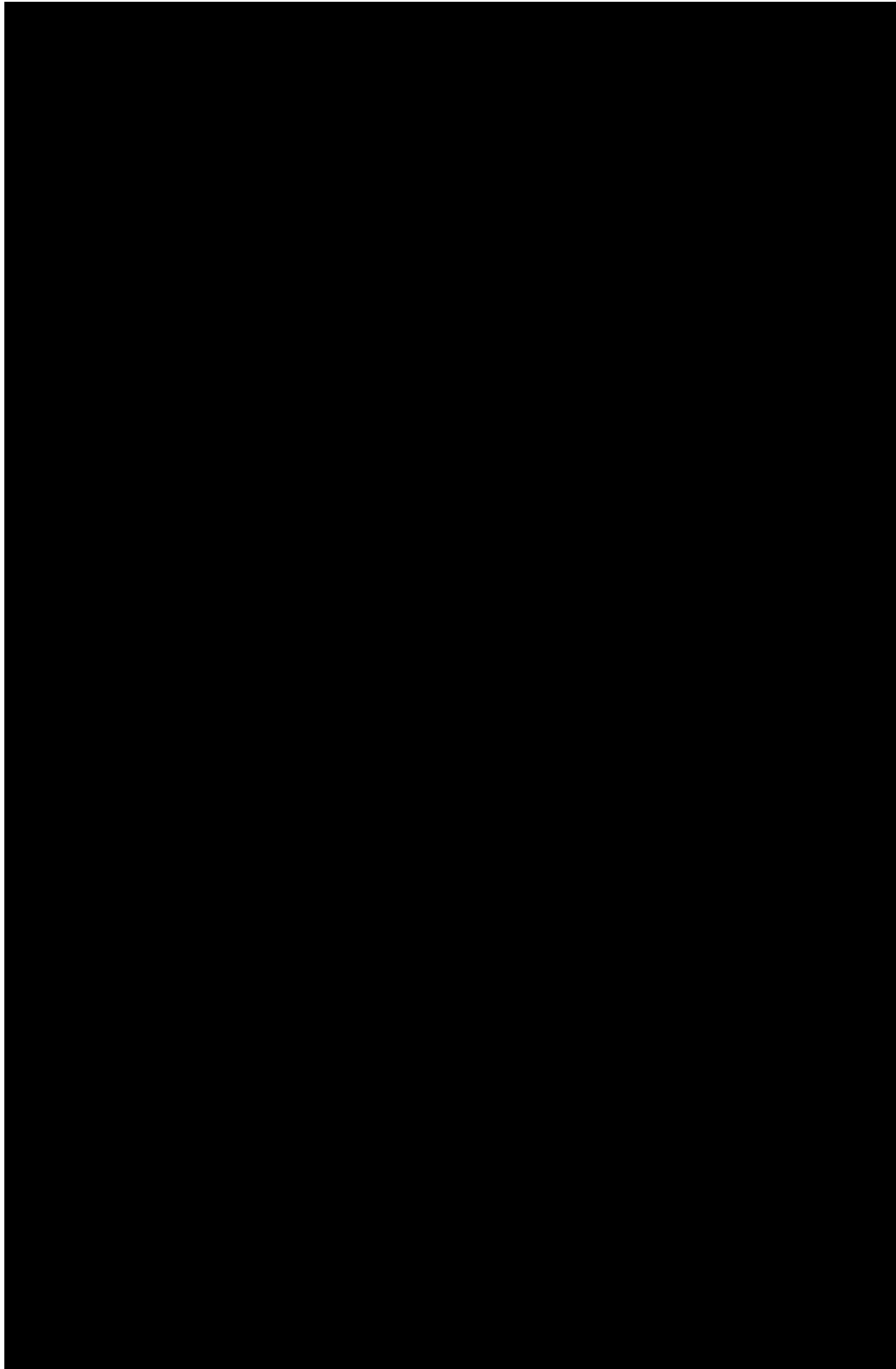
Source:COL/CC/BHC/10/003 – 6.

If tidesmen were paid solely by the tide then the number of tides alone dictated their pay. In 1722 there were between 363 tides and 399 tides worked, by individuals. (Not everyone worked the same number of tides each week). In many weeks the contractor and his apprentices accounted for more tides than the tidesmen. Not all tidesmen worked the same number of tides each week (the tides per person are broken out on the bills as per 7.3.c). This means that the average number of tides worked per week for the year was between 6.9

¹⁸ ‘gin men, or ‘Engine men’, I use the abbreviation as it is given in the books.

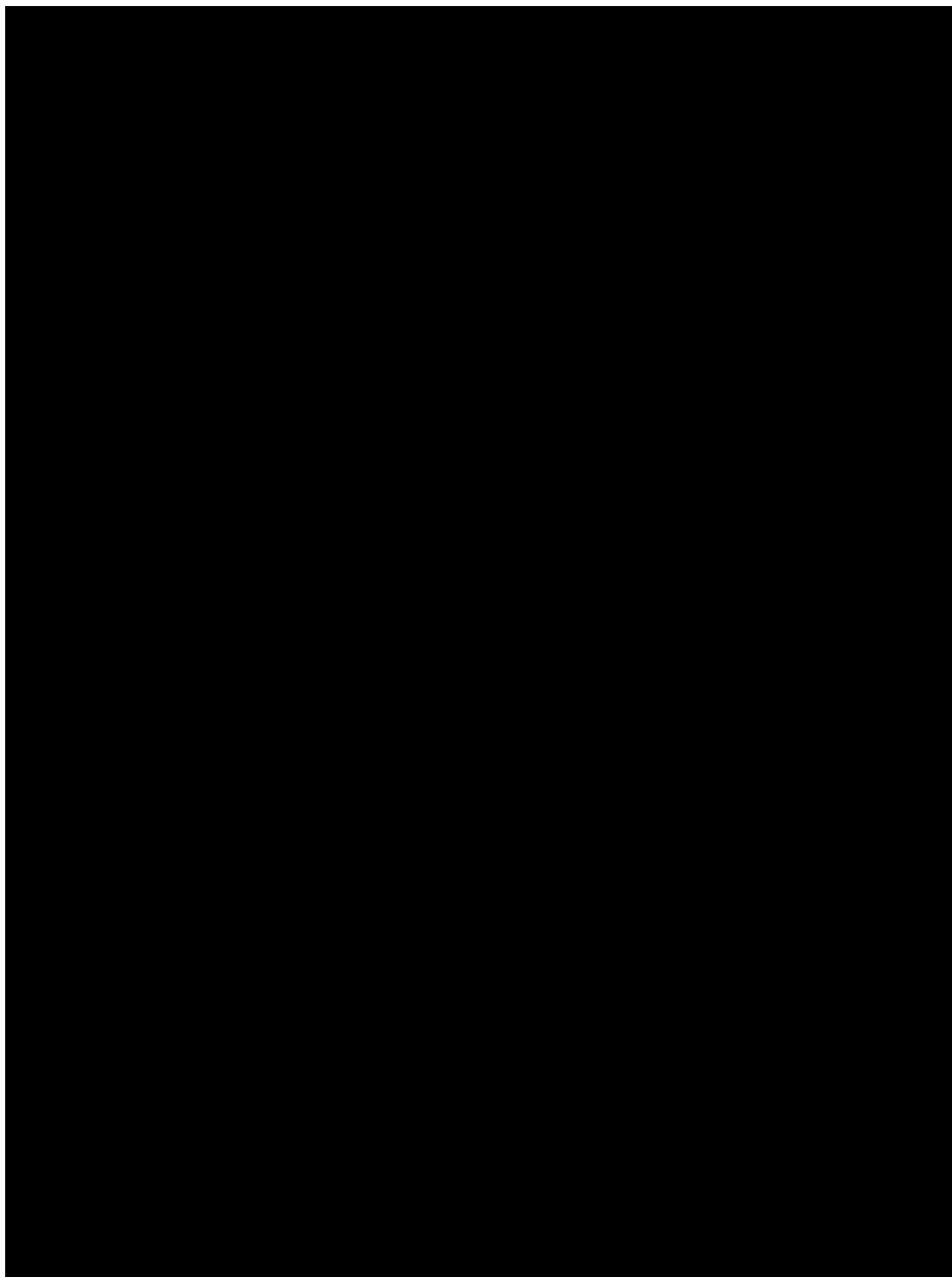
and 7.6. Assuming a tidesmen, carpenter, worked 7 tides a week on average their average pay per week would have been 126d. or 10s. 6d. an implied day rate of 21d.

Image 8.6. Tide Carpenter's bill, December 1735



Source:COL/CC/BHC/10/003 – 6.

Image 8.7. Tide Carpenter's bill, August 1735



Source:COL/CC/BHC/10/003 – 6.

Table 8.4 Sparruck's bills 1722, 1736, implied day rates.

June 30th 1722	# Days	Rate in d.	# Tides	Rate in d.	Extra Worke	Total pay	Implied day rate
Barth Sparruck II	6	240	12	72	12	324	54
Barth Sparruck I	6	120	12	144		264	44
Roose	6	108	12	72		180	30
Smart	6	108	12	72		180	30
Samuel Sparruck			12	216		216	36
Hon. Roberforce			12	216		216	36
Earle			12	108		108	18
Robins			12	108		108	18
One Labourer			8	72		72	12
Dec. 15th 1722							
Barth Sparruck II	6	240	7	42		282	47
Barth Sparruck I	6	120	7	84		204	34
Roose	6	108	7	42		150	25
Smart	6	108	7	42		150	25
Samuel Sparruck			6	108		108	18
Hon. Roberforce			6	108		108	18
Earle			4	36		36	6
Robins			6	54		54	9
One Labourer						0	0
Gin (18 men)		6	54		54	9	
2 men 6 tides each			6	54		54	9
Feb. 19th 1736							I
Barth Sparruck II	6	240	10	60		300	50
Jo Nixon	6	120	10	120		240	40
Apprentice 1	6	108	10	60		168	28
Apprentice 2	6	108	10	60		168	28
4 tidesmen			10	180		180	30
2 labourers			10	90		90	15
2 tidesmen	3	96	10	180		276	46
One Labourer			8	72		72	12
Jan. 22nd 1736							
Barth Sparruck II	6	240	10	60		300	50
Jo Nixon	6	120	7	84		204	34
Apprentice 1	6	108	7	42		150	25
Apprentice 2	6	108	7	42		150	25
4 tidesmen			6	108		108	18
2 labourers			6	54		54	9
2 tidesmen	3	96	6	108		204	34

In 1736 two tidesmen were charged out for day rates, but never for more than three days a week; their day rate was 32d. Four tidesmen worked just tides. Using the same Figures, and assuming an average of 7 tides a week and the three days' pay, the two tidesmen's pay would have been 37d. per day.

As Table 8.4 implies shows, in a week where there were twelve tides worked the pay of the tidesmen carpenters and labourers at the Bridge looked close to the figures from Boulton or Schwarz, at 18s. a week or 36d a day. But in December, when just six or seven tides were worked, then pay would have been much lower, 18d. to 21d. per day, yet due to the amount of daylight extra work could not be taken up.

For labourers, just one day of day work was billed for, at 24d. in 1722 (November 10th 1722). Assuming Earle and Robins were labourers (as they were paid the same rate as the 'labourer'), their pay for an average week of 7 tides would have 63d. or 5s. 3d. an implied day rate of 10.5 d per day. Assuming the 'gin men should be treated as labourers (as they were also paid the same rates) the same holds.

These rates of pay persisted until the 1740s, when the rates for labourers increased to 12d. or one shilling the tide. At an average of 7 tides a week this would have given them a day rate equivalent of 14d. per day (at most). Spurrock's organisation and team size work also got bigger. In 1745 his team consisted of himself, Nixon, two apprentices, ten tidesmen, twenty 'gin men, and the odd casually hired carpenter or labourer. The tidesmen were by now mostly receiving days of work per week. The rates for work remained exactly as they had in 1722, but with day pay as well as tide pay the tide carpenters did better. Based on a modal working week of 6 days, and various mean tide per week figures, the pay charged to the Bridge for those earning day rates and working the tides on London Bridge would have been 16s. 2d. approx in 1745-48, or 34d. per day.

In 1757 Spurrock's involvement in Bridge House ceased. In the books he is succeeded by his chief carpenter since 1736, Joseph Nixon. Nixon's bills and his team size were approximately half of Sparruck's. The contract was taken over by Peter Schuckford in the 1760s, Whilst Spurrock's bills from the 1740s and early 1750s were approximately £1000 per annum, Schuckford's in the mid-1770s are for less than £500 annually.¹⁹ After work to improve the safety of the piers and starlings of the Bridge was finished in 1762, there was

¹⁹ LMA CLA/07/FN/03/027

less work for tide carpenters. Schuckford's bills from the 1770s and 80s show a much reduced team of only two or three men. The sums reduce substantially until 1788 when the books were no longer filled in.²⁰

Table 8.5. Charge out Rates Bridge House 1685 to 1788.

Charge out rates Bridge House	1685 - 1718		1718 - 1745		1745- 1788	
	per day	per tide	per day	per tide	per day	per tide
Named Masons	32	6	32	6	32	
Masons by day (casual)	30		30			
Labourers	24	9	24	9	24	
Land carpenters	32	9	32	9	32	
Named carpenters	36		36		36	
Carpenters Labour	24	6	24	9	24	12
Tide Carpenters	20	6	20	6	20	6
Tide Labourers	18	6	18	6		12
Tidesmen		18		18		18
'Gin men		9		9		12
Carpenters by day(casual)	32		32		32	
Sawyers (pair)	48		48		48	

Land Carpenters 1720 – 1785: Thomas Wilmore was the first of several generations of Land carpenters at The Bridge House throughout the eighteenth century. In the 1720s Wilmore was receiving a salary of £4 per annum, and others were charged out as set out in Table 8.6.

²⁰ LMA CLA/07/FN/03/28

Table 8.6. Land Carpenter's rates, 1720

	Per day	Per tide / time
Contractor	32d	
Foreman	36d – 32d	
Named (apprentice)	18d*	
Named (carpenter)	36d	
Named (Sawyer) & mate	48	
Men	30d	
Sick Pay	14d	
Piece / tide rate		9d

Source: LMA/COL/CC/BHC/10/003 *Based on the fact that tide carpenters' apprentices were paid the same and they appear in the same place in the bill

In the 1720s the land carpenters consisted of a team of seven to fourteen men, varying throughout the year. The bills for 1720s show men paid by both day and tide. Three carpenters were usually paid at the rate of 6d. a tide each, and a man called Richard Jason 9d. per tide. The average number of tides per week for the carpenters was 7.8 and for Richard Jason 5.2. Jason's average weekly pay was 55d., or 4s. 7d. an equivalent day rate over 6 days would have been less than 10d. The three carpenters, assuming they were paid equally, were paid just 4s. per week on average. In 20 of the 52 weeks there are also men listed as being charged out at 3s. (36d.) a day. In a week where they were present (November 23rd) mean pay for 14 men (excluding the contractor and the two sawyers' mates) was 12s. 7d. for the week, or an equivalent day rate of 25d. William Wilmore (presumably the son of Thomas) was paid 1s. 'over work' (presumably overtime of some description) on several weeks taking his charge out pay to 17s. a week.

In 1730 the team consisted of Thomas Wilmor, land carpenter (16s. for 6 days), William Wilmor (16s. for 6 days), Thomas Wilmor Junior (9s. for 6 days) James Ward (9s. for 6 days), (both these probably in apprentice roles,) 3 carpenters at 18d. a tide, and man named Ellice Hedges at 9d. a tide. At an average of 7 tides a week the carpenters would have had an equivalent day rates of 21d., Hedges an equivalent of 10.5d.

The mean pay for the week ending September 12th 1730 was 17d. per day per man over 6 days, or 8s. 7d. for the week. If we assume Hedges and George Horne's mate were labourers not craftsmen and remove them from the calculations the median earnings would be 24.4d. per day.²¹ Allen's rate from the 1737 for craftsmen is 36d. and for labourers 22 - 24d. Hedges pay was less than half the labourers' rate.

Wilmor's bills by the late 1740s were a different matter, however. The amounts of their bills and the number of men listed began to decline. Although the Wilmor family or firm are on the books throughout the rest of the eighteenth-century, by the 1770s, after the changes to the Bridge the team consisted of just one or two men carrying out maintenance work, still at the rate charged out of 16s. a week or 32d. per day each.

Masons 1718 to 1780s: The contracting mason at Bridge House until 1725 was still Thomas Wise. Wise's bills from 1718 survive. Pay was by tide and by day. The rates charged out are in Table 8.7.

Table 8.7. Thomas Wise's charge out rates, Bridge House, 1718.

	Day	Tide
Tho Wise (contractor)	11s for 6 days	6d
Mason	32d	-
Apprentice	18d	6d
John Little	14d	5d
Man (John Harvey)	24 – 28d	-

Weekly bills were in the region of £4 to £5. The only people who received tide pay were the contractor, John Little, and the apprentices.

After 1725 the contract passed to William Lesow. Forty-two of Lesow's bills for 1735 are in the records, and they show three named masons paid 16s. a week for a six day week, a day rate of 32d. before mark-up is discounted. Labourers were charged at 2s. per day. A man named Edward Clark was paid 7s. a week for 6 days, and tides at 5d. a tide. 394 tides were

²¹ See records for 1730s at CLA/007/FN/04/19, and CLA/007/FN/05/061

worked in the extant bills by him taking his median day pay to 20.25d. Not every week was a six-day week, so the average pay charged out per week for masons was 15s. 4d.

After the 1740s the contracting mason was Joseph Kinleside. In this period, the bills did not include tides, and the team was smaller in size. The charge out rate remained 16s. a week for a mason and 12s. a week for the man “assisting us”. This rate persisted to the 1780s. The mason contractor Kinleside himself charged 24d. per day in 1749 – 57, and the modal weekly bills were £2 16s. for “repair work”.²² The men are described as working “cutting out old ashlar at the Bridge and working of new ditto in the yard for the same” in repetition.

8.4. Bridge House Pay in the long run.

The pay records of Bridge house are enormously complex, covering as they do, many trades, many firms, many types of work, and levels of skill over the very long run. Two things are striking above all else. Firstly, the persistence of very low pay for people who regularly worked at the Bridge. Labourers pay below an equivalent shilling a day feature mid-century. Similarly, carpenters paid by tide earning the equivalent of what we have thought to be labourers pay until now. A craftsmen’s charge out day rate of 32d. a day persisted well into the 1780s.

Whilst the charge out rates for craftsmen on day rates roughly mirrors the rates of existing series there are many indicators that these were not the rates men received, and that the contractors took a mark-up of some description. The records are from the 1660s, when it is possible that the rates recorded were direct are in the region of a 30 per cent and more; lower than the Boulton / Allen series.

The second striking element of Bridge House pay is the combination of tide rates and day rates which made up pay. Essentially there was a two-tier system of status and pay. The numbers of craftsmen paid day rates was very low, tide rates cumulatively did not return the same as day rates at the charge out rates in the Boulton, Schwarz or Allen series. The number of people regularly employed for a six-day week at Bridge House was small - less

²² CLA/007/FN/04/02

than ten per cent on Spurrock's bills throughout 1720 – 1757. Tide earners, who were the greater number, earned less.

In the long run, there seems to have been a heyday for contractors and labour with high numbers of tides and work in the 1730s and 40s. During these decades there were many more men employed than before or after, but most of them worked by the tide, and were not receiving a fixed number of days per week. Rates increased for tides in the 1730s, but not for days. In fact, three generations of Wilmors, acting as lead contractors as land carpenters, worked for the same day rates (in 1720 as in 1780). After the major works to the Bridge were completed in the 1740s and 1750s it seems that maintenance work largely dried up.²³

Much more work needs to be done to understand the workings of Bridge House and employment there. This chapter has only just begun to show the wealth of sources and data available to us there.

²³ Home, *Old London Bridge*., chapter 10.

Chapter 9. Working hours and number of days worked.

In addition to giving us an insight into wage levels, the accounts and records of construction projects offer us some insights into the hours and days of work that London's building workforce might experience over a year. In this chapter, I use this evidence to evaluate the potential amount of work that a craftsman or labourer might hope to obtain. The number of days worked in a year is relevant to studies of early modern standards of living, but also relevant to theories about an 'industrious revolution' and how an increase in labour inputs per head in the long eighteenth century contributed to economic growth.¹

The most substantive contribution to this subject, and virtually the only data for London, has been made by Hans Joachim Voth, who analysed the depositions of those giving evidence at the Old Bailey to show that working days increased in London between 1760 and 1800. Voth calculated that in the 1750s there were 208 working days of 11 hours a day on average, which rose in 1800, to 306 days a year of 11 hours in 1800. Much of the difference Voth explained through the fact that Mondays were not worked by many in the mid eighteenth century, but were by 1800.² This chapter will use some of the evidence from sites gathered for this study to describe the practices of working hours and days and to attempt to examine whether construction workers showed this shift in working hours discovered by Voth.

In order to understand what a day's wage means we also need to know what the length of the working day was. On extraordinary and ordinary sites, the working day seems to have lasted for twelve hours with a break. The call bell at St. Paul's reputedly was rung at 6 am, 1pm and 6pm.³ Winter times are not differentiated in any of the records. With a break for men to eat in the middle of the day, this implies a working day of eleven hours.⁴ The Middle Temple's records from June 1722 have a bill from Edward Stanton, mason, which details

¹ Jan de Vries, *The Industrious Revolution : Consumer Behavior and the Household Economy, 1650 to the Present* (Cambridge ; New York: Cambridge University Press, 2008). R. Allen and J. L. Weisdorf, "Was There an Industrious Revolution before the Industrial Revolution? An Empirical Exercise for England, 1300-1830 " *Economic History Review* 64, no. no. 3 (2011); Broadberry et al., *British Economic Growth 1270 -1870*.pp263-5.Hans-Joachim Voth, "The Longest Years: New Estimates of Labour Input in England, 1760 -1830," *The Journal of Economic History* 61, no. 4 (2001); Hans-Joachim Voth, "Time and Work in Eighteenth-Century London," *The Journal of Economic History* 58, no. 1 (1998).

² Voth, "Time and Work in Eighteenth-Century London."pp.35-36

³ Lang, *Rebuilding St.Paul's after the Great Fire of London* , p.81. This differs from the system in the Dutch Republic where 'shoften' were punctuated by three breaks throughout the day. See de Vries, "An Employer's Guide to Wages and Working Conditions in the Netherlands, 1450-1850."pp.47-64

⁴ Voth actually notes eating times of 1.5 hours, Voth, "Time and Work in Eighteenth-Century London." note 31, but since 3 hours is ¼ of a day in accounts more than 1 hrs break seems unlikely, therefore I accept Voth's figure of 11hrs per day.

half a day's work for a mason and three hours for a labourer costing a total of 2s.⁵ If masons were charged out at 3s. a day and labourers at 2s. a day (as was the rate in the other accompanying lines of the bill), then this would imply the amount for the labourer's three hours was just 6d., and it follows that three hours was a quarter of a day and 12 hours was a full day. Given the St. Paul's evidence it seems a plausible working assumption that of those 12 hours 11 were worked.

What of the number of days worked? Throughout the period under study, construction normally continued six days a week on all public London construction sites.⁶ For 'ordinary' work, records at Bridge House are astonishing in their consistency of a six-day working week, with the exception of the week in which the 25th December fell, and some weeks in the spring, I assume this is due to Easter.⁷ This means that up to 309 days could possibly be worked at the maximum in any one year.⁸ A similar pattern can be seen very clearly in the original call books for St. Paul's for day work.⁹ On 'extraordinary' sites, since 'day work' was not the most predominant form of contract, and the accounts and bills that show days rates at most institutions only give rates for it, not measured work or task work, extracting the number of days worked from these would possibly give us a low figure - unless day work was consistently used as the way of working. For St. Paul's carpenters that was apparently the case, so examining their working days might give us an accurate average days worked per month.¹⁰

Campbell found that the number of working days per month at St. Paul's was between 21 and 27 in 1686-8.¹¹ But that doesn't necessarily mean each man worked that number of days. Table 9.1. shows the number of average man days in a month for January to April, 1707 and 1709. This is calculated from the total number of days worked divided by the number of men in the call books. It shows that the average days worked in most months was about 20 days; this is below Campbell's estimate, even for the carpenters who were constantly employed on day rates. By way of comparison, taking the accounts for Whitehall

⁵ In folder ACCVOUBI MT.2/TUT, Middle Temple Archives.

⁶ See Wren Society, Volume 16 for a general discussion of the works, and LMA St. Paul's, MS25485 for more.

⁷ St. Paul's days worked are presumably affected by 'Saints' days – but due to the variability of the data, contractors not all recording days worked (as they were not on day work) this is difficult to fully estimate.

⁸ This is based on the year with the most days worked at Bridge House, which was 309 in 1735, 1721, 1732, 1747, and on 6 days per week over 52 weeks less Dec 25th and two other days.

⁹ LMA St. Paul's Ms 25471 - 85

¹⁰ Campbell, *Finances*, page 322 -325

¹¹ Campbell, *Finances*, page 325

from the Office of the King's Works for March 1660 the average number of days worked per man was only 17.85, the mode 22.¹²

Table 9.1. Average number of days worked per man St. Paul' Cathedral, Call books 1707.

Trade	January	February	March	April	Average
1707					
Bricklayers	18	20	22	20	20
Carpenters	20	19	19	21	19.75
Sawyers	22	20	12	18	18
Labourers	22	21	22	23	22
1709					
Joiners	25	20	22	20	21.75
Carpenters	20	19	19	21	19.75
Sawyers	17	22	12	0	12.75
Labourers	22	13	22	25	20.5
Total					

Source: St. Paul's call books LMA MS25574

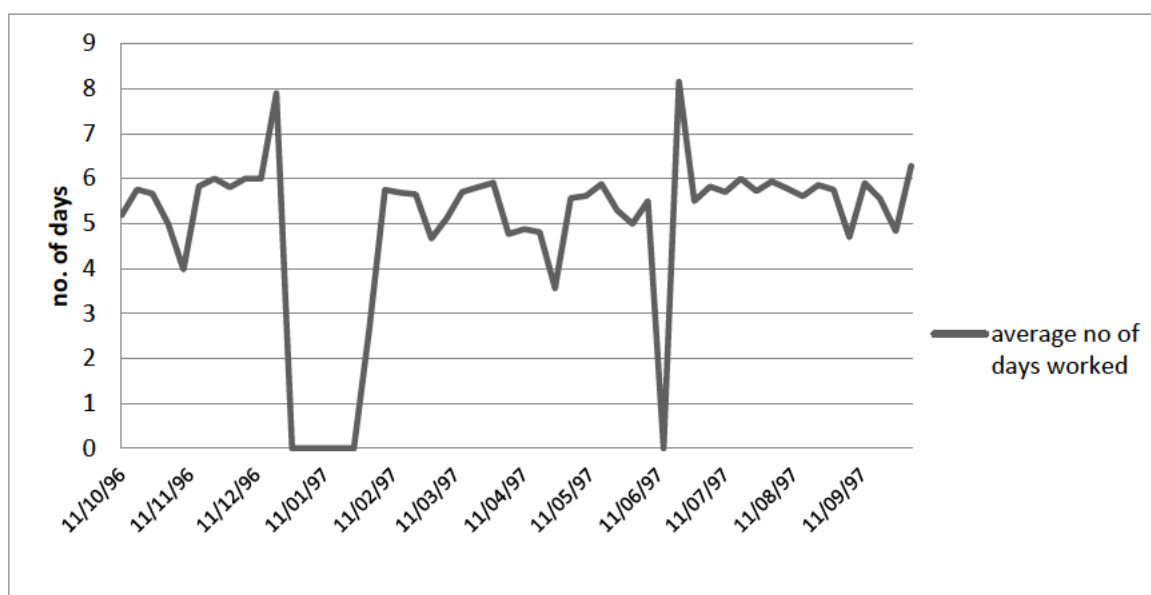
A possibly more insightful source are the William Kempster daybooks for St. Paul's contracts 1700-2 1705, and 1708.¹³ The books begin in the week ending the 12th October 1700. In the following 52 weeks Kempster had men on site at St. Paul's in 46 weeks.¹⁴ A total of 28 men are named in the book over that period. The highest number of men working in any one week was twenty-two (9th November) and the lowest six (1st March). The average number of days worked per man per week is shown below (Figure 9.2). Mostly the figures hover between five and six but it can be seen that there are some large variations in all seasons, with one big gap in January 1700/01 when there was no work carried out. (Numbers above 6 are for when the day book records merged two weeks together). If we look instead at how many men Kempster had in his team at any one time, we see greater variation over the long run, while in the short run the numbers on site generally changed

¹² n=67, std dev =7.78. An attempt to do this for other years was not possible due to lack of observations and duplication of persons between sites. This excludes more permanently employed labourers in trust and clerks of works who seemed to be paid all days of the month regularly.

¹³ Kempster's books are at TNA PRO C106/145.

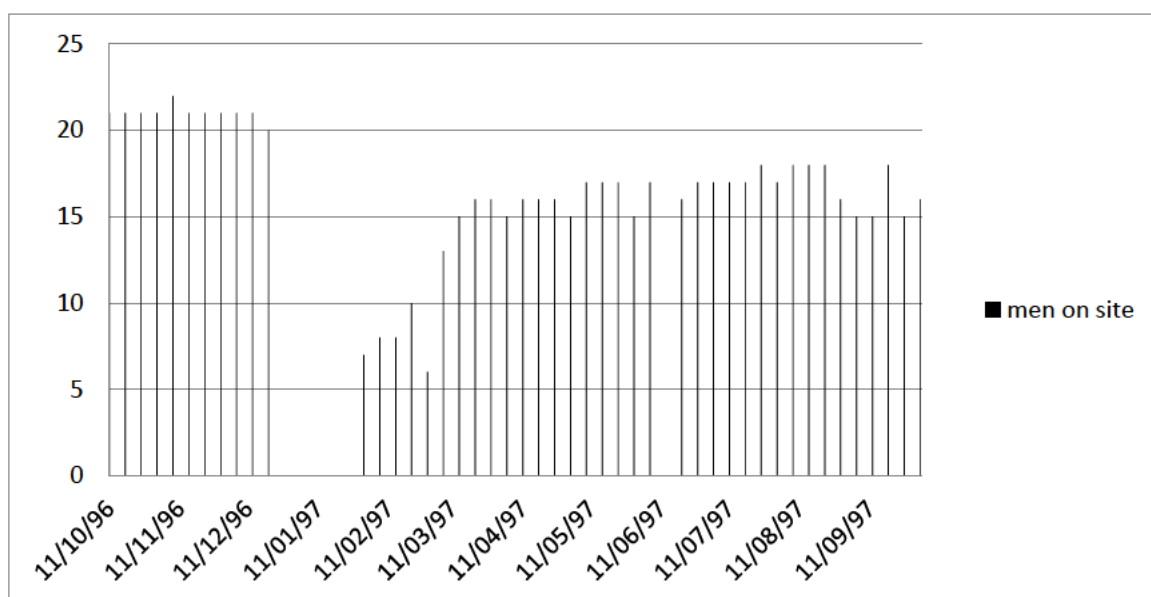
¹⁴ Ibid. Day book.

Figure 9.1. Average no of days worked per man per week, Kempster Team 1700-1.¹⁵



Source: TNA C106/145

Figure 9.2. Kempster Team numbers St. Paul's 1700-01.¹⁶

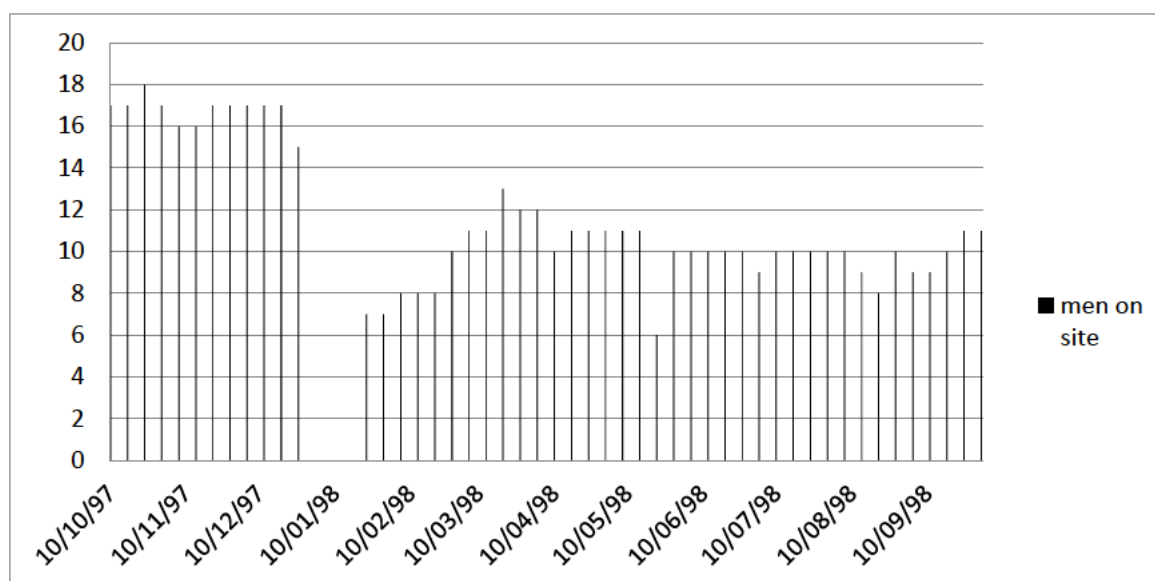


Source: TNA C106/145

¹⁵ Weeks where more than 6 days are shown occur because records were missed for a week, and more than 6 days per man logged the following week. I have not smoothed the data. Source: TNA PRO C106/145

¹⁶ Source: Ibid.

Figure 9.3. Kempster Team numbers St. Paul's 1701-02.

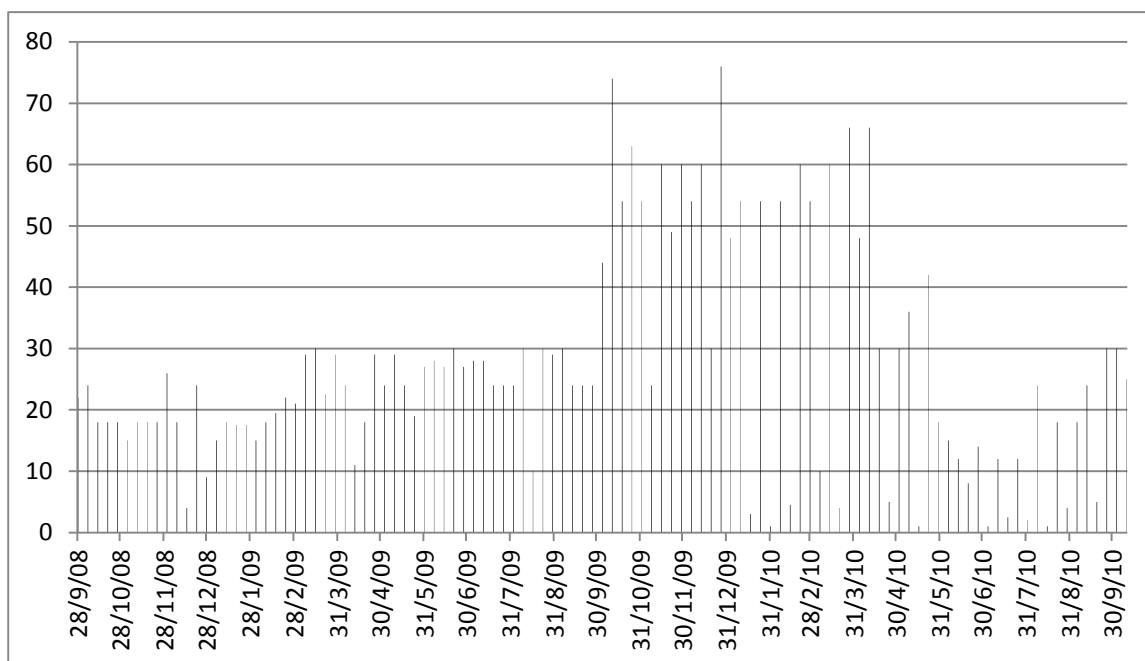


Source: TNA C106/145

relatively little from week to week. The number of men on site (Figure 9.2.) is higher in the autumn months than at any other time. In the following year (Figure 9.3.), there is a similar pattern, with a higher number of men onsite in the autumn than at any other time.

A similar exercise can be carried out for two years at the beginning of the Wren refurbishment of Westminster Abbey, for which there are records of labourer's days worked. However, the numbers were given but not the names.¹⁷ Figure 8.1.e shows the total number of labourers' man days charged for in Ralph Sims's 'money' bills, Westminster Abbey September 1712 to December 1714. There was a large variance in the amount of work available for the labourers. In 1713-14 the highest number of days of labourers' work deployed on the site, in total, in a week was 74, and the lowest 1. This gives a mean of 27 days, but as the data show this was distributed in a stochastic manner, and did not guarantee men a full month's work throughout. (It should be noted that the labourers referred to only include those hired and billed for by Ralph Sims, other contractors may have had other men on site who were not accounted for in day bills and so their attendance will not have been recorded.)

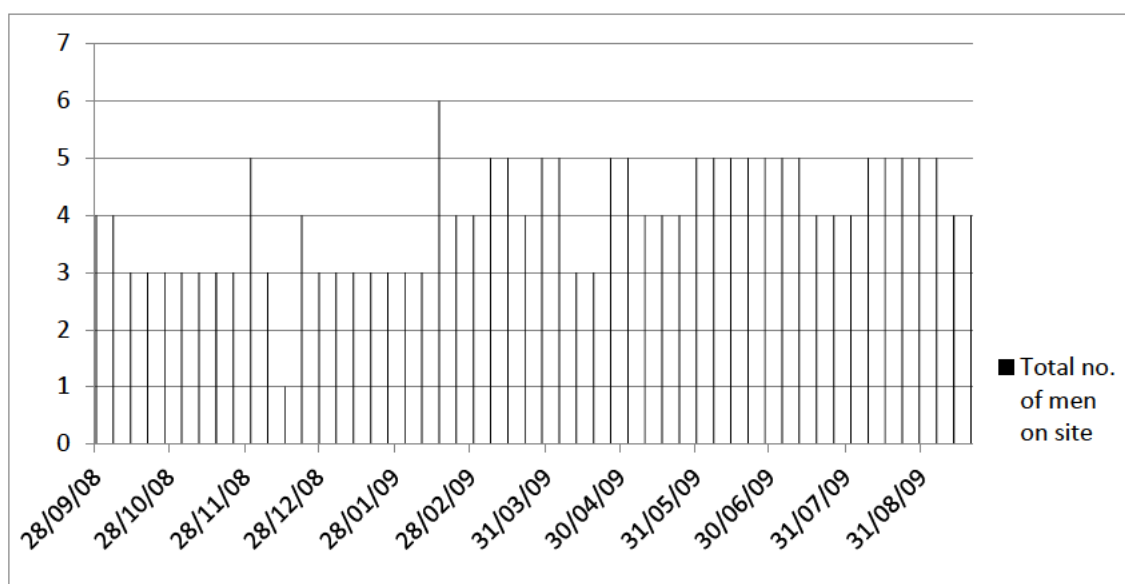
¹⁷ Westminster Abbey Muniments, Ralph Sims Bills, no.34513.

Figure 9.4. Total number of labourer days, Westminster Abbey, 1712-14.

Source, author's transcription of Westminster Abbey Muniments, Ralph Sims's Bills, no.34513.

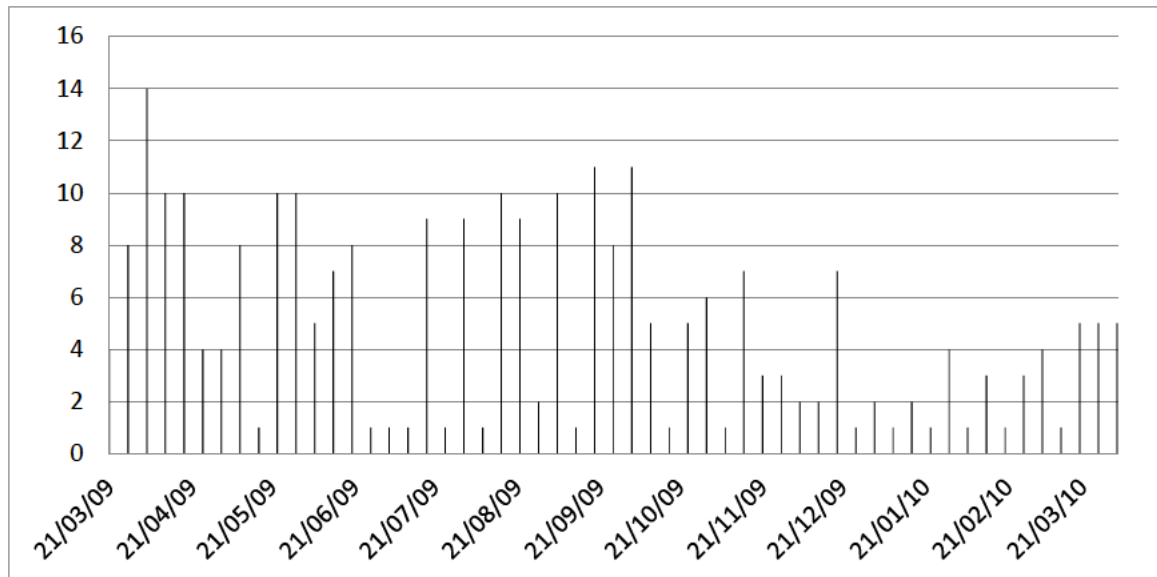
The number of labourers employed on the site varied substantially from week to week. Within each week, not all labourers were employed for a full six days of work, or for all the days worked on site. For 47 of the 100 weeks recorded there are not 6 full days for all workers. For instance, on the 29th September 1712, 3 men at 6 days and 1 man at 4 days were recorded. In December 1st to 6th of the same year 3 men worked 6 days and 2 men worked 4. January 12th to 17th 2 men worked six days and one man worked 5 and a half. This is a recurrent but not predictable phenomenon. Because there are no names recorded we can't see who, if anyone, was prioritised for work and who was not. But the unpredictability of work is illustrated as follows; in 1712 to 13 the average number of men on site was 4 per week, but the mode was 5. There was only 6 weeks in the year where 5 men had 6 whole days' work, and nine weeks where 4 men had 6 whole days' work each. Thus in less than a third of the year was the average number of men employed for the full six days of the working week. (Figures 9.5. and 9.6.).

Figure 9.5. Total men at site (Labourers) Westminster Abbey 1712 -13.



Source, author's transcription of Westminster Abbey Muniments, Ralph Sims's Bills, no.34513.

Figure 9.6. Total men at site (Labourers), per week Westminster Abbey 1713 -14.



Source, author's transcription of Westminster Abbey Muniments, Ralph Sims's Bills, no.34513.

In 1713-14 the variance in days worked was much higher. The average number of men on site was almost 5 but the mode was only 1, and the highest number in a week is 14: 4 men had 6 whole days' work in 31 weeks. The average number of days worked per man was 5.08 in Table 9.2.¹⁸

Did this change throughout the seasons? Campbell was of the opinion that masons would have worked fewer days overall per annum because they could not work the winter months due to the effect of cold and water on mortar and so on.¹⁹ However, evidence of winter working is one of the features of the account books. Winter working is apparent at all sites and in all institutional books. The fragmentary evidence should not be taken as wholly representative of the weight of work between summer and winter, because there were factors just as influential as the weather which may have dictated at which times work was carried out. The availability of materials, the flow or release of finance, accounting periods and measurement times, contracts at other unobserved sites, were possibly as much a reason for the start of work as seasonality. Kempster's team at St. Paul's only did not work 3 weeks in January in the second year of his records. Although there do seem to have been smaller teams from January (6- 8 men as opposed to 16 – 18 before the end of December), there were also smaller numbers working across the summer than in the previous year. For both years it seems as if the busiest time for work on site was October to December. Records of projects which would have had no interiors – like Westminster Bridge - also show winter working.²⁰

It does seem that building sites in London were fully operational 6 days a week throughout the late seventeenth and early eighteenth centuries. At Bridge House, those who were employed regularly and who were named in accounts on day rates worked approximately 300 -309 days per year. Some of these, on day work, seem have been assured work year round. Those who worked tides however had to accept lesser working hours or variable hours (such as tides) to guarantee themselves a regular position; their work was also clearly seasonal. They had variable income, almost half as much in the winter as summer.²¹

¹⁸ n=141, average days per week worked per man when on-site 5.08, std deviation 1.408, variance 2.066

¹⁹ Campbell, "The Finances of the Carpenter in England 1660-1710: A Case Study on the Implications of the Change from Craft to Designer-Based Construction."p. 324, and p. 360, *in diabatto*

²⁰ Ibid. p.316 where he gives examples of shed being constructed at St. Paul's and other sites.

²¹ See Pay at Bridge House, chapter 7 above

Table 9.2. Number of days worked, Kempster team, St. Paul's 1700-1.

Name	Total number of days worked	Average days on site per week when present
Tho Loller	262.00	5.57
Tho Knagg	261.50	5.56
J Garner	252.00	5.48
James Williams	248.00	5.64
Ed Healing	246.00	5.35
John Parlour	243.00	5.40
R Florker	239.00	5.69
John Foster	237.50	5.65
John Renn	234.00	5.57
R Joanes	226.50	5.52
Rog Bliffard	221.00	5.53
Chs Thurland	216.50	5.55
W Danifour	214.50	5.23
Tho Bayley	194.50	5.40
J Magnes	158.50	4.53
Jos Shepard	143.00	5.50
John Slorkly	126.00	5.04
J Smith	74.50	5.73
M Turrill	70.00	5.38
Will Cooper	65.00	5.42
John Barker	62.50	5.68
G Conaway	62.00	5.17
Edmund Biboy	46.50	4.65
Edmund Gibson	38.00	5.43
Tho Allen	30.00	4.29
Peter Marrot	26.00	5.20
R Parinoole	17.50	4.38
Tho Minor	6.00	6.00
total	4221.50	
average no. of days	150.77	5.34

Source: TNA C106/145 n=141, average days per week worked per man when on-site 5.08, std deviation 1.408, variance 2.066

Overall it seems that the working hours of skilled and unskilled workers in the building industry in London 1665 to 1780 were up to 6 days a week for twelve hours. Many, perhaps most, received 5 not 6 days of work in a week, however. An analysis of the actual hours worked by Kempster's team in table 8.1.h gives the distribution. But when we turn from the week to the year this is not as clear. We can get some sense of the way in which turnover of workers and short hiring constrained the amount of work an individual might receive by calculating the average number of days worked per man per week, however.

The number of weeks worked in this set of accounts was 46. The average number of days per man per annum is misleading in this case, however, because all the men who worked 143 days or less were not present in the books for large numbers of weeks. They may have been working elsewhere, on another site of Kempster's, or not working at all. So the average days on-site per week when present are a more accurate indicator of working hours and days for masons in this period. While for an individual building worker to achieve a year of employment they must normally have worked across a range of sites. Without further sources we also cannot know whether or how Kempster and contractors like him retained men when they did not have active sites.

There *was* a site in the city that was operative at least 51 weeks per year: London Bridge. Generally, a differentiation in summer and winter pay rates has not been observed in this study for this period; despite the fact that we assume winter working days were shorter. In reality we don't have any evidence that the working day *was* shorter in winter, as rates were the same throughout the year on all sites, but for one group of people the organisation of work ensured that it was. Carpenters and others working on London Bridge worked tides, not days. Only a small number of people were contracted, paid or accounted for by the day: those who were the contractors or placeholders, their apprentices, and their foremen (sometimes these were sons) where it is not clear if they are being paid for attendance or work, but some years give us a clear picture.

The mason's bills for 1735 are a case in point. There are bills for 51 weeks. The team worked 6 days in all but three weeks (Easter week ending 12th April, that ending 31st May, and Christmas week ending on December 25th). In the April and May week four days were worked, giving a total of 302 working days in the year. Only one man, George Collier, the most senior mason or the first one named and listed after the contractor, was consistently named however, so the rest of the team appear to have been coming and going from employment. There was an average of 7.37 tides worked per week. One man (the lowest paid by day or by tide) worked, or was charged out for, six days in every working week, 306 days.²²

In 1748 the masons' bills show 52 weeks of work, the week containing December 25th was a 5 day working week, the last week in March four days, and the last week in April five days,

²² Lesow's masons' bills, 1735 in Bills account and sundry papers LMA COL/CC/BHC/10/003

making a maximum of 308 available working days. There is, as discussed in the section on sites and sources and pay, a question mark over whether all this time was actually worked or merely billed out.²³ The average number of working days per year that contractors billed at Bridge House until the 1780's was between 300 and 309 for Land Carpenters, and Carpenters, but the number of men working on any day varied enormously. Others only worked tides. Many carpenters and engine carpenters did not work days, but tides only, or a mixture of tides and days. Tides may appear to have been a form of overtime, as they also seem to have been at the Royal Naval Dockyards. The tide rate was the same proportion of full day rates in both places – twenty eight per cent.²⁴ For those paid by the day *and* the tide they amount to overtime. But a significant number were paid *only* paid by the tide until the 1740's. Tide work was limited by the season and the tidal clock. But the records of the tide carpenters show a maximum of twelve tides a week in summer and six in winter. In 2015, twelve low tides over a six-day week in the hours of daylight was only possible between the 12th and 17th July, if the hours worked were from roughly 4.45am to 10pm.²⁵ The variance in tides worked implies that there were other reasons why the maximum number of tides worked was not always taken advantage of. The availability of work, or what the contractor had agreed with the Bridge master as work to be done, also played a role.

How do these levels and rates of work compare to previously published rates? Voth's evidence, sourced from London making it directly comparable, calculated 2,228 and 2,631 hours per year in 1750, rising to between 3,336 and 3,538 hours per year between 1760 and 1800, all on the basis of an 11 hour working day.²⁶

Voth included a construction case study in his analysis, for the Burnton and Western canal in Cheshire in 1801.²⁷ Voth's main findings were the high number of days and the fact that Mondays were regularly worked. The canal work site was operational six days a week. 5,924 days were worked on the canal in one year, but an average number of days per man was not given.²⁸ However, his data comes from just one set of the accounts, for 'extra

²³ Also see Latham, "'The City Has Been Wronged and Abused!': Institutional Corruption in the Eighteenth Century." for a discussion of corruption among the workmen.

²⁴ See ADM 102/2977 for the split at Royal Dockyards for Shipwrights.

²⁵ <http://www.pla.co.uk/assets/towerq12015.pdf>

²⁶ Voth, "Time and Work in Eighteenth-Century London.", pp.30,46

²⁷ He did not have a case study or site evidence.

²⁸ Ibid. pp 47 - 49

work'.²⁹ There may have been more days worked in other accounts. Essentially, the site seems very similar to St. Paul's or any other. Examining the evidence from St. Paul's and Bridge House it is not clear that Saints days *were* taken before 1760. Work on other trades would need to be done to establish whether construction workers were unusual in the intensity with which operations were carried on over the year, open 6 days nearly all weeks or whether they were representative.

We can sketch out some tentative estimates of what these records suggest for the total working year to compare with Voth's Figures'. If working hours are taken into account, workers who could get work 52 weeks a year were already working more than Voth's 1800 Figures between 1700 and 1750. Based on a 47 week working year a man working an average of 5.34 days per week³⁰ would have worked 2,941 hours as shown above. In the table a calculation of 6 days a week at 12 hour days is made to consider the case of further hours than 11 worked due to combinations of tides and days and Bridge House.

The evidence of call books, pay records from Bridge House and William Kempster suggests that London building sites were operational six days a week at least 51 weeks a year. Aside from London Bridge, not all trades would have been on-site at 'extraordinary' sites all year round, as is borne out by the 46 weeks work at St. Paul's for masons in 1702. Based on an 11-hour working day only men working less than 5 days for 47 weeks a year would have worked the sorts of hours that Voth calculated before 1760. The most industrious of Kempster's masons who are observed throughout worked a great many more hours, and in fact Kempster's team compare favourably to the team Voth presents for 1801 in terms of industriousness. If the tides and days recorded at Bridge house before 1757 were actually worked, then some men there would have worked many more hours again. Based on the available evidence from the sources in this thesis it seems that London builders were putting in longer hours than existing estimates before Voth's industrious revolution. (Table 9.3.).

²⁹ Nisbet, *A Proper Price*. pp.29 – 30 gives the forms of contracting for this kind of work c 1800, showing that 'day works may have included further labour.

³⁰ The average days worked per week figure from 8.1.h above.

Table 9.3. Calculated numbers of hours worked per year based on number or days worked at St. Paul's, Bridge House. (Voth estimate 1760 >2,228 <2,631).

Days per week	Hours per day	No of weeks per year	Total days	total hours
5.34*	11	47	250.98	2760.76
5.34	11	51	272.34	2995.74
5.34	11	52	277.68	3054.48
5.69**	11	47	267.43	2941.73
5.69	11	51	290.19	3192.09
5.69	11	52	295.88	3254.08
4.29***	11	47	201.63	2217.93
4.29	11	51	218.79	2406.69
4.29	11	52	223.08	2453.88
6	12		306	3672
	12		302	3624

*average, ** highest, *** lowest no. of days on site per week at St. Paul's

The means by which men found work is something that we don't know enough about however. Men such as those who worked for Kempster worked long hours and many days when they had work, but without further sources we cannot know how long they could expect to be without work when the site closed or works completed.

Chapter 10. Conclusions and implications for wage series and economic history

This thesis has argued that economic historians have misapprehended the nature of the construction industry in long eighteenth century London, and as a result have overstated the wages of labourers and craftsmen. I have presented evidence to show that the day rates for craftsmen and labourers in the building trades that previous authors have taken for wage payments were charge out rates submitted as bills by large contractors to institutions, *not* wages. I have shown that contractors had operating costs and that they took mark-up on the day rates they charged out to cover their costs, and to profit. New evidence, presented in this thesis for the first time, has shown that the received daily wage rates of London craftsmen were approximately twenty per cent lower in the long run, and that for labourers even lower still in key periods. This concluding chapter will examine what that means for our understanding of wages in London, our use of wage series, and our assumptions about organisation and employment in the long eighteenth century. In the first section I will highlight conclusions about the market for building in London and the market for employment for builders; in the second section I examine implications for our understanding of comparative prices of labour.

10.1. Observations and conclusions based on the new evidence.

In this thesis I have presented a view of the London market for building services that has not been considered until now by economic historians. The key differences to what has been published before are discussed in each of the following paragraphs.

The Extent of the market and the scale of firms: By 1650 building in London was big business, with both large sites and large contracting firms and partnerships dominating the market for profitable contracts from public clients. If Elizabeth McKellar crushed the artisan ideal in her study of private housing development to 1720, this thesis resonates with her findings, and supports the view of the market advanced by Knoop and Jones in the 1930s. By the late seventeenth century London building contractors were operating on a very large scale. The scale of London firms is at odds with the continuation of small masters and artisan type production that Woodard showed persisting in Northern Towns through the mid-

eighteenth century, yet it should not be surprising in the least that London was of a different order.

The reach of the firms involved needs further research and evaluation, however. The Kempsters, the Stronges, Andrews Jelfe, and others carried out work outside of London too. More work is needed to uncover whether they used the same men to work in multiple locations, or hired locally, or both, in order for us to assess how to understand wages outside the capital in south east England adequately.

Technological change, new institutions and organisation: The organisation of the building industry in London in the seventeenth century underwent dramatic change in response to demand and scale of works. Clients and contractors began to manage the risk of building in new ways with contractual terms that limited the risk of sunk costs and mitigated the problems of monitoring large works. These ways of working placed contractors wholly responsible for employing and deploying skill and for managing the costs of hiring labour. The practice of measurement became a new institution, which enabled what would have been complex contingent claims contracts otherwise into a commonly understood set of procedures and processes, some of which the construction industry still uses today. In order to profit from measured contracts (and contractors did profit), they had to cost control all the elements and factors of production, and only deploy and pay for skill as it was required. This technological change imposed costs, or operating margin, on contractors, which they faced even when conducting ‘day work’, and it was these constraints which influenced the rates at which labour was hired.

The wages craft and labour received were lower than we have previously thought: Of course without many more contractors’ books like the Kempster day books we cannot know exactly the pay or its distribution on any site. However, the indication from the sources examined here is that applying a twenty per cent overhead and profit margin to charge out rates would give us a reasonable estimate of the average that craftsmen and labourers actually earned. This was the discount applied in the nineteenth century.

The Kempster books indicate that there were skilled masons who worked for well-known and high-profile building contractors who earned 24d. a day in 1708. There were men who earned less than that at St. Paul’s. This is not to say that no one ever earned the amounts given in existing series. In light of the records examined here it looks as if the existing series

may be representative for the highest level of skill in the trades, but that is a number equivalent to perhaps ten per cent of the workforce, based on the distribution of rates at Bridge House and St. Paul's. However, the evidence for labourers is that pay was lower again. The rates for St. Paul's in the 1700s are thirty per cent lower than existing series, as are the rates for those on Office of the King's Works books in the 1790s. Figures 9.2.a, and 9.2.b put these figures into chart form using Allen's existing data.

The average or median craftsman earned approximately twenty per cent less than the series, but the average labourer thirty per cent less. Those are the average figures, a significant proportion - the unskilled - as a result earned much less, which leads us to the next points, relating to skill.

There was high variation in pay rates for craftsmen in any given year: This is not news, Boulton also showed a large variation in the rates he recorded in any one period. It seems related to the high variation in *skill* of craftsmen, as much as the response of the market to supply and demand. Without being able to control for skill – to know that the level of work any pay relates to is constant- the sources will not let us know when pay rates in the market increase in response to the forces of supply and demand. We should also consider that it may be the case that when the more highly skilled work, carving or fluting columns was not available, men traded down to less skilled and less highly paid work.

Existing series imply that high rates in the 1660s fell and did not increase substantially again until the 1730s, and again the 1790s. In fact, they have always shown a stagnation of wage rates throughout the bulk of the eighteenth century. The sources examined here show charge out rates lower than existing series in some cases. Without further work any 'turning points' or increases in rates cannot be substantiated, but indications may be that the increase in rates from these sources at the end of the eighteenth century were not as rapid as has been previously found.

Although day rates were a predominant form of pay not everyone received them: Whilst the St. Paul's record indicate that pay by the day, with weekly payments were the norm for large sites, some building craftsmen and labourers were not paid by the day, but by the tide, or the piece. At Bridge House day rates were the preserve of a few, with many more paid by tides. Further work is needed to understand the search costs and numbers of days worked for those who were not regulars at a big site.

Labourers on large London construction sites were not 'unskilled': Labourers were not the lowest paid on sites, and their work was not unskilled. Taking the day rates of labourers from the bills of institutions has given us a very rosy picture of the earnings of labourers until now. The rate in the Allen series for labourers in the 1690s is 24d. per day, and for the 1700s 22d. From these figures Allen has concluded that unskilled London workers could afford a 'respectable basket' of goods and had a high standard of living, and that these high wages were an incentive to labour saving bias, which brought about industrialisation in Britain.¹

The Kempster books and St. Paul's accounts tell a different story. By way of example, Charles Thurland and John Parlour were labouring for Kempster in 1700, 1701, 1702, 1706, 1707, 1708 at the day rate of 18d. With such long experience at St. Paul's, working with some of the most cutting edge techniques and most skilled craftsmen of the day, they must have gained experience, knowledge and the trust of Kempster. In fact, it would be hard to imagine a case with more skilled or experienced labourers. Yet, their pay was consistently 18d. per day, 19 per cent less than 22d. Generally, labourer's rates in the St. Paul's accounts are thirty per cent under-recorded in the series Allen used to calculate living standards for unskilled men in the same period. Thurland and Parlour were not the lowest paid on site by any means. The St. Paul's accounts show many labourers, some regularly employed, paid 16d. a day in 1708. Diggers at Westminster Bridge were *charged out* at 18d. a day in 1744. 'Labourers' at Bridge House in the 1780s were paid 14d. a day (7s. week). All of these figures imply that the pay for semi-skilled labourers was approximately twenty per cent below the Allen series, but the pay for *unskilled* men on construction sites was *far* lower.

We should discount the idea that there were means of pay that mattered other than money after 1650: The average building craftsman from the Restoration onwards in London was not an 'artisan', in command of his own work and profit, and with others working for him whom he trained as has been assumed. The average building craftsman was a highly skilled journeyman, who worked as waged labour in a large team, for a number of masters or contractors; he had few rights or claims. He did not have 'exchange entitlements' or forms of pay other than monetary, in fact the exchange entitlement he probably prized most was the promise or actuality of regular work. Woodward acknowledged that this was the case for masons, but held that in the Northern Towns other trades craftsmen maintained autonomy as

¹ Allen, *The British Industrial Revolution in Global Perspective*. pp.44-46

small masters with artisan like models of production. The overwhelming evidence is that carpenters, plumbers, paviours, and joiners had joined the ranks of waged labour in London by the mid-seventeenth century. Historical narratives of pay in the long eighteenth century have been influenced by debates about the positive or negative influence of industrialisation, and by theoretical debates about how demand factors and “industriousness” played a role in development and the beginnings of modern economic growth. These influences have had as much effect on the way we have viewed earning as the actual wage evidence. The sources do not permit us to believe that building workers in London were paid in a form anything other than their monetary wage, and that was lower than we have previously thought. We need to develop explanations for how lower earnings fit with development and industrialisation, rather than speculate that workers were better off than they were.

The findings change our understanding of the relationship between living standards and economic development: The lack of increase in wage rates for construction workers, highlighted particularly by the persistence of rates at Bridge House in the long term, suggests a relative decline in purchasing power and living standards. This concurs with the analysis of Schwarz, without any further analysis into prices. Schwarz showed that previous cost of living indices to his research, (Gilboy/Schumpeter, Phelps Brown Hopkins, Lindert & Williamson) showed an increase in the cost of living by 41 per cent 1741 – 90. The Allen CPI shows gentler decline in real wages (through period of high volatility) for the latter half of the eighteenth century.² None of this can be substantiated however without further work on prices, and particularly on rents.³ The real finding before any new work is carried out is that only approximately ten per cent of building craftsmen afforded the standard of living ascribed to average craftsmen by previous authors, and no labourer attained that ascribed them.

A difference of twenty per cent in wages or the price of labour will substantively change living standards indices for London, and no doubt provoke new research on prices of consumption goods. Moreover, the issue of labour substitution is a matter for comparative analysis. Existing wages series have been used to argue that relative factor prices in Britain

² Schwarz, "The Standard of Living in the Long Run: London, 1700-1860."p.27

³ David Ormrod, James Gibson, and Owen Lyne, "City and Countryside Revisited.Comparative Rent Movements in London and the South-East, 1580-1914," (School of Economics Discussion papers: University of Kent, 2011). shows rise in rents in small sample of London rising by more than that given in Allen series.

were different to elsewhere in Europe. Could it be that wages in other countries and cities would be subject to the same discounts as shown here?

10.2. Comparisons with other cities.

It is hardly the case that England pioneered great architecture and investment in palaces and public spaces in the late-seventeenth century. The inspiration for Jones, Wren and others were the works of Italian cities and French Kings.⁴ So, was the contracting model the norm in other European cities? Should all European building craftsmen's wages be discounted, and if so, from the same point in time? The question, about the means of state contracting and the nature of employment and organisation is wide enough to merit its own researches, and so this question cannot be wholly answered here. However, a review of the literature for other cities suggests that the comparison of wages between England and other European centres in existing series is not entirely straightforward. If the data for London previously recorded is for men working on large projects of the highest skill and innovation is that the case for the other cities' data? Did the construction industry have the same structure elsewhere or might workers in other cities have had non-monetary payment or other security or benefits?

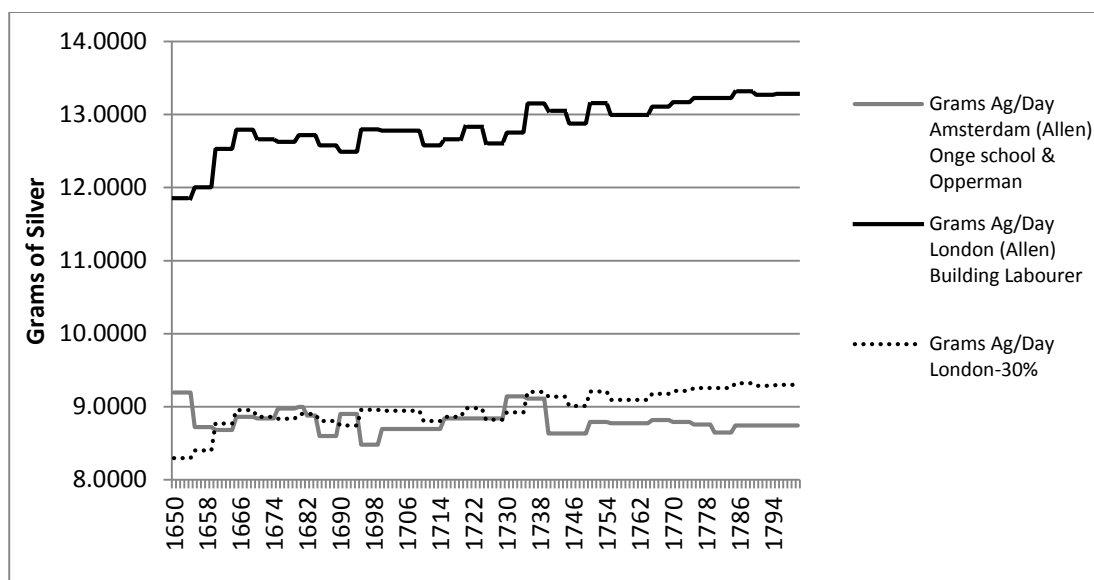
The cities that are most often cited in case studies examining the difference between British wages and incentives and European ones are Strasbourg and Amsterdam. Allen used the case of labourer's wages in Strasbourg to compare to Southern England in 2009.⁵ The failure of Amsterdam, or the Low Countries, to industrialise are cited by many economic historians as contradictory to the factor price argument.⁶ Yet, neither data can be said to be come from comparative or similar sources. The purpose of this section of the thesis is to evaluate whether what I have shown of the organisation and price of labour is comparable to that of other cities. If London labour was cheaper than we have thought, were the circumstances in which labour was contracted similar or different elsewhere?

⁴ {Summerson, 1945 #1237}, chapter 1.

⁵ Allen, "Engels' Pause: Technical Change, Capital Accumulation, and Inequality in the British Industrial Revolution."

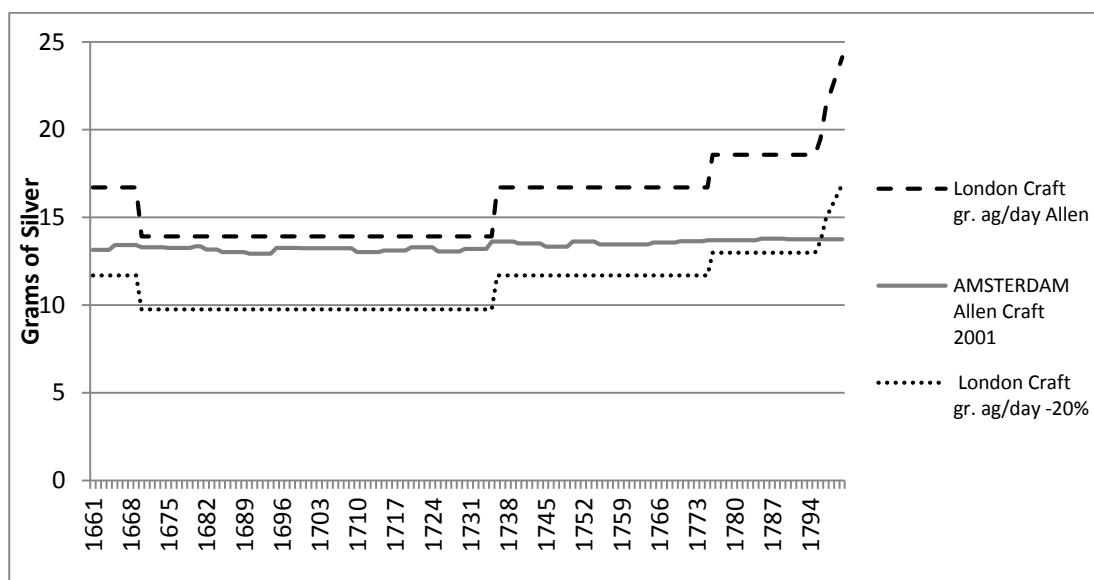
⁶ Jacob, *The First Knowledge Economy : Human Capital and the European Economy, 1750-1850*.

Figure 10.1. New London and Amsterdam labourers series: London and Amsterdam
Labourers -30%⁷



Source: Figures from (Allen 2013) discounted as discussed in text.

Figure 10.2. New London and Amsterdam craftsmen series: London and Amsterdam
Craftsmen -20%



Source: Figures from (Allen 2013) discounted as discussed in text.

⁷ To make the comparison between cities I have used Allen's silver wage figures. There is not enough data in the Strasbourg file at <http://www.iisg.nl/hpw/data.php> to make adequate comparisons.

a. Amsterdam and Strasbourg:

It has been shown that in the Low Countries the relative status and income of building craftsmen declined substantially across the seventeenth century.⁸ The sources that Allen draws upon for his Amsterdam city series are drawn from deVries and Van Der Woude's 1997 data.⁹ Their figures were actually constructed for the whole of the Western Dutch Republic. Some of the Amsterdam city figures that contributed to it were taken from Nusteling's 1985 study, and they are higher than the aggregated figures by approximately ten per cent.¹⁰ There are, however, not many observations in Nusteling's original series.

In Nusteling's study of Amsterdam, data is given for masters, journeymen, unskilled and assistants at work on the wharves and docks. It seems likely that this work would have been less skilled than that which is documented in the Westminster Abbey or Greenwich data. They would, perhaps, have been more comparable with what John Fitch paid for bricklayers and carpenters wharfing Fleet ditch in the 1670s - alas of course we don't know what he paid them. They would perhaps also be comparable to some of the Bridge house records. Furthermore, the Amsterdam sources record a difference between the wages paid at private wharves and wages on municipal projects. There is a 13- 20 per cent difference in the rates with the municipal ones – probably directly paid ones - lower. De Vries and Van der Woude's mean rates were taken from an amalgamation of these different rates, thus if further research did indicate that a discount should be applied, it would probably not be as great as London.

DeVries noted that in the first quarter of the eighteenth century Dutch sailors and British sailors out of the two ports were paid exactly the same.¹¹ There has been a great deal of work showing how integrated financial markets were between London and Amsterdam.

⁸ Blonde and Hanus, "Beyond Building Craftsmen. Economic Growth and Living Standards in the Sixteenth-Century Low Countries: The Case of 'S-Hertogenbosch (1500–1560)."pp.179-207.

⁹ de Vries and Woude, "The First Modern Economy Success, Failure, and Perseverance of the Dutch Economy 1500 -1815."p.610, de Vries, "An Inquiry into the Behaviour of Wages in the Dutch Republic."; Van der Wee, " Prices and Wages as Development Variables ".

¹⁰ H. P. H. Nusteling, *Welvaart En Werkgelegenheid in Amsterdam, 1540-1860 : Een Relas over Demografie, Economie En Sociale Politiek Van Een Wereldstad* (Amsterdam: Bataafsche Leeuw, 1985).

¹¹ de Vries, "An Inquiry into the Behaviour of Wages in the Dutch Republic."p.82.

Such measures are taken by economists to indicate that other prices and markets will have some level of integration too.¹²

Because the London wage series was not broken down into masters and journeyman, but solely into craftsmen and labourers, any comparison between Amsterdam and London has been on an uncertain basis. The silver price in itself however naturally inflates English figures, according to Mayhew, from 1670 onwards.¹³ Considering the new evidence for London, and the sources for Amsterdam, and the lower bias of Allen's Dutch data, there emerges the possibility that Amsterdam wages were never cheaper relatively until the late-eighteenth century, way after inventions and innovations had sought to 'labour save'.¹⁴ Moreover, the institutional and technological basis for building in Amsterdam may have been different; the city of Amsterdam may have been employing building craftsmen directly as late as the 1760s.¹⁵

The Strasbourg wages used in Allen's case study of the adoption of the spinning Jenny are substantially lower than London wages, but in fact the figures used are not from Strasbourg at all but from Mulhouse, a town over 100km south of Strasbourg.¹⁶ The original source used by Allen to derive his data from Strasbourg comes from Hanauer who published, in 1876, his study of Alsatian economic history.¹⁷ The source reports a wide variety of data from throughout Alsace, in fact in Colmar (73 km south of Strasbourg), masons earned 20% more than the Mulhouse wage included in the Allen series (4 grams of silver) between 1726-1744 and 50% more (5.6 grams of silver) between 1746 and 1749. In short, it is possible that the Strasbourg wage data in Allen's series is understated by anything from thirty to fifty

¹²Larry Neal, "The Integration and Efficiency of the London and Amsterdam Stock Markets in the Eighteenth Century," *Journal of Economic History* 47, no. 1 (1987).pp.97-115.

¹³N. Mayhew "By weight or number? The international comparison of prices and wages" Paper given at the IHR, Senate House London June 19th 2015.

¹⁴In correspondence with this author Professor Jan de Vries has expressed the initial opinion that the wages collected in Holland for building craftsmen were different in format and could not have contained mark up in the same way as the English bills discussed in his thesis. The question will be thoroughly examined and compared to his sources as a next stage of research.

¹⁵A brief review of Archief van het Stadsfabriekambt en Stadswerken en Stadsgebouwen, inventory number 4, Archief van het Stadsfabriekambt en Stadswerken en Stadsgebouwen, inventory number 731, Archief van het Stadsfabriekambt en Stadswerken en Stadsgebouwen, inventory number 24, Archief van de Thesaurieren Ordinaris, inventory number 370 all available via <http://stadsarchief.amsterdam.nl/> leads to this statement. This question requires much further detailed research. I am grateful to Ruben Schalk, a doctoral candidate at the University of Utrecht for these archival leads.

¹⁶Allen, "The Industrial Revolution in Miniature: The Spinning Jenny in Britain, France, and India."

¹⁷Charles Auguste Hanauer. 1876. *Études économiques sur l'Alsace ancienne et moderne (denrées et salaires)*. Paris : Société industrielle de Mulhouse.

per cent, again without any consideration of the potential impact of contracting practices.¹⁸

In order to be clear about relative factor prices for labour we need to have comparable data, with comparable underlying skill levels. A further analysis of the different types of work that underpin data, and the ways of working and organisation of construction in other cities is long overdue.

b. Southern England:

If the wages of London craftsmen and labourers have been overstated by up to thirty per cent, then this potentially wipes out the 'London premium'. It is held that London had higher wages and prices than the rest of the country, the most notable recording of such being the work of Arthur Young who showed in his 'travels' that wages and prices declines with distance from London.¹⁹ Economists and historians believe wages were higher in the city to compensate for increased mortality, to attract migrant labour, and to provide for higher prices.²⁰

The figures Allen and others have used for building craftsmen's wages in Southern England are still those of Phelps Brown Hopkins, and they come pretty much intact from Thorold Rogers and Gilboy.²¹ Phelps Brown and Hopkins noted a falling off in the frequency with which day rates of all kinds appear in accounts after 1660, and this is may well be due to the introduction of the contracting system in provincial building projects.²² The figures for Southern England before 1700 are taken wholly from the accounts of work carried out for Oxford and Cambridge colleges which was extracted by Thorold Rogers. Despite its location, much of the work carried out in both towns, and at both universities on new building was carried out by Wren and indeed much of it by contactors found on London sites, such as the Stronges and the Kempsters.²³

¹⁸ I am indebted to Vincent Geloso, a PhD candidate at LSE for providing this detail on Hanaeur's work. It was also discussed in a working paper by Professor Nicholas Mayhew, June 19th 2015, IHR, n.693 above.

¹⁹ Arthur Young, *A Six Months Tour through the North of England : Containing, an Account of the Present State of Agriculture, Manufactures and Population, in Several Counties of This Kingdom* (London: W. Strahan, 1771).

²⁰ Jeffrey G. Williamson, *Coping with City Growth During the British Industrial Revolution* (Cambridge: Cambridge : Cambridge University Press, 1990). pp.232 - 239

²¹ Brown and Hopkins, "Seven Centuries of Building Wages."

²² Ibid. p.195

²³ See Wren Society, Volume V, for instance, Christopher Kempster was wholly in charge of the construction of Tom Tower, Christchurch Oxford, 1681 – 2 for Wren.

New College Oxford provided a substantial portion of Rogers' data, and although Wren did not carry out the works there, a review of building bills in the vouchers suggests that all day rates were taken from contractor's bills that follow the same form as that found in the London records. At New College, John Doude carried out masons' work in 1707, John Piddington in the 1740s. Their bills detail days and some materials, but not carriage, rent, accounting costs, or tools. In short, they are just like a London contractor's bill, and as such the labour day rates detailed would probably have been subject to the same type of mark-up as those in London. Payment can be seen to be delayed in these vouchers also, by 6 – 12 months making the cost of credit also a consideration.²⁴ In the latter part of the eighteenth century large London contractors carried out extraordinary works on measured contracts at the college, specifically James Wyatt. This means that wages rates that might be found in the New College records for those projects would definitely be charge out rates. It is also possible, that like Jelfe in the 1730s, Wyatt and others who built Oxford or Cambridge projects, had men and teams that travelled. If this was the case then it is likely that only a small portion of the workers on such a site were local, making builders days rates a very poor proxy for local wages.

Without further work into detailed bills, margins, skill and day rates, it is impossible to be absolutely sure that the margin or mark-up taken on work outside of London was the same. That work is surely overdue since substantial archival work on the Oxford and Cambridge projects has not been carried out since Rogers in the mid-nineteenth century. The travel, carriage, and correspondence and monitoring costs of operating outside of London would hardly have inspired contractors such as Kempster or Wyatt to work for less outside of London, even if the cost of labour outside of the city was available at lower rates.

²⁴ New College Oxford, Archive, See vouchers 11367 – 11399.

Concluding remarks:

Economic historians may constantly seek new data, yet our most fundamental data sets for wages in Europe have been mostly based on research carried out three generations ago, or more. If wages and prices are really “the DNA” of the economic past then we need some new observations to see the real shape of the double helix, and really understand early modern sources on wages and earning generally. The further implications of this research will no doubt lead to many further questions. How representative were builders of the wider population and economy? How far did the contracting system spread and at what times? How did men such as Kempster’s labourers live on 18d. a day?

The premise of this thesis was a simple observation that bills in archival records had been taken for payments. Yet this simple insight has yielded a large alteration to the widely accepted view of early modern pay in England. ‘High wages’ have suited a story of surplus, a consumer revolution, high human capital and innovation in England. None of these things are dependent on high wages for *everyone*. The data from records presented here implies that skilled and semi-skilled men with experience of working on advanced building sites were available for work at day rates twenty to thirty per cent lower than existing series have recorded. This only really presents a problem for the theories that depend on the idea that business could not access affordable labour and so substituted with capital and mechanisation. Plenty more evidence has been provided that there was great advancement in organisation, design, a high availability of professional services and skill, and high levels of innovation in the building trades in England in the long eighteenth century. That these factors can coexist with cheap labour should be unsurprising to anyone living in the second decade of twenty-first century Britain.

Archival sources

Detailed source files and page numbers – where available - are given in footnote and text.

The following give the call numbers at relevant archives.

Westminster Abbey Muniments.

Christopher Wren Fabric Books, catalogue numbers, 34513, 34514, 34517

Associated papers catalogue numbers 34552-62

The National Archives

Archives of the Office of the Kings Works Work 5/1 – 88

Work 6/46 Westminster Bridge

Admiralty records ADM 67, /2 Greenwich Hospital

ADM 80/2 Greenwich Hospital

Chancery Masters PRO C 106/145 note books loose papers and day books

Middle Temple

ACC VOU MT.2/TAP, MT.6/RBW,

Treasurer's accounts - loose papers No. 1- 79

London Metropolitan archives

Bridge House Estates records

CLA/007/FN/03/018- 28: Weekly payment books 1661 - 1785

CLA/007/FN/04/01- 09, Bill Books containing copies of audited bills 1745 - 82

CLA/007/FN/10/006-7, Payments made to Tie and Land carpenters 1787 – 88.

CLA/007/FN/05/006 – 9, 061, Receipt Books

CLA/007/FN/04/018-19, Land carpenters weekly bills for labour.

COL/CC/BHC/10/003- 10 Bills and Sundry papers

CLA/007/AD/01/007 Papers relating to Thomas Veasy and abuses at Bridge House

St. Paul's Cathedral

CLC/313/I/B012/MS25485, 25481 008 – 010 Call books and remittances

(The Wren Society Volumes cited give the most accessible and highly accurate account).

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