

The living standards of Tyneside coal miners, 1836-1862

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Abstract

Using c. 16,000 fortnightly paybills from Wylam Colliery in the Northern Coalfield, we assess the standard-of-living of Tyneside coal miners between 1836 and 1862. We argue that the earnings of hewers were lower than currently proposed by the literature, and that the employment of additional family members provided the income necessary for survival. We also quantitatively demonstrate the wage levels of other, more junior, occupations.

Additionally, we argue that mining families did not earn more than those in other industries due to the income of adult males; instead they generated additional income through child labour. We also assess worker migration, and independently confirm the existing commentary in the literature. In addition, we investigate other factors affecting standard-of-living, such as progression through mining occupations.

We have used our data not only to investigate the average wage level of these miners, but also to critique the use of wages in assessing standard-of-living. We have therefore calculated the fluctuations in earnings on a fortnightly basis, and discussed the impact this would have had on standard-of-living. We have also considered the deviation in the earnings of workers, and the extent to which families may have differed from the norm. Furthermore, we have also considered the aspects of standard-of-living which we are unable to comment on using our present data. We conclude that experiences varied considerably, and therefore that whilst the use of the mean wage by most scholars is informative, it is only part of the picture.

Table of Contents

Abstract	2
Table of Contents	3
Table of Figures	4
Acknowledgements	5
Author's Declaration	6
Introduction	7
Literature Review	10
The 'Incentives-based' Industrial Revolution	10
Living Standards in the Industrial Revolution	11
Nominal versus Real Wages as a Measure	17
Coal Mining- National	19
Coal Mining- the Northern Coalfield	23
Wylam Colliery	30
Sources	32
Methodology	44
Analysis	49
The General Pattern of Wages	49
Hewers	49
Putters	55
Drivers	59
Trappers (and working the switches)	61
Comparisons to Existing Wage Estimates	64
Deviation in Wages	73
Fluctuations in Wages	76
The Spread of Occupations and Progression in the Mine	80
Migration	83
The Family	89
Other Factors Relating to Earnings	102
Conclusion	110
Appendix One: Wylam Colliery Pitmen's Bonds	115
Appendix Two: Piece and Daily Rates	116
Appendix Three: Colliery Output	120
Appendix Four: Agricultural Hiring in the Northeast	121
Appendix Five: Mortality and Life Expectancy	123
Bibliography	124

Table of Figures

<i>Graph 1-</i> Hewers' Earnings per Fortnight	49
<i>Graph 2-</i> Hewers' Average Wage by Year.....	50
<i>Graph 3-</i> Standard Deviation of Hewers' Wages	51
<i>Graph 4-</i> Number of Hewers by Year.....	52
<i>Graph 5-</i> Average Hewers' Wage and Number of Hewers	53
<i>Graph 6-</i> Average Earnings- Putters v Hewers.....	56
<i>Graph 7-</i> A Comparison of Hewers' and Putters' Standard Deviations.....	58
<i>Graph 8-</i> Drivers' Earnings per Fortnight	60
<i>Graph 9-</i> Trappers'/Switches' Earnings per Fortnight	61
<i>Graph 10-</i> Comparison to Church (Northeast) Estimates.....	65
<i>Graph 11-</i> Comparison to Church (National) Estimates.....	65
<i>Graph 12-</i> Hewers' Real Wages by Bond Year.....	68
<i>Graph 13-</i> Index Wage Series and Cost-of-Living Series	69
<i>Graph 14-</i> A Comparison of Indices.....	71
<i>Graph 15-</i> Standard Deviation as a Percentage of Hewers' Average Wage.....	74
<i>Graph 16-</i> Hewers' Average Standard Deviation of Individual Standard Deviations	78
<i>Graph 17-</i> Retained v New Hewers per Year	84
<i>Table 1-</i> Comparison Between our Hypothetical Mining Family and Leifchilde's Estimates	96
<i>Graph 18-</i> Mining Family (1838-1839).....	99
<i>Graph 19-</i> Agricultural Family (1838)	100
<i>Table 2-</i> Child Labour in Agricultural and Mining Families, 1838.....	100
<i>Graph 20-</i> Rounded Hewers' Ranks	105
<i>Graph 20.1-</i> Hewers' Ranks	106
<i>Graph 20.2-</i> Hewers' Ranks	107
<i>Graph 20.3-</i> Hewers' Ranks	107
<i>Table 3-</i> Wylam Pitmen's Bonds	115
<i>Graph 21-</i> Hewers' Piece Rates by Seam	116
<i>Graph 22-</i> Putters' Piece Rates	117
<i>Graph 23-</i> Daily Rates of Junior Mine Workers.....	118
<i>Graph 24-</i> Annual Wylam Colliery Output	120
<i>Table 4-</i> Occupational Mortality	123

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Author's Declaration

I declare that all material submitted for this dissertation (where not otherwise referenced) is my own. No part of this work has previously been published, or is currently under consideration for publication, nor has it been submitted as part of any other degree.

Introduction

The overall aim of this study is to investigate the living standards of Tyneside coal miners in the context of the Industrial Revolution. Using data from Wylam Colliery, we address a variety of questions regarding the working lives of these miners, and how this impacted on their lives as a whole. We consider the family economy in a variety of ways- not purely limited to earning potential, but also its effect on migration. The living standards of British workers during the Industrial Revolution has seen much debate in historical literature. In recent years, it has taken on a new relevance, becoming the basis for a school-of-thought which explains the onset of the British Industrial Revolution and why Britain was first to industrialise.¹ Yet the fortunes of these workers are still hotly debated.² By limiting ourselves to one group of workers in one industry, we are able to examine in detail the lives of these workers, and evaluate to what extent they were ‘rich’.

The Northeast was considered to be the leading British coalfield, with the best colliery managers, and the most skilled miners.³ It underwent a rapid expansion during the period of our study, supplying coal both for consumption elsewhere in the country (via its coastal trade), and for the rapidly growing local iron industry.⁴ By 1862 its output was sixteen times the size it had been a century and a half earlier, in 1700.⁵ It is therefore an important industry to the British Industrial Revolution as a whole, as well as an interesting region in its own right, during this period.

¹ Robert C. Allen, *The British Industrial Revolution in Global Perspective* (Cambridge: Cambridge University Press, 2009), 15–16.

² for example; 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 (August 1, 2013): 693.

³ Michael W. Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830 : The Industrial Revolution* (Oxford: Clarendon Press, 1984), 28.

⁴ B. R. Mitchell, *Economic Development of the British Coal Industry 1800-1914* (Cambridge Cambridgeshire ; New York: Cambridge University Press, 1984), 16.

⁵ Roy A. Church, *The History of the British Coal Industry. Volume 3, 1830-1913 : Victorian Pre-Eminence* (Oxford: Clarendon Press, 1986), 3; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 26.

It would be a mistake to consider this study as purely a micro-history of the colliery at Wylam. Of course, to some extent, it is just that. All of our data come from the same colliery, and therefore the majority of workers lived in the same village. But our research agenda has repercussions and applications for our understanding of coal-miners in the Northeast as a whole. We therefore urge that this research be considered as a case study of the Northern coalfield, from which conclusions can be applied to all coal mining in that area. Wylam may not be the perfect case study, but the level of detail which these paybills provide is unique, and the accompanying long running series of Pitmen's Bonds⁶ even more so. Although not the largest colliery in the area, it was certainly mid-sized, and therefore may be more representative of an average workers' experience. Whilst the colliery was independently owned, it was part of the organisation in the Northeast which limited the amount of coal allowed to be sold via coastal transport, and the Blakett family who owned it had been in the coal trade for decades.

We have, throughout this study, tried to place our workers in the context of this area, and consider what might be motivating the differences between our work and the literature. We conclude that despite these explanations, the literature at present holds several views which are not consistent with our findings. These are; that the current accepted level of earnings overestimates the actual income of miners during this period; that the concentration on the earnings of hewers has resulted in scholars ignoring the tangible effects of the equality between hewers' and putters' earnings, and that average wage rates overlook the very different fortunes of individual workers. Not all of these points are original⁷, but all are at present under-explored. From these observations, we expand our investigation to

⁶ The Pitmen's Bond was a contract which bound the worker to a colliery, usually for the period of a year (although this changed in the 1840s; see pages 45-50 for a more in depth discussion). It guaranteed the worker certain rights and privileges (again see pages 45-50) in exchange for his services. It also clearly set out the duties he was required to perform, and the rate at which he would be paid for this work. Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 260.

⁷ Church has highlighted that as his earnings are calculated from shift rates, the number of days worked per week and fines would lower wage levels. Jaffe and Flinn have both identified that putters could earn as much as hewers, but have not quantitatively investigated this. See; *Ibid.*, 560; James Alan Jaffe, *The Struggle for Market Power: Industrial Relations in the British Coal Industry, 1800-1840* (Cambridge University Press, 2003), 83; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 391.

the role of the family in mining life, and the difference additional workers could make to the welfare of the family. We find that Rowntree's poverty cycle is relevant here⁸, but that the difference between its peaks and troughs are far greater for mining families than those in other industries.

In other respects, our findings confirm those of the literature. We find the general shape of the wage series to be broadly consistent with that of Church, but at an absolute lower level. We argue that this speaks to the accuracy of our own series. We also corroborate Hair's investigation of migration in the coalfield by a completely independent method, and come to similar conclusions. We have also drawn upon the findings of fluctuations in wages and attempted to tie them more closely to the family economy and the consequences for the standard-of-living. However, we do use our work on the family economy to challenge the notion that individual miners were significantly better off than those in other industries during the Industrial Revolution.

We also touch upon the structure of the coal mining trade, and how a young boy might progress through the occupations of the mine to the role of hewer. To this extent we incorporate a more dynamic understanding of standards-of-living insofar as we consider how earnings would change over time. We argue that experience in other occupations was vital for this progression, and that this is indicated through the secondary employments within the mine of around half the workers in this period. We find that men who had gone through this progression and become hewers were most resistant to this practise and preferred to work exclusively in hewing. As they had already reached the peak of their profession, they no longer required the experience to move up through the mine. We also argue for the centrality of the family unit to labour in the mine.

We establish our research agenda with a review of the literature relevant to the topic- starting with the importance of wages to the 'incentives view' of British industrialisation. We then move on to an evaluation of this use of wages as a proxy for living standards, followed by a review of the specific coal mining

⁸ B. Seebohm Rowntree, *Poverty : A Study of Town Life*, [Special centennial ed.] (Bristol: Policy, 2000), 136–137.

literature. We also explain our sources and methodology in dealing with our data. Our analysis is then split into eight sections, the main themes of which have been outlined above. Finally, our concluding section summarises our findings at present and identifies where future research could improve our understanding of standard-of-living beyond that of income.

Literature Review

We now review the literature relevant to our field of inquiry, on both an industry-specific level, and in a wider context. We first consider how the wider literature has motivated our present research, before taking a critical approach to measures of living standards. Finally we assess literature specifically concerned with coal mining and Wylam colliery.

The 'Incentives-based' Industrial Revolution

Any discussion of wages during the Industrial Revolution must first engage with the scholarship of Bob Allen, which has recently become dominant. Allen's view of why Britain industrialised first disregards the 'classic' view (which favours the 'unique' nature of British institutions) and the "Industrial Enlightenment"⁹ (in which an accumulation of "useful knowledge"¹⁰, driven by an elite few,¹¹ led to technological developments¹²) advanced by Mokyr, in favour of a British 'high-wage, cheap-energy' economy. Supposedly, this situation encouraged the invention of new technologies because of cheaply available natural resources, whereas elsewhere coal was expensive so using labour was more profitable.¹³ The 'Allen-thesis' therefore hinges upon this 'high-wage, cheap-energy' economy.

Humphries' recent work claims Allen "underestimates the relative caloric needs of women and children"¹⁴ and therefore created a "false household economy"¹⁵.

⁹ Joel Mokyr, *The Enlightened Economy: An Economic History of Britain 1700-1850* (New Haven ; London: Yale University Press, 2009), 40.

¹⁰ *Ibid.*, 35.

¹¹ *Ibid.*, 85.

¹² *Ibid.*, 83–84.

¹³ Allen, *The British Industrial Revolution in Global Perspective*, 15–16.

¹⁴ Humphries, "The Lure of Aggregates and the Pitfalls of the Patriarchal Perspective," 695.

Somewhat in keeping with Allen's view, Humphries' concluded that there was a motivation for mechanisation, but this was to utilise female and child labour, not cheap energy, as women and children could then perform the tasks of adult males without the strength and skill previously required.¹⁶

Coal mining itself creates a peculiar problem for the Allen-thesis. The high wages of its workers fit with his general argument, but this should have elevated the price of coal, and therefore made it more expensive. Allen's own wage series is based upon London builders' wages.¹⁷ These journeyman workers are hardly representative of all British workers in all industries, and therefore calls into question just how far this theory applies to all British workers.

The present study therefore has been influenced by this debate on two fronts. Firstly, it has motivated us to consider the issue of a 'male breadwinner' versus 'the family'. Our consideration of child labour in the earnings of a household can therefore help to settle the debate around the main sources of income for the typical British mining family during the period. Secondly, these arguments rely almost entirely on average wage levels as a measure of standard-of-living, and fail to account for any other factors which influenced quality-of-life. At present, we do not have the data to expand much beyond this ourselves, but we do intend to place our study of living standards within a wider context.

Living Standards in the Industrial Revolution

The main focus of this study is the wage data for Wylam coal miners. We have approached this in a variety of ways; beginning with the customary review of adult male wage levels. However, we have then expanded our approach to use wage data in ways completely unrelated to the actual level of wages (see *Migration*) and highlighted the contributions of other family members to the household (see *The Family*). The focus of this section however, is a discussion of how representative wages are of standard-of-living. This has been a growing

¹⁵ Ibid.

¹⁶ Ibid., 709.

¹⁷ Allen, *The British Industrial Revolution in Global Perspective*, 33–34.

theme in the literature in recent years, which will be discussed here, along with our own contribution and how this has been implemented. We also acknowledge some of the problems with our reliance on wages as a measure of standard-of-living.

Firstly, it should be noted that many scholars have used wages as a measure of standard-of-living, and this is an important addition to our collective knowledge. They have, however, used different indices and wage series to reach very different conclusions. Lindert and Williamson have argued that workers enjoyed significant gains over the period of our study, and that real wages “nearly doubled between 1820 and 1850”.¹⁸ In opposition, Feinstein concluded real wages were stagnant for the first half of the 1800s, even falling during certain periods.¹⁹ His response to Lindert and Williamson argued “the standard-of-living of the average working-class family improved by less than 15 percent between the 1780s and 1850s”²⁰ and this was “consistent with other [...] indicators.”²¹ Feinstein demonstrates real earnings were stagnant from the 1780s to 1830s, when they started to increase, only to fall back and restart the process in the 1840s.²² He claimed more “substantial gains”²³ were not felt until the 1860s.²⁴ Feinstein achieved this by improving the index used to deflate his wage series—including potatoes, milk, cheese, oats and beer,²⁵ and more accurate estimates for clothing and rent.²⁶ Additionally, Feinstein used three separate base years rather than Lindert and Williamson’s one.²⁷

We therefore see that scholars have come to very different conclusions regarding the general trends in wages over the period of our study. Our wage series adds to

¹⁸ 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 (February 1, 1983): 11.

¹⁹ 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. 03 (1998): 649.

²⁰ *Ibid.*, 625.

²¹ *Ibid.*

²² *Ibid.*, 349.

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ *Ibid.*, 641–642.

²⁶ *Ibid.*, 642.

²⁷ *Ibid.*, 641.

this body of data, and assesses the trends in workers' wages over the middle of the nineteenth century. Yet even within the use of wages, these studies fail to capture a large amount of useful information. Firstly, these studies are based on mean wages. This is perhaps the best way to display the general trend, but it fails to capture much of the variation in the data- implying that every man in 1840 (for example) earned the same wage. This study questions to what extent this was the case, and therefore if the standard-of-living can be directly assumed from such measures. We have therefore been careful to report the standard deviation of wages from the mean at relevant points in our analysis. Additionally, using annual estimates (as these studies do) again reduces the wealth of experiences of different workers. An advantage of using fortnightly wage data (which, in fairness, is not always available) as the present study has done, is that it allows us to report how much an individuals' fortnightly earnings varied over the year. Again, we have indicated this, and measured how much the sample of individuals varied as a whole, at various points.

We should also consider some of the assumptions that working with wage data tends to make about standard-of-living. Most importantly, it assumes that workers are something economists call "rational"²⁸ actors. This essentially means that they will always look to maximise their earnings. We will demonstrate later in this study that our miners did not always act in such a manner, but this also has an impact on our thinking with regards to standard-of-living. For example, wages fail to account for any preference for leisure time which an individual might have, instead of looking to earn more money. Assessing standard-of-living only through wages would indicate that a man who worked more but had less leisure time had a higher standard-of-living than one who did the opposite. Depending on our definition of standard-of-living this may not have been the case. We have no data on the individual leisure activities of Wylam's miners, but we should recall in our assessment of their living standards that factors such as leisure played a role.

²⁸ Stephen E. G. Lea, *The Individual in the Economy* (Cambridge: Cambridge University Press, 1987), 104.

Additionally, we should consider the idea that the workers' environment contributed to his standard-of-living. Williamson also reports that British workers demanded a premium for working in cities. He demonstrates that workers in urban environments were compensated for a loss in health-related standard-of-living (for example; sanitation, urban crowding) by increased wages. Williamson found in order for workers to move to newly industrialising cities, a wage increase of up to thirty percent (compared to rural areas) was necessary in the 1830s and 1840s.²⁹ Voth has expanded this to calculate a worker "risk premium"³⁰ for those employed in urban areas. He computed the increase in wages an urban worker should have demanded in order to compensate him for his increased risk of mortality; his findings were that "migrants may have shown a net gain in the north [...] and that a sizeable advantage was likely in the south".³¹

We can apply this idea to those in dangerous industries such as coal mining. Firstly, the dangerous working environment and the poor sanitation of their living conditions mean the lives of miners were perhaps more comparable to urban than rural workers. Secondly, a miner was at far greater risk of death or injury (via cave-in or explosion), and contracting an illness from working conditions.³² It therefore follows miners would demand higher wages than counterparts in other industries, but their lifetime earnings would be more comparable. This is complicated not only by mortality, but morbidity and retirement. Church has highlighted a contradiction in contemporary accounts of miners' health (which speak of the preponderance of diseases such as bronchitis and rheumatism), and calculated figures, which show occupational mortality (in a slightly later period) to be comparatively good for those in the mining

²⁹ Jeffrey G. Williamson, *Coping with City Growth during the British Industrial Revolution* (Cambridge England ; New York: Cambridge University Press, 1990), 257.

³⁰ Hans-Joachim Voth, "Living Standards and the Urban Environment," in *The Cambridge Economic History of Modern Britain*, ed. Roderick Floud and Paul Johnson (Cambridge: Cambridge University Press, 2004), 287, <http://universitypublishingonline.org.ezproxy.york.ac.uk/cambridge/histories/chapter.jsf?bid=CB09781139053853&cid=CBO9781139053853A014>.

³¹ *Ibid.*

³² McIvor and Johnson found that mortality due to accidents and respiratory diseases was higher in the coal trade than in other industries; Arthur McIvor and Ronald Johnston, *Miners' Lung: A History of Dust Disease in British Coal Mining* (Ashgate Publishing, Ltd., 2007), 41.

profession.³³ He attributes this to the under recording of deaths of retired miners from these diseases, the early retirement of miners from the most physically demanding jobs (between 45 and 55), and the “favourable age structure”³⁴ which meant that only strong young men were working in the trade, and therefore disguised the potential increase in mortality.³⁵ These factors explain why the working career of a miner would be shorter than in other occupations (through mortality, morbidity or custom) and therefore he demanded a premium for his shorter window of peak earnings. Additionally, Bowden and Mills have used census information from the late nineteenth and early twentieth centuries to demonstrate that coal miners in Northumberland and Durham had a life expectancy of 53 years, with 25 percent dying before the age of 34 (their data have been supplied in Appendix Five with Bowden’s permission).³⁶ This was on par with coal miners as a whole, and one year longer than males in industrial districts (although industrial workers had a lower chance of dying under 34, at 20 percent). By comparison, adults males in agricultural districts could expect to live an extra ten years, and have a greater chance at living beyond the age of 34 (only 14 percent would die beforehand). Overall, northern coal miners could expect to live six year less than the average adult male, and were eight percent more likely to die before the age of 34.

However, whilst these arguments include environmental factors in wage data, they do not really consider the environment itself as part of the standard-of-living measure. Although the wages of the present study do much to explain the access that a worker (and his family) had to resources which would affect their standard-of-living (such as food) and help to explain some of their actions (such as the age at which their children started work), they do not really consider the working or living conditions in their own right. This is an important regard in which wages fail to capture the essence of standard-of-living.

³³ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 595.

³⁴ *Ibid.*

³⁵ *Ibid.*, 594–595.

³⁶ Sue Bowden and Judith W. Mills, “University of York Centre for Research in Economic History Discussion Papers: Occupational Mortality, Age at Marriage and Marital Fertility in Early Twentieth Century England and Wales,” February 2004.

Some scholars have sought to include more of these environmental factors in measures of living standards. Height has been seen to act as a measure of nutrition throughout childhood and early adulthood, and therefore embodies the living standards of an individual's early life.³⁷ Additionally, children can be affected by the same factors during pregnancy.³⁸ Floud, with Wachter and Gregory, discovered boys at Sandhurst military academy could differ in heights by fourteen centimetres depending on their social background.³⁹ They also calculated increasing average heights between 1760 and 1830, although these were relatively minimal.⁴⁰ However, this style of "anthropometric"⁴¹ history has been problematic, as it does not seem particularly correlated with income in the eighteenth and nineteenth centuries.⁴² Whilst we do not know the heights (or anything about the physical wellbeing) of the workers at Wylam, this literature identifies the effects which environmental factors could have on standard-of-living, and demonstrates that it is not something which can be captured through the use of wages alone. We might also include in this category measures such as life expectancy and infant mortality. The coal pits were not a healthy environment for those working in them, and were particularly damaging due to the young age at which boys began work. We must recall this when discussing standard-of-living.

Additionally, others have focussed on the rights and freedoms of workers as a measure of living standards. Crafts has applied the Human Development Index to Industrial Revolution Britain. This measure contains three aspects- GDP per capita, life expectancy, and access to education.⁴³ Crafts also incorporated civil and political rights and freedoms, concluding living standards did improve throughout the period 1780 to 1850.⁴⁴ Wages obviously contribute to the first of the three HDI categories (and will likely correlate with the third). Life

³⁷ Voth, "Living Standards and the Urban Environment," 274.

³⁸ *Ibid.*, 274.

³⁹ Roderick Floud, *Height, Health, and History: Nutritional Status in the United Kingdom, 1750-1980* (Cambridge; New York: Cambridge University Press, 1990), 197.

⁴⁰ Voth, "Living Standards and the Urban Environment," 276.

⁴¹ *Ibid.*, 274.

⁴² *Ibid.*

⁴³ N. F. R. Crafts, "The Human Development Index and Changes in Standards of Living: Some Historical Comparisons," *European Review of Economic History* 1, no. 3 (December 1, 1997): 620.

⁴⁴ *Ibid.*, 626.

expectancy links to the point above regarding the inclusion of environmental factors when measuring of standard-of-living. Other factors such as access to education and the right to vote are also aspects of living standards which are unrelated to wages. The existing literature does discuss the political activism and freedoms (such as that to form a trade union) of miners in the Northeast. This will be addressed in the *Coalmining- Northeast* section of the literature view below. We are therefore able to think about these in the context of our miners, however these rights have not yet been quantified at all, let alone in a manner which compares to the advanced nature of Crafts' work and would be viable to compare to other regions.

Overall, using wages as a measure of living standards is not perfect. It fails to account for health-related standards-of-living, preference for activities outside of work, and personal freedoms which formed a key part of the general happiness of any individual. However, wages are an important part of any assessment of quality-of-life. They also act as a proxy measure, for some of the factors which have been described above. The most important thing for any study which attempts to fit wages into the picture of living standards is to be aware of its limitations. We therefore acknowledge that whilst there are many aspects of standard-of-living which we are not able to discuss with the data presently available, wages do play an important part in this story. Within the use of wages themselves there are also methodological issues, which restrict their explanatory power, but we have taken care to address these in sufficient detail, and incorporate them into our overall picture of living standards.

Nominal versus Real Wages as a Measure

The present study has included analysis of both nominal and real wages. However, outside of comparisons with the existing literature, it has taken a preference for nominal wages. This is due to several reasons, which will now be examined.

Firstly, it was considered how relevant existing cost-of-living indices were to the present study. This is not intended to say that real wages should be dismissed in

any scenario. Ideally, wages would always be adjusted for the cost-of-living in a study of living standards. However, to do so with an unsuitable index would do more harm than good. We have used existing indices (specifically Church's combination of the GRS and Wood indices, and Clark's recent series based on the earnings of agricultural labourers) to assess the relative level of wages in different years throughout the series. This has been a fruitful exercise, and gives a very similar picture to that provided by the nominal wages. However, these indices do not necessarily capture baskets-of-goods relevant to miners at Wylam. Whilst both have a relatively large range of goods included, the weighting of these goods is particularly important.⁴⁵ The use of an imperfect index (with weightings not appropriate for the sample employed) will give a picture of standard-of-living which is misleading. Whilst data for the specific consumption patterns of Wylam mining families are not available, we will demonstrate that they seem to have enjoyed a relatively high income. This usually meant the consumption of more luxury or higher quality goods. Therefore indices based on weightings for agricultural workers (Clark), or general weightings (GRS and Wood) are not ideal, and whilst they do control for some changes over time, should not be overly relied upon.

Secondly, as the process of annual bonding meant that piece rates (or daily rates for junior workers) were fixed throughout the year, nominal wages have been preferred. This is because (in addition to problems with the appropriateness of indices mentioned above), as Clark notes, the relative movements of nominal wages year-on-year tells us about the state of the labour market, and whether supply and demand dynamics were in effect.⁴⁶ Furthermore, coal owners reacted to changes in the price of coal, which were not necessarily correlated with changes in the price of other goods. Therefore, to use a real wage index with our wage data would distort the image of industrial relations which we are trying to capture. We could use a measure which controlled for the price of coal, but this would not provide values representative of purchasing power. This has relevance

⁴⁵ This issue has been highlighted by many scholars. See, for example; Pat Hudson, *History by Numbers: An Introduction to Quantitative Approaches* (London : New York: Bloomsbury Academic, 2000), 116; Roderick Floud, ed., *Essays in Quantitative Economic History* (Oxford: Oxford University Press, 1974), 11.

⁴⁶ Gregory Clark, "The Long March of History: Farm Wages, Population, and Economic Growth, England 1209–18691," *The Economic History Review* 60, no. 1 (2007): 115.

for measures such as migration, which are as much an expression of relative power as of earning potential. For those measures more directly linked to standard-of-living, such as deviations and fluctuations in wages, the nominal wage has also been used. This is because dispersion of individual wage entries is harder to capture when using index values, and is more meaningful when it can be expressed as a unit of currency.

Overall, whilst we do not deny the usefulness of real wages in assessing income and standard-of-living, we believe that they must be used appropriately. Additionally, some measures are more easily interpretable when using nominal wages. Therefore whilst this study employs a real wage index in assessing relative levels of income over time, nominal wages have been preferred for other measures.

Coal Mining- National

The historical literature for coal mining has a strong narrative. Whilst miners' experiences varied by geography, the Northeast has received particular attention. We must therefore examine present knowledge to place Wylam miners in this story.

An excellent starting point is Flinn's *The History of the British Coal Mining Industry, Volume 2 1700-1830*. Here, he argues there was a clear division between the underground and over-ground workers,⁴⁷ with the demand mainly for the former.⁴⁸ This accounts for the higher wage rates of underground workers, and their selection as the focus for this study. Flinn also addresses underground female employment in mines, claiming it "had already ceased by about 1720"⁴⁹ in the Northeast. This suggests men and boys were either the only wage earners in their household or that women worked in other industries- relatively few in mining villages like Wylam.

⁴⁷ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 329.

⁴⁸ *Ibid.*, 331.

⁴⁹ *Ibid.*, 333.

Flinn also argues colliers were viewed as an ethnic group, making distinctions between ‘miners’, ‘pitmen’ and ‘colliers’.⁵⁰ He quotes mining innovator John Buddle, who claimed “Our peculiar race of pitmen [...] can only be kept up by *breeding*”.⁵¹ Flinn claims this was embodied in the way miners treated their sons, who were forced into the mines before they could consider other employment.⁵² Flinn also adds a further breakdown of class based on skill, using Buddle’s idea of “middling good pitmen, a thorough good pitmen, and a pitmen”.⁵³ This can be investigated by examining the consistent earnings level of individual workers. If Buddle’s argument is accurate, there should be consistent differences in earnings.

Following Flinn, Church contributed the third volume of the series. He argues the Mines and Collieries Act 1842 was more significant for child labour than women.⁵⁴ This further supports either men being the only wage earners, or women finding employment in other industries. He estimates in 1842 up to thirty percent of coal miners nationally were under twenty, and thirteen percent under fifteen, although he cites Hair’s thesis which concluded child employment was below the national average on the Tyne.⁵⁵

Church discusses technology reducing the need for child labour, but concludes this was not always so- the trapping system of the Northeast being an example of the reverse.⁵⁶ In the Northeast, he argues “free colliery housing and limited alternative employment opportunities”⁵⁷ contributed to the “hereditary nature”⁵⁸ of coal mining. Church’s assertion of limited alternative male employment

⁵⁰ Ibid., 339.

⁵¹ Ibid., 339.

⁵² Ibid., 339.

⁵³ Ibid., 339.

⁵⁴ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 191– 192; The Mines and Collieries Act of 1842 banned women and children under the age of ten from working underground in the mine. “Coal Mines - UK Parliament,” accessed January 22, 2015, <http://www.parliament.uk/about/living-heritage/transformingsociety/livinglearning/19thcentury/overview/coalmines/>.

⁵⁵ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 193.

⁵⁶ Ibid., 194; Trappers were boys who opened and closed trap doors, which allowed tubs to move through and kept air flowing underground. For an explanation, see; Robert Colls, *The Pitmen of the Northern Coalfield: Work, Culture, and Protest, 1790-1850* (Manchester University Press, 1987), ix.

⁵⁷ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 229.

⁵⁸ Ibid.

suggests female employment would have been more so.⁵⁹ Additionally, the ‘hereditary nature’ of coal mining can account for the employment structure, the young age at which many boys started work and the predominance of related individuals working together. Church also claims children did not sign Bonds;⁶⁰ however we find evidence to the contrary.⁶¹

Church also discusses miners’ culture. Using contemporary accounts, he claims they viewed mining as a skilled profession, requiring more than physical fitness.⁶² He uses this to explain why “nothing more than strength and experience”⁶³ could allow a trapper to progress to a hewer in the Northeast⁶⁴, where the coal was the most difficult to work and he must “interpret the sounds and smells of danger”.⁶⁵ He argues these skills varied not just between mining districts but collieries.⁶⁶ He also stresses division of labour in the Northeast- each man had a very specialised task.⁶⁷ This begs the question of how a boy might gain the experience to progress in the colliery. We suggest this was done by working in several capacities simultaneously. This would be missed by purely investigating hewers.

Church also addresses migration in the coalfield. He argues miners voluntarily migrated in search of better employment- the peak of this migration being the 1830s and 1840s.⁶⁸ He again refers to Hair’s unpublished work, which calculated a ten to thirty-five percent annual movement of miners from parish records.⁶⁹

⁵⁹ Ibid.

⁶⁰ Ibid., 260.

⁶¹ For the purposes of this study, those under the age of 18 have been considered children. Whilst the age at which being considered an adult by contemporaries would likely have been younger in this period, there were several reasons for doing so. Firstly, boys graduated to being hewers (at the earliest) around the age of 18, although this was usually later. This was when they became truly autonomous workers, and ceased to be viewed as junior members of the colliery. Secondly, the majority of the income of young workers would have been contributed to their families, and most boys would still be living at home until they became hewers. Finally, a boy younger than 18 would have little chance of being able to migrate to a different colliery by himself, and therefore was not really independent of the family unit.

⁶² Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 203.

⁶³ Ibid., 206.

⁶⁴ Ibid., 205–206.

⁶⁵ Ibid., 206.

⁶⁶ Ibid.

⁶⁷ Ibid., 207–208.

⁶⁸ Ibid., 218–219.

⁶⁹ Ibid., 218.

Wylam's records allow investigation of this trend by assessing the turnover of workers each year. Church asserts a change came about with the end of annual bonding.⁷⁰ This meant the terms of contracts were less desirable, and in conjunction with smaller pits disappearing, led to less internal migration.⁷¹ He also tracks recruitment from other industries, and concludes that North-eastern mining drew in adult males in the 1830s and 1860s.⁷² High worker mobility seems to conflict with the idea that conditions in different collieries meant those working there for a longer period had an advantage. Either hewers did not view this as the case, or there were more important motivations for migration.

Using Gayer, Rostow, and Schwartz's index until 1850, and G. H. Wood's index in the following years⁷³, Church determines that the real wages of hewers "fluctuated greatly"⁷⁴ between the years 1830 and 1842 "but the average trend was stationary or slightly downwards"⁷⁵. From 1842 to the mid-1860s Church sees a "critical period of improvement"⁷⁶ in which earnings increased by "at least 50 per cent"⁷⁷ overall. He then uses Williamson's average annual male earnings to compare miners to other industries, and concludes that of the years 1827, 1852, 1881, and 1901, only in 1881 were miners below average.⁷⁸ Whilst the latter estimates are beyond our study, the earlier estimates provide a point of comparison for our data.

Church mainly addresses the wages of adult males in one mining occupation (hewing), and the analysis centres mainly on these wages. However he also highlights the difficulty in assessing women and children's contributions to household income,⁷⁹ but later states their participation rates were "relatively low"⁸⁰. Instead, Church sees women's employment as caring for lodgers, which

⁷⁰ Ibid., 219.

⁷¹ Ibid.

⁷² Ibid., 234.

⁷³ Ibid., 646–648.

⁷⁴ Ibid., 570.

⁷⁵ Ibid.

⁷⁶ Ibid., 571.

⁷⁷ Ibid.

⁷⁸ Ibid., 574.

⁷⁹ Ibid.

⁸⁰ Ibid., 581.

provided additional income.⁸¹ There is little quantification of this type of work, although he does provide some limited wage estimates for junior mine workers.

Church also addresses the living conditions of miners and their families'. He illustrates a points system for the allocation of colliery housing, based on the marital status and family size of hewers.⁸² He also discusses options for those who did not receive colliery housing- lodging with another miner, renting from a private landlord⁸³ or becoming an "owner-occupier".⁸⁴ Wylam records only indicate which hewers occupied colliery housing. However they also give evidence of other benefits from working in the colliery, such as access to cheap coal and medical care. These benefits have rarely been considered in this literature and quantify some of the normally 'intangible costs' of living during this period. Church claims although early housing was sub-par⁸⁵, after 1845 "nearly all British miners lived in houses of stone or brick".⁸⁶ Church also claims miners could afford well-furnished homes, despite their dishevelled outer appearance.⁸⁷ This implies miners possessed disposable income, and demonstrates how they allocated such resources. Church also discusses the diets of mining families, although his data are mainly from the 1870s and 1880s or other geographic regions, less relevant to the current study.⁸⁸ More recent work by Horrell and Humphries includes household budgets from mining families in our period⁸⁹, which have been used as a comparison.

Coal Mining- the Northern Coalfield

Flinn reports that coal had been mined from the Northeast, mainly for the purpose of selling in London, since the sixteenth century. This arose due to two main factors; the position of the coalfield near rivers which allowed easy access

⁸¹ Ibid., 633.

⁸² Ibid., 601.

⁸³ Ibid., 602.

⁸⁴ Ibid.

⁸⁵ Ibid., 606.

⁸⁶ Ibid.

⁸⁷ Ibid., 609.

⁸⁸ Ibid., 571–572, 577, 580.

⁸⁹ Sara Horrell and Jane Humphries, "Old Questions, New Data, and Alternative Perspectives: Families' Living Standards in the Industrial Revolution," *The Journal of Economic History* 52, no. 04 (1992): 873–878.

to the sea, and the ample supply of high quality coal.⁹⁰ In the eighteenth and early nineteenth centuries the Northeast dominated the coal market, although this did decline over that period- from 43.2 percent of total British coal output in 1700, to 22.8 percent by 1830.⁹¹ However, Flinn highlights that it was still the biggest coal producing region in 1830 “by a significant margin”.⁹² Over the same period North-eastern output tripled, so that it was producing 6,915,000 tons per year by 1830,⁹³ and was the leader “in technology, in the skill of its miners, and in the expertise of its managers.”⁹⁴

During the period of our wage study output continued to increase, so that by the end of our period (in 1862) the Northeast was producing around 20.9 million tons per year- 16 times greater than in 1700.⁹⁵ However, the share the Northeast had of the total coal market remained the same- around 23 percent.⁹⁶ It was demand for coal which drove this output (especially for iron manufacture⁹⁷), but technological developments (such as the steam engine and the safety lamp which allowed mines to both reach deeper seams, and shift greater quantities of coal from the face) which facilitated this increase.⁹⁸

Mitchell presents statistics in his work *Economic Development of the British Coal Industry* which indicate that by 1840, 46 percent of the coal produced in Durham and Northumberland was consumed by the coastal trade (mainly to London). Just over one third was consumed locally, either by the collieries, local domestic consumption, or by local manufacturing. Just over one eighth of all North-eastern output in 1840 was exported. The remainder was consumed by ironworks, steamships and railways, but in 1840 this made up a relatively minor

⁹⁰ Michael W. Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830 : The Industrial Revolution* (Oxford: Clarendon Press, 1984), 18.

⁹¹ *Ibid.*, 26.

⁹² *Ibid.*, 28.

⁹³ *Ibid.*, 26.

⁹⁴ *Ibid.*, 28.

⁹⁵ Roy A. Church, *The History of the British Coal Industry. Volume 3, 1830-1913 : Victorian Pre-Eminence* (Oxford: Clarendon Press, 1986), 3; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 26.

⁹⁶ calculated from Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 3.

⁹⁷ *Ibid.*, 25.

⁹⁸ *Ibid.*, 4.

part of the total.⁹⁹ Coastwise trade then declined to 34 percent of output by 1855, and 21 percent by 1869 (the next entry in Mitchell's tables, although 7 years after the end of our study). The actual tonnage still increased, from 1.2 million tons in 1840, to 5 million in 1869. Ironworks consumption grew rapidly, from 1 percent in 1840, to 11 percent in 1855, and to 30 percent in 1869. Railways and steamships had reached 4 and 5 percent respectively by 1869, but were relatively minor consumers overall of North-eastern output. We therefore see that whilst the North-eastern coalfield shipped a sizable proportion of its output to other parts of the country during this period, the increased consumption of the iron industry was also important in driving its growth.¹⁰⁰

Colls has focussed on the Northeast, especially the relationship between miners and owners. He also identified a trend of ethnicity in colliers during the period, claiming most pitmen in new collieries were "born and bred in the traditional areas of the coalfield"¹⁰¹ and it was tertiary workers who came from "rural and distant parts."¹⁰² This further supports the fundamental role of the family in the mining industry. Colls continues to argue pitmen (underground mine workers who were 'born and bred' in the northern coalfield) considered themselves skilled, "taught informally, through family and friends, and guarded by the exclusivity of the mining community"¹⁰³. Additionally, he claims the "word 'pitman' carried with it meanings of social bearing: other men were 'colliers' compared to 'pitmen', and others again were labourers".¹⁰⁴ He uses evidence of major disasters after the importation of workers, supposedly caused by their inexperience of mining in the Northern coalfield, to support this claim.¹⁰⁵ In this period Wylam suffered relatively few disasters in comparison to other collieries. However, this does not detract from the social connotations of working in the mine. A pitmen had a very specific identity; senior to that of a collier (a man who might work underground, but was not necessarily bred in the coalfield) and a labourer (a man who worked in the colliery, but not at the coal face). A man bred

⁹⁹ Mitchell, *Economic Development of the British Coal Industry 1800-1914*, 16.

¹⁰⁰ *Ibid.*

¹⁰¹ Colls, *The Pitmen of the Northern Coalfield*, 8.

¹⁰² *Ibid.*, 8-9.

¹⁰³ *Ibid.*, 11.

¹⁰⁴ *Ibid.*, 12.

¹⁰⁵ *Ibid.*, 15.

in the coalfield was always a pitman, but could be distinguished by his status as “a middling good pitman, a thorough good pitman; and a pitman; which the latter are the highest degrees”.¹⁰⁶ The wording in the Bonds can shed light on this division between those working at the coal face, and those employed elsewhere in the mine.

Additionally, Colls looks at the organisation of labour. He reports that by the 1840s boys worked a one-shift, twelve-hour day, supporting two six-hour shifts for hewers.¹⁰⁷ This gives us an idea of some of the factors affecting standard-of-living for our miners outside of their income, such as leisure time. Unfortunately our data contain very little information about factors such as leisure time; wages were mainly based on productivity, and therefore give us little indication about any preference for leisure rather than work, and the Bonds contain no clauses specifically relating to leisure. However, it is important to recall that there are factors affecting standard-of-living other than those which we are able to measure here.

Colls also evaluates the worker organisations in the coalfield, and the practise of restriction. According to Colls, ‘The United Association of Colliers’ was the first formal worker organisation, established in 1825.¹⁰⁸ He reports that “their four thousand hewers were not to work more than eight hours, or earn more than 4s 6d, in a day”,¹⁰⁹ those who did so would be fined the days’ wages.¹¹⁰ Whilst it is unknown how many of the workers at Wylam were members of these types of organisations, the limit of earnings can be compared to actual earnings for each fortnight. Colls also comments on the practise of ‘cavilling’ (drawing lots) four times a year, which determined where a miner worked in the mine.¹¹¹ This, he says, meant pay became significantly influenced by “the gamble of a lottery”.¹¹² This helps to explain the variation in earnings of hewers during this period. Our data allows us to identify this practise as hewers moved around the colliery.

¹⁰⁶ Ibid., 12.

¹⁰⁷ Ibid., 27.

¹⁰⁸ Ibid., 30.

¹⁰⁹ Ibid., 30.

¹¹⁰ Ibid., 30.

¹¹¹ Ibid., 48.

¹¹² Ibid.

Colls also comments on the Pitmen's Bond. He claims binding money was given as an incentive for hewers to sign their Bonds, usually totalling *1s* or *6d*.¹¹³ He tracks the rise in binding money up to 1804, where the demand of men for the Napoleonic Wars meant this sum reached as high as 20 guineas¹¹⁴ and the owners sought to place limits on it the following year.¹¹⁵ He then tracks the binding monies annually until their supposed abolishment in 1822, and the nature of the bindings thereafter.¹¹⁶ That binding money had declined by the period of our wage series holds particular relevance to the current study, as the large one-off payment could make a significant difference to a workers standard-of-living. His identification of the Napoleonic Wars as a drain of labour also reminds us of the turbulent international arena in this period, and the incentives for labour outside of the normal working market.

More recently Jaffe's work, *The Struggle for Market Power*, further investigated labour relations in the Northeast. Jaffe claims for miners "the market was their industrial culture",¹¹⁷ and the struggle over the terms of exchange governed industrial relations.¹¹⁸ In this interpretation, piece rates are not just pay rates, but expressions of relative power.¹¹⁹ In addition, we must see episodes of social unrest as additionally important, rather than simple pay disputes.¹²⁰

Jaffe discusses the cartel of coal owners¹²¹, and its 'Vend' which restricted the coal available to London. He claims northern coal owners had used this practise since the early-1700s.¹²² The Vend assigned volumes of coal to each colliery, and

¹¹³ Ibid.

¹¹⁴ Ibid., 78.

¹¹⁵ Ibid., 78.

¹¹⁶ Ibid., 78–100.

¹¹⁷ Jaffe, *The Struggle for Market Power*, 4.

¹¹⁸ Ibid., 1.

¹¹⁹ Ibid., 4.

¹²⁰ Ibid., 6.

¹²¹ The coal owners' cartel was an organisation in the Northern coalfield during this period. It managed "the Vend" which restricted the output of the collieries in the Northeast, as well as attempting to manage the amount of labour which could move between collieries in the earlier part of our period. Its measures were designed to regulate the price of coal in London. The cartel collapsed in mid-1840s. See; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 66–67; Colls, *The Pitmen of the Northern Coalfield*, 79.

¹²² Jaffe, *The Struggle for Market Power*, 32.

thus restricted output.¹²³ This became more regularly administrated after 1829.¹²⁴ Jaffe demonstrates the cartel was dependent on the large coal owners- with its collapses in 1828, 1832 and 1844 after key withdrawals.¹²⁵ He highlights the Vend was also broken on other occasions.¹²⁶ The Vend had a direct effect on miners' pay; as a colliery neared its quota, production ceased, and miners could not work. Collieries would cease production for three days, re-start for a day, before ceasing again. This avoided having to compensate miners if no work was available for four days or more, or allow them to seek employment elsewhere (as mandated by the Bond).¹²⁷ This helps explain some of the fluctuations in Wylam miners' wages.

Jaffe argues as working costs were high for the coal industry, it was imperative to reduce wages as far as possible.¹²⁸ This was done by “the imposition of fines”¹²⁹ on hewers.¹³⁰ However, whilst hewers were the main source of wage-expenditure, there appears to have been relatively minimal effort in controlling the wages of other occupations. The present study considers workers in other occupations who were not subjected to this practise, as fines applied mainly to the work of hewers.¹³¹

Jaffe claims the separation of ownership and management of the colliery was key in maintaining labour relations. Disputes were between management (viewers) and workers, meaning owners could maintain a paternalistic relationship with their workforce.¹³² Partly motivated by unrest in the 1820s, he claims this relationship meant owners were keen to house, educate and cultivate religion in their workers.¹³³ Jaffe argues that school-building peaked in the Northern coalfield during the 1840s, as a result of owner paternalism, and a reaction by the

¹²³ Ibid.

¹²⁴ Ibid.

¹²⁵ Ibid., 32–33.

¹²⁶ Ibid., 76.

¹²⁷ Colls, *The Pitmen of the Northern Coalfield*, 65.

¹²⁸ Jaffe, *The Struggle for Market Power*, 38.

¹²⁹ Ibid., 49.

¹³⁰ For a discussion of the nature of fines, see page 50.

¹³¹ See Flinn for a description of fines, and his commentary which refers only to the fining of hewers. Additionally, the fines described could only apply to the work of hewers; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 378–379.

¹³² Jaffe, *The Struggle for Market Power*, 49.

¹³³ Ibid., 73.

Church of England to Methodism.¹³⁴ Wylam's Bonds fit with this timeline, demanding compulsory contributions to a colliery school from the 1840s.

Jaffe also claims women's participation was far lower in County Durham in 1841 than the national average (seventeen to twenty-six percent).¹³⁵ He claims whenever they did work, this was primarily in domestic service¹³⁶, or as "dressmakers, milliners, agricultural laborers, schoolmistresses, and publicans or innkeepers."¹³⁷ He compares this to a highly mobile male labour market, with a high rate of internal migration- although this is based on Flinn's work, and not an independent corroboration.¹³⁸ The role of women is not fully understood from the wage data from Wylam. There is little evidence of their employment in the colliery. One however must query Jaffe's alternative employments. In one mining village, there could only have been so many 'dressmakers', 'schoolmistresses', 'innkeepers' or 'milliners'. The Blakett estate may have meant agriculture was a possibility. However this was hardly a stable occupation, and suffered large seasonal variations. Domestic service therefore seems the most likely scenario. This was mainly caring for lodgers in the family home. This may be reinforced by the relatively few hewers identified by the paybills as receiving colliery housing, and would therefore likely have lodged in the village.

Jaffe also challenges Colls' interpretation of earning restriction. He uses contemporary accounts to suggest it was forced upon the unions by workers rather than the trade unions attempting to stop competition between hewers.¹³⁹ Jaffe says workers believed restriction created more jobs in the colliery, and reduced its output- therefore being active on more days the year despite the Vend.¹⁴⁰ The idea of creating more jobs certainly seems to fit with other evidence. Pitmen frequently expressed worries of an influx of labour from other industries, and the scarcity of work.¹⁴¹ The latter purpose means Jaffe is

¹³⁴ Ibid., 88–89.

¹³⁵ Ibid., 81.

¹³⁶ Ibid.

¹³⁷ Ibid.

¹³⁸ Ibid.

¹³⁹ Ibid., 118.

¹⁴⁰ Ibid.

¹⁴¹ for example; Colls, *The Pitmen of the Northern Coalfield*, 8, 92, 107.

suggesting miners were unable to save or stockpile resources. By spacing out the work they ensured a steadier stream of income, but not a higher level- unless they expected other miners to be capable of earning over the threshold regularly. This rests upon how significant different skill levels were to earnings, and if wage fluctuations affected spending differently to how annual absolute levels would suggest.

We have therefore seen that coal mining has an established literature, both in the Northeast and nationally. North-eastern labour relations were incredibly complex- an intricate interplay between owners, viewers and workers. The impact of this, and the Bond, on workers is still not completely understood- from its effect on migration to the general level of wages. Additionally, the role of women and children in the family economy requires further investigation.

Wylam Colliery

Information describing the history of Wylam itself is relatively scarce; it is perhaps best known for being the home of railway engineer George Stephenson, and one of the earliest places to employ locomotive technology.¹⁴² The latter was mainly thanks to the interest of the Blakett family in financing and developing such innovations.¹⁴³ The village is said to have been “almost entirely occupied by coal-miners and iron-furnacemen”¹⁴⁴ and containing “nothing to interest”¹⁴⁵ the observer. However, the presence of a colliery and ironworks resulted in a relatively large population relative to a typical mining village.¹⁴⁶ Whilst the presence of iron manufacture in Wylam would have had an effect on all industrial activities, the insular nature of the coal trade discussed above would have caused a degree of isolation between the two.

Kirby, who compiled the paybills from the colliery at Wylam, has used this data to assess productivity of these miners. He argues absences from work were not

¹⁴² Philip R. B. Brooks, *Where Railways Were Born: The Story of Wylam and Its Railway Pioneers* (Wylam, Northumberland: Wylam Parish Council, 1979), 2, 3, <http://www.tynedaleheritage.org/PdfWordDocs/WhereRailwaysWereBorn.PDF>.

¹⁴³ *Ibid.*, 5.

¹⁴⁴ Samuel Smiles, *The Life of George Stephenson* (London: John Murray, 1881), 4.

¹⁴⁵ *Ibid.*

¹⁴⁶ *Ibid.*

motivated by laziness, but the physical demands of hewing¹⁴⁷ - emphasising by “the mid-century, a hewer might cut between 2.5 and four tons of coal per day.”¹⁴⁸ He suggested shorter working weeks by the 1840s were “a response to rising fatigue”.¹⁴⁹ Kirby also examines the motivations of hewers. He cites a study by Liddell of absences of Durham miners, which claims single men lost 2.7 weeks, married men (with no children) 2.1 and married men (with one child) 1.8 per year,¹⁵⁰ although these data are from 1946-49¹⁵¹, significantly later than Kirby’s own study. Kirby performed his own analysis on 1700 entries from the Wylam paybills, finding householders produced around ten percent more coal daily than non-householders in the period 1839-58.¹⁵²

Kirby also analysed the representativeness of Wylam colliery compared to the rest of the northern coalfield. He argues in “1800, the colliery employed around 100 workers [...] 215 by 1838, and between 1854 and 1861 the figure stood around 205. By comparison, a survey in 1842 of the 46 principal collieries in the district provided an average workforce of about 225.”¹⁵³ He also suggests some problems with the data, which we will later discuss in greater depth. He claims a “missing hewer might be working in a different seam or a different pit within the colliery (for which a paybill has not survived) or he might be employed as a putter or in off-hand work elsewhere”.¹⁵⁴ All these points aid the present investigation.

Kirby’s work suggested possible motivations for the work ethic of Wylam hewers, in addition to potential flaws of the data of this study. He also examines Wylam colliery, tracking its size throughout the period. However, his work has focussed on the productivity of these miners, rather than their absolute wage

¹⁴⁷ Peter Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” *The Economic History Review* 65, no. 3 (August 1, 2012): 970.

¹⁴⁸ *Ibid.*, 970.

¹⁴⁹ *Ibid.*, 971.

¹⁵⁰ *Ibid.*, 973.

¹⁵¹ F. D. K. Liddell, “Attendance in the Coal-Mining Industry,” *The British Journal of Sociology* 5, no. 1 (March 1954): 82.

¹⁵² Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 973.

¹⁵³ *Ibid.*, 966.

¹⁵⁴ *Ibid.*, 973.

levels. Additionally, he has focussed only on hewers, rather than the wide range of occupations his data provide.

In conclusion to this section, the present study addresses the absolute level of wages and the role of the family in coal mining literature of the Northeast, as well as contributing to our understanding of the complex owner-worker relations in the Northern coalfield. In this it fits with the contributions of Church and Colls, and to a lesser extent, Jaffe. It aims to consider ‘the family’, in addition to the ‘male worker’, and the consequences of decisions and events on the family economy. Whilst the system of employment in the Northern coalfield was somewhat different to elsewhere in the country, it also has relevance to coal miners in general. This study also has implications outside of its geographic bounds. Berg and Hudson have argued that regional history has much to contribute to the general debate around the Industrial Revolution, and even Crafts and Harley have acknowledged its merits. The wage series created by this study can be used in comparison to more general literature on the nature and causes of the Industrial Revolution. Allen’s (and to some extent, Humphries’) work relies on the idea of British workers being well off; if coal miners turn out to have had very different fortunes then this impacts on the strength of this school-of-thought in general. Additionally, the real wages calculated by this study can be compared to the aggregate estimates of Lindert and Williamson, and Feinstein, in order to compare the fates of Northern coal miners in relation to the rest of the British economy.

Sources

The main data for this study are c. 16,000 paybills from Wylam colliery. These are drawn from an existing dataset of c. 60,000 entries. The paybills are fortnightly records which recorded the ‘scores of tubs’ a hewer produced, and therefore the compensation he was owed. Putters were also paid by a piece rate. Drivers, trappers and many other workers were paid by a daily rate. All these data are named, allowing the reconstruction of employment histories. The dataset was created by Professor Peter Kirby, who has kindly agreed for its repurposing

in the present investigation. The original work was entitled '*Productivity and Household Economy in a Tyneside Mining Community, 1775-1861*' and was obtained through the UK Data Service¹⁵⁵. This was originally transcribed from the paybills of Wylam Colliery maintained in the Blakett collection at the Northumberland Archives, Ashington.

Wylam Colliery was located around ten miles west of Newcastle, in the modern day county of Northumberland. It was the most westerly of the Tyneside collieries.¹⁵⁶ The Blakett family owned the manor on which the colliery developed, until it passed into the hands of the Wylam Coal Company in the 1880s.¹⁵⁷ Christopher Blakett, who owned the colliery in the early 1800s, was a keen financier of locomotive technology, and financed the development of the 'Puffing Billy' and the 'Wylam Dilly'¹⁵⁸. The main players in the Northern coalfield were the Marquis of Londonderry and the Earl of Durham¹⁵⁹, and from 1820, the Hetton Coal Company.¹⁶⁰ Wylam was one of the few collieries owned by an independent family, although the Blaketts did own mines in other areas; specifically mining lead in the Pennines¹⁶¹. The Bonds indicate they briefly acquired the nearby Prudhoe colliery in 1839, but this disappears from the records by 1856. Data survive for five of the pits at Wylam Colliery (Ann, Haugh, Peggy, Prosperous, and Tyne) although there were around ten operating over the period of the nineteenth century.¹⁶²

The paybills form the central part of the present study. They show the amount of wages miners received after the deductions of fines and other charges necessary for their work. These were expenses such as 'Fire Coal' (coal provided for personal usage at a cheap rate), 'Candles', 'Powder' (gunpowder), 'Picksharper' (the fee for sharpening pickaxes) and their contributions to 'Surgeons', or

¹⁵⁵ Peter Kirby, "Productivity and Household Economy in a Tyneside Mining Community, 1774-1867," accessed September 21, 2013, <http://discover.ukdataservice.ac.uk/catalogue/?sn=6341&type=Data%20catalogue>.

¹⁵⁶ Kirby, "Attendance and Work Effort in the Great Northern Coalfield, 1775-1864," 965.

¹⁵⁷ "Durham Mining Museum - Wylam Colliery," accessed June 9, 2014, <http://www.dmm.org.uk/colliery/w037.htm>.

¹⁵⁸ Brooks, *Where Railways Were Born*, 5, 8, 9, 24.

¹⁵⁹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 122-123.

¹⁶⁰ *Ibid.*, 130.

¹⁶¹ Brooks, *Where Railways Were Born*, 5.

¹⁶² "Durham Mining Museum - Wylam Colliery."

medical care. These data are especially rich; they list the amount earned by the worker, his occupation, the seam and pit in which he was working at the time, any deductions from his pay, and if he worked “in the broken”¹⁶³ or participated in “wet work”¹⁶⁴. Kirby has been able to reconstruct the productivity of each worker down to a fortnightly level¹⁶⁵, but this richness of data has also allowed the present study to reconstruct the employment histories of individual workers on a fortnightly basis for extended periods. Some workers have employment histories that span decades, starting from when they began work in junior capacities to achieving the prestigious role of a hewer.

The detailed breakdown of occupations is important due to the focus of the present study on the family, rather than just the male breadwinner. Thanks to the age structure of mining, we can use these occupations to reconstruct potential earnings at different stages of childhood, in addition to as an adult. There are several different defined occupations working in collieries at this point. Whilst different collieries have different terminologies and specific duties for these job roles, they compare to any other coal mine in the country. The elite workers were referred to as ‘hewers’. These were the men who actually worked the coal face, traditionally using a pick-axe, although gunpowder became increasingly popular during this period.¹⁶⁶ Hewers were usually over twenty-one¹⁶⁷, having worked their way up through the mine in various occupations.¹⁶⁸ ‘Putters’ were next in the hierarchy. They transported the coal (either pushing or pulling) between the hewers at the face, and the drivers on the rolley ways.¹⁶⁹ They tended to be teenage boys¹⁷⁰, who would look to progress to hewing as they aged. ‘Drivers’ were yet another step more junior. They transported tubs along the main ‘rolley way’ (underground road) out of the mine. This was usually done using horses, which had a tendency to rear and buck underground, so this required good

¹⁶³ This involved digging out the supports in a previous worked section of the mine. See; Jaffe, *The Struggle for Market Power*, 62.

¹⁶⁴ Working in a part of the mine which required the hewer to get wet. See; Ibid.

¹⁶⁵ Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 966.

¹⁶⁶ Colls, *The Pitmen of the Northern Coalfield*, viii.

¹⁶⁷ Ibid.

¹⁶⁸ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 206.

¹⁶⁹ Colls, *The Pitmen of the Northern Coalfield*, ix.

¹⁷⁰ Ibid., 46.

physical strength.¹⁷¹ They were often defined as “boys”.¹⁷² Finally, ‘trappers’ were the youngest underground workers. They opened and closed the trap doors for the tubs to move through and keep air flowing underground.¹⁷³ Church assigns more concrete age definitions to these workers, citing an account of George Johnson (a 1830s viewer in the Northeast¹⁷⁴). He defines trappers as twelve to fourteen, drivers as stronger twelve to fourteen year olds, putters as fifteen to twenty-two or twenty-three, and hewers from twenty-three onwards.¹⁷⁵ Church additionally claims it was customary for hewers to move out of that occupation should they reach fifty-five, to less physical work.¹⁷⁶

Kirby records twenty-one different occupations in his database (including those aforementioned)¹⁷⁷, but it is these four which this study focusses on. Most existing quantitative studies have focussed only on hewers’ wage rates¹⁷⁸, even going as far to exclude “putter-hewers”¹⁷⁹. This study is more expansive, considering more occupations. Hewers and putters have been included for the most obvious reasons. They were integral to the mining process, and constituted the majority of workers. Additionally, they were the central workers to the Pitmen’s Bond¹⁸⁰, which governed the terms of labour throughout the Northern coalfield.¹⁸¹ They were also paid by a piece rate, meaning that their incomes were potentially the most varied during this period. Drivers and trappers are included as they provide an insight into the types of work and the potential earnings of child labourers, and were also included in the binding process on many occasions.

The main task of this study has been to arrange the existing wage entries (containing all of the information listed above) into employment histories of

¹⁷¹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 194.

¹⁷² Colls, *The Pitmen of the Northern Coalfield*, viii.

¹⁷³ *Ibid.*, ix.

¹⁷⁴ A “viewer” was the manager of a colliery, who usually reported directly to the owner. His main concern was the day-to-day operation of the mine. See; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 66–67.

¹⁷⁵ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 195.

¹⁷⁶ *Ibid.*, 203.

¹⁷⁷ Kirby, “Productivity and Household Economy in a Tyneside Mining Community, 1774-1867.”

¹⁷⁸ see, for examples Colls, *The Pitmen of the Northern Coalfield*, 49.

¹⁷⁹ Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 966.

¹⁸⁰ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 260.

¹⁸¹ Colls, *The Pitmen of the Northern Coalfield*, 45.

individual workers. These entries are all contained in Kirby's data set, arranged chronologically. Whilst this provides an excellent snapshot of the pay and productivity in a mine in any individual fortnight, it fails to indicate long running trends concerning individual workers. To assess the movement of workers' wages over the year (and in subsequent years), it was necessary not only to identify their ongoing earnings, but also any work in other occupations which boosted their usual income- lower earnings in one fortnight could be accounted for by time being allocated to another occupation. This study has therefore built upon Kirby's work by constructing these employment histories for a sample of workers selected from this data set. The runs of data have also been separated by Bond year, rather than simply calendar year, as it was these dates for which earnings would be governed by the same contract. For the years of the Monthly Bond, calendar years have been used. The entries for each fortnight in an individual's Bond year were then used in the calculation of average earnings and standard deviations of earnings.

Unfortunately, the records themselves do not cover all workers at Wylam as records for all seams and pits have not survived. However, this should have no more of an effect than sampling the surviving records themselves. Despite the rich nature of these data, they are not completely continuous. This could be for several reasons. Firstly, wage entries could be missing due to workers being on strike. This occurred particularly widely in 1831-32 and 1844 when there were coalfield-wide labour movements and co-ordinated strike action.¹⁸² Whilst the employment of strike-breakers may have meant that the colliery was not forced to cease production, the usual roster of hewers would be absent and gaps in their employment histories would appear.¹⁸³ Secondly, some of the wage records have not survived or been transcribed. This means that we have no record of some seams at all, and we lose track of miners should they move into one of these seams, as frequently occurred. Workers also appear to have picked up shifts in other capacities on a relatively frequent basis. Due to this habit, it is also possible that records of a portion of some workers earnings may have been lost. As this was on an ad hoc basis, it should not seriously affect the results as this probably

¹⁸² Ibid., 92-98, 296-301.

¹⁸³ see, for example *ibid.*, 95.

accounted for a relatively small amount of consistent earnings. There are occasions where a worker is listed with a pit but no seam in the records, but very rarely the reverse.

The Bond year 1836-1837 is the most problematic. This is at the very beginning of our wage series, and contains fewer entries due to the loss of records. As will be discussed in the migration section, this has resulted in an over-estimation of new workers in 1837-1838. However, this does not necessarily detract from other measures for that year- for example, average wage levels should still hold validity. The sample size is far bigger in subsequent years, but does not exceed 56 entries for hewers in any year. The sampling procedure means that if any hewer was included he would also feature in any subsequent years he worked.

An additional issue was the practice of working in a ‘gang’ or with ‘partners’. Here, only the lead name was recorded in the paybill. In the case of hewers working with partners, it has generally been assumed that the partner was a family relation who was been taken into the mine to learn the trade, and the income was all going into the same household anyway.¹⁸⁴ Whilst there undoubtedly would have been exceptions, there appears no other way of dealing with this problem bar excluding these data entirely. Identifying these fortnights has been difficult, but a judgement has been made based on their relative levels to other fortnights (especially those in close proximity) and average earnings as a whole. Employment histories containing entries of this nature have been clearly marked in the data, and excluded from calculations.

For those working on miscellaneous tasks in a gang, the issue becomes more problematic. There appears to be no way of distinguishing which workers took part other than the named payee. These entries have therefore been excluded from calculations concerning average earnings. They have been retained in the employment histories for the purpose of investigating the secondary employments of workers. Whilst it is unfortunate to exclude wage data on a

¹⁸⁴ Church talks of fathers hiring their sons as a “mate” to teach them to work in the pit, and Colls argues that the craft in the Northeast was taught by family or friends. See; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 231; Colls, *The Pitmen of the Northern Coalfield*, 11.

selective basis, including gang working in the earnings of one individual would unnecessarily elevate the average earnings for that individual in the given year, and present false results. Whilst this has resulted in the individuals' earnings being obscured, his wages for other fortnights allows us to calculate his income were he to have worked the entire year in his normal capacity.

A further issue evolved by strictly assigning a worker to an occupation- workers were often involved in other occupations in the colliery in addition to their main employment. For example, young boys often worked the 'switches' in addition to trapping. In these cases, earnings outside of their primary occupation have been retained in the dataset. This is in order to capture an accurate reflection of the types and amount of work available to miners during this period. To ignore additional income purely because it fails to fall into an assessed category would misrepresent the earnings of workers during this period.

Additionally, this study makes use of the 'Pitmen's Bond', which governed the terms of employment in the mines during this period. The Bonds contain information on piece rates in each year, the rights provided to workers, and the costs and fines which they were required to comply with throughout the year. The Bond guaranteed that any individual who signed it would remain in the employ of the colliery to which he was contracted, unless meeting certain conditions specified by the terms of the Bond itself. They provide a valuable insight into the labour relations of the period (including the rights which everyday miners were able to attain), some of the fixed costs of working in a mine (along with the standard pay-rate, even if this was then influenced by productivity) and the structure of labour in the coalfield. Wylam's Bonds survive from as early as 1794. They are sporadic until the beginning of our period of study. They then run continuously from 1837 until 1844, when they ceased to be annual documents upon the introduction of the Monthly Bond. Wylam has two examples of the Monthly Bond; on its introduction in April 1844, and February 1847. We then see the introduction of a semi-annual Bond in April 1856, and the return of annual bonding in April 1857. This runs until the end of our study in 1862. All of this information is presented in Appendix One.

Miners could be imprisoned for breaking their Bond.¹⁸⁵ These documents were usually re-negotiated on a yearly basis, but became monthly contracts from 1844 until they were reinstated- at the behest of the miners- in the 1850s.¹⁸⁶ The signing of the Bonds, or ‘binding’ of colliers, underwent changes over the period of this study; moving from an alcohol fuelled event to a more professional and respectable process by the mid-1800s.¹⁸⁷

The date of the binding determined whether the miners or the owners held the power over negotiations. Bindings in high demand seasons (such as October) meant that the workers were able to exert considerable pull over the terms of the Bond, but spring or summer bindings placed this power the hands of the mine owners and their viewer representatives.¹⁸⁸ However, this was not the only consideration- the 1810 strike was due to owners wanting to move the binding from October to January, finally settled by the workers agreeing on April.¹⁸⁹ By moving the binding to after the season of peak demand, the workers appear to have sacrificed much of their power in negotiations- even a January binding would have meant a greater demand for coal than an April one. Therefore, there must have been some other motivation; Colls argues workers did not want to be taken away from their families (the binding process often involved workers spending several days in Newcastle) in the peak of winter.¹⁹⁰

Generally, as demonstrated by the dates of Wylam’s Bonds (see appendix), bindings occurred in April during our period. These were frequently the opportunities that workers took to strike. By refusing to sign a new Bond, a worker protected himself from the legal ramifications of breaking his contract, and at the same time exerted his influence over the colliery owners. For this to be effective mass actions were required, and due to the cross-coalfield nature of the Bond (and its attempts at standardisation) this necessitated miners across the Northern coalfield to act in a unified manner. This necessitated the development,

¹⁸⁵ Colls, *The Pitmen of the Northern Coalfield*, 68.

¹⁸⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 260–261.

¹⁸⁷ Colls, *The Pitmen of the Northern Coalfield*, 104.

¹⁸⁸ *Ibid.*, 64.

¹⁸⁹ *Ibid.*

¹⁹⁰ *Ibid.*, 82.

organisation and administration of coalfield-wide labour movements.¹⁹¹ It also meant that owners could try and break strikes by offering terms to individual collieries which would entice them back to work. This was especially effective during long strikes when workers were at the point of exhaustion. Of course, it also had the adverse effect of breaking the united nature of the owners and allowing some workers to win preferable terms.¹⁹² Indeed, in one case workers were able to win the desired terms in individual collieries, return to work, and use their pay to fund friendly societies for workers at other collieries still on strike.¹⁹³

It was common practice for a colliery to provide ‘binding money’ as an incentive for workers to sign a Bond during this period.¹⁹⁴ Flinn’s work indicates this reached a peak in 1804 as a result of the Napoleonic Wars drawing men from the workforce.¹⁹⁵ However, Colls’ research demonstrates that by the period of the present study binding money had generally been reduced to a relatively nominal amount- around 1s.¹⁹⁶ This has therefore reduced the need of the present study to account for such income. Whilst different men signing at different times were paid differing amounts¹⁹⁷, the effect of this amount of money on annual earnings would be very minimal.

Piece rates were negotiated at the yearly binding. They varied from colliery to colliery¹⁹⁸, although there were attempts towards the middle of the nineteenth century to standardise rates throughout the coalfield. This was successful in the rates of putters, drivers and trappers¹⁹⁹, but not so for hewers.²⁰⁰ Hewers’ piece

¹⁹¹ Ibid., 101–102.

¹⁹² Ibid., 91.

¹⁹³ Ibid.

¹⁹⁴ Ibid., 48.

¹⁹⁵ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 344.

¹⁹⁶ Colls, *The Pitmen of the Northern Coalfield*, 85.

¹⁹⁷ Ibid., 49.

¹⁹⁸ Ibid., 45–46.

¹⁹⁹ Drivers and trappers were paid by a daily rate, meaning this was easier to set throughout the coalfield. Their tasks were far less influenced by productivity, unlike hewers, meaning their earnings were far more standardised to begin with. Younger workers (who typically fulfilled the roles of drivers and trappers) also held less power than their older counterparts, meaning they were less able to resist these changes. Putters were also younger workers, and their piece rates were based on distance, rather than production. Their pay was also less affected by the varied conditions between different collieries than hewers.

²⁰⁰ Colls, *The Pitmen of the Northern Coalfield*, 85, 99.

rates could also vary within the colliery for the type of work undertaken. Working 'in the broken' could generally attract higher rates due to its added danger.²⁰¹ The Bonds have been used to gather these piece rates for each year at Wylam colliery. These are useful for several reasons. Firstly, miners did not have the luxury of hindsight. In other words, they could not calculate how much they would be able to earn in a year, as this varied significantly due to a number of factors in the mine.²⁰² They therefore would judge the attractiveness of opportunities based on the piece rates they were offered. Secondly, piece rates provide a rough guide to labour relations in each year- a suppression of piece rates would suggest the ownership gaining power, and an increase, the reverse.

Using piece rates to try to calculate wages is problematic, as there were too many unknown variables- such as working in the broken or wet work (which yielded different rates), fines (which deducted earnings for supposed poor workmanship) and costs (such as pick sharpening or buying gunpowder). This means we should be cautious about using changes in piece rates to explain trends in wages and migration. However, as previously mentioned, they were the only guide which the average hewer had. Used in conjunction with our knowledge of average wages for the year as a whole, they can help to explain changes in wages and the actions of some workers- such as moving away from the mine in search of more valuable work. This has impacted on our analysis of migration.

The Bonds contained many rights which might seem out of place in the conditions of a nineteenth century coal mine. Clauses guaranteed workers a minimum income per fortnight. This has been investigated in relation to the seemingly low average earnings of hewers in our research. Housing was also frequently mentioned in the Bonds. Whether this was at the expense of the colliery or the miner, hewers were entitled to colliery housing, sometimes being compensated if they took lodging elsewhere. The condition in which this housing was to be kept was also agreed upon. The literature has not been kind to the standard of colliery owned housing during this period, and has criticised it for

²⁰¹ Jaffe, *The Struggle for Market Power*, 62.

²⁰² Earnings were determined by piece rate (which could differ between seams in the same colliery), fines, and deductions (such as candles or pick sharpening). See; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 556–558.

problems with sanitation and access to water.²⁰³ However, it was viewed by colliery owners as a vital means for maintaining control over their workers²⁰⁴, and must have factored in decisions such as migration for the average miner.

Access to medical care was also established, although data from the paybills indicate miners were required to make fortnightly contributions to its cost. This was constant throughout the period at 6 pence per fortnight. Bonds do not mention 'Friendly Societies' as these were worker led organisations, designed to aid those in need due to illness or injury, or in more extreme cases those on strike. However, it is likely that most miners did make contributions from their fortnightly wages to these societies.²⁰⁵ Ideally, further investigation would have been undertaken into societies with the aim of discerning which hewers from Wylam might have been members. However, the relatively minor influence contributions had on fortnightly wages means it would not have drastically affected income. Membership of Friendly Societies may indicate a certain ability to provision, and therefore imply a certain standard-of-living, but they should be seen in the overall context. The uncertainty surrounding the availability of work in the coal industry meant that families required some form of income stream during work stoppages or strike action, as occurred on a relatively frequent basis. Therefore, whilst membership of such organisations may well reflect standard-of-living, they should be seen as having greater economic necessity in the coal trade than in other industries.

The report of the 1842 Commission lists contributions to friendly societies as around *1s.3d.* per month²⁰⁶, (7.5 pence per fortnight). This is not enough to significantly change our understanding of monthly expenditure, but this value gives us an idea of the potential amount of earnings allocated to these types of organisations. We have also investigated the effects of unions on earnings through an evaluation of restriction, and how much of an issue it was in the productivity of hewers, by comparing the daily rate of restriction to the earnings

²⁰³ Ibid., 606.

²⁰⁴ Ibid., 280, 601.

²⁰⁵ Colls, *The Pitmen of the Northern Coalfield*, 132.

²⁰⁶ Great Britain. Parliament. House of Commons, *Children's Employment Commission- First Report of the Commissioners- Mines, 1842. Appendix One. [electronic Resource]*. (Cambridge eng: Proquest LLC, 2006), 536.

of individuals. Other deductions were taken from hewers' earnings in this period, such as compulsory contributions for a colliery school from the 1840s.

The Bonds also clearly set out the fines to which a hewer could be subjected during his employment. With the autonomy of the worker at the coal face, it was a means of maintaining control at the source of production.²⁰⁷ Fines could be levied for a variety of reasons. Larger chunks of coal were seen to be more valuable than smaller chunks, and therefore fines were imposed should a hewer not produce coal of a reasonable size. If there was a particular proportion of 'chaff' or rotten coal in a corf, then the hewer would not be paid for that tub.²⁰⁸ A frequent objection of hewers was that they could be fined for light tubs, when the coal had been lost after it had left their possession- in the transportation by the putters or drivers.²⁰⁹ These fines have been accounted for in calculations of hewers' wages in some of the literature, but awareness of them is relevant to not just the level of income of a hewer, but also the relationship between owner and worker.

Unfortunately, whilst we can account for the cost of the various benefits in the paybills, this is not possible for fines. These were deducted from the hewers' wage, and not listed as a separate value in our data. Whilst this is problematic for assessing the impact of fines, it does mean that the wage values calculated by this study more accurately represent the income of mining families, by accounting for these deductions in overall earnings.

In summary, these data are unique in many respects. Their detail provide us with a rare opportunity to track the earnings of workers not only on an annual but on a fortnightly basis. This allows us to investigate how fortnightly fluctuations in wages might have affected standard-of-living. It also allows us to evaluate how large those fluctuations might have been, and how regularly they occurred. We can also assess if it affected particular occupations more heavily than others. The range and depth of occupations contained in the data provide a rare opportunity.

²⁰⁷ Jaffe, *The Struggle for Market Power*, 65.

²⁰⁸ Colls, *The Pitmen of the Northern Coalfield*, 64.

²⁰⁹ Jaffe, *The Struggle for Market Power*, 65–66.

This allows us to move away from the practice of the literature to comment only on the earnings of hewers, and move into the realm of the family economy. Named data in conjunction with these occupations can allow us to start reconstructing families, and assess how important the family unit was to the mining industry. We can then use data concerning average family size, in conjunction with the average earnings of different occupations, to discover what the annual income of a mining family might have been. Additionally, the use of employment histories lets us compare the earnings of different hewers over different periods, with the aim of establishing the amount of skill or luck in determining hewers' wages.

Methodology

The data have been sampled, reducing the original investigation to around 30,000 entries. The data were selected by surname, in order to include all paybills for an individual. All entries for A, C, E, G, I, J, K, M, O, R, T, V and Y were originally included. There were no entries for Q, X or Z, meaning sampling pattern was altered. Where misspellings, names queried by the transcriber or transcription errors occurred, a judgement was made to place the entry in the most suitable category. For example, a name originally transcribed as 'Arnting [Errington]' was assumed to be part of the earnings of 'George Errington' and moved accordingly.

Data were then grouped into those entries which were under the same name. Some discretion was used here; for example 'Wm' and 'William' were assumed to be the same unless the pattern of wage entries indicated otherwise- for instance, one person working in the same occupation 60 years apart was considered to be unlikely. Groupings were then separated into individual workers, if there were multiple men with the same name. This required individual analysis of each entry. This was not as simple as it may appear, and the most frequent complications shall now be discussed.

Firstly, transcription errors occurred in the digitalisation of these data. Whilst some mistakes immediately appeared as a discrepancy, others were not so self-evident. For example, a series may seem perfectly normal, with various gaps, with the first name 'Jos' (Joseph). However on combining this series with one of the first name 'Jas' (James) and the same surname, occasional entries fit better in the other series to which the name might suggest (either by the pit and seam in which the worker was employed, the occupation undertaken, or if one series had multiple entries for the same fortnight). If entries seemed to perfectly fit in a different series, then it was assumed an error had occurred, and the entry moved. It has not been possible to check all of these entries against the original documents, but a sample were found to confirm these assertions.

Additionally, problems occurred when a father and son worked together in the mine. Frequently, they would work in the same pit and seam, often both as hewers (there was only one occurrence of a father and son working in another occupation, as men usually became hewers in their early twenties). In many cases the records indicated 'Jr' and 'Sr' (or some other variant) but where this was not the case other identifying factors were sought; for example one of the men may consistently have taken 'Fire coal' (charged against his name in the pay book) identifying him from the other. If no identifying factor was found then paybills were assigned in a manner which reflected identifiable earnings- if one man was seen to consistently earn more than the other, then unidentifiable earnings were assigned in the same way, if earnings were consistently similar then the paybills were assigned in a way which would reflect this also. This may have had the effect of removing some of the variation in the data from the two entries, but this technique was seen to preserve the initial trends as much as possible, and therefore was deemed to be the most suitable manner in which to process these data. We have therefore been able to construct highly detailed employment histories of individual workers throughout the years of our wage series, and evaluate the fluctuations in their fortnightly wages, as well as their absolute wage levels.

When a father and son were not working in the same pit or seam, no such textual indicator was noted. This caused problems for tracking the movements of hewers

after the drawing of lots and odd shifts being taken in a different seam. These paybills were assigned based on any discernible patterns- which may have caused some entries to be assigned incorrectly, however this should effect a relatively small number of entries. A similar problem arose when one also had a paybill for another occupation. Here it often became impossible to determine who had completed the work. Unless patterns in the data indicated otherwise, the procedure was therefore to assign the multiple employments in such a way as to equalise earnings. Again, this would have created some errors, but these should be relatively minimal. Additionally, in this scenario the income should have still all been going to the same family.

Frequently it was found that one of a father and son would eventually drop out of the wage records. This could have been because of death, incapacitating illness, moving on to other employment or retirement. Without analysis of parish records or census information it is almost impossible to determine which of the men this might have been. For the purposes of this study it was assumed that 'Jr' continued his employment in the mine. This is by no means a perfect assumption. Similarly, if 'Jr' could not be tracked in his progression to a hewer it was assumed that his father was the first worker. Whilst these assumptions may mean that the exact history of each employee may actually be a composite of two employees (the father and the son), at this stage family histories are not being reconstructed and therefore this would have a minimal effect on wage trends.

At this point, it became necessary to further refine the sample. This was done by evaluating the representativeness of the runs of data. The fewest possible weeks in a period was thirteen (for semi-annual Bonds), with a maximum of twenty-six (for annual Bonds). If a run of wage data failed to cover five fortnights for an individual, the sample was deemed too small and the worker excluded. For shorter Bond periods, this minimum of five entries was still maintained. Weaknesses of these data have been identified and included in the analysis.

The spread of data was then evaluated. It became clear from this analysis that the sample included far more entries from the latter portion of the period than the earlier, with a large gap between the two groups of data. The decision was

therefore taken to refine wage analysis to the period of the late 1830s to the early 1860s. As most of our other avenues of investigation were dependent upon this wage data, they were also restricted accordingly. However, it was felt important to place this period in the overall picture, and so this has been done wherever possible. This reduced the present sample to around 16,000 entries.

Analysis of the Pitmen's Bonds was also undertaken. Each year the worker and his occupation were recorded, and transcribed by Kirby²¹⁰. Having taken Kirby's entries, we have assembled them into employment histories of individual workers. Clashes demonstrated men with the same name working that year. This was then cross-referenced with the wage histories to ensure paybills had been divided correctly. Kirby's transcription included the years of the Bonds, but not the dates they were valid between. A timeline of Wylam's Bonds was therefore established from the original documents (see appendix).

During this process, the Bonds of most men corresponded to the occupation they fulfilled in the paybills. However this was sometimes not the case. This could have been either because the wage and Bond entries were in fact two different people, or the man in question did not work the job he signed to do. We assert the latter. Firstly, taking *some* work in other occupations was common practice- this will be later demonstrated by this study. We find junior workers would fill in if a man was taken sick, injured or absent. Therefore, should an incident occur- for example a death- it is likely a junior worker would take his place.

Additionally we know men were prepared to undertake other miscellaneous work, should they deem it profitable. Therefore, should a man find more attractive work elsewhere in the mine, it does not seem a stretch for him to simply cease his original task. Finally, the labour Vend limited the number of hewers a colliery could bind. Employing other workers (or unbound labourers) in a hewing capacity could circumvent this system, and increase output. The system of vending labour itself, this was always secondary to the vending of coal, designed to control binding money more than anything else. Additionally, whilst the coal Vend was usually adhered to, preventing the movement of labour was

²¹⁰ Kirby, "Productivity and Household Economy in a Tyneside Mining Community, 1774-1867."

not well enforced, and was ignored when it suited colliery owners after its introduction in 1805. By the period of our study, this agreement had become obsolete.²¹¹ The labour Vend therefore had a limited impact, but collieries could still employ unbound labours at times when they needed to increase their output.

Usually if a man had pay entries but no Bond, it was because the Bonds for that year do not survive or remain un-transcribed. With the establishment of Monthly Bonds from 1844 until 1854, very little data is present in the Blackett records. It was also common for men to have Bonds for years for which they did not have accompanying wages. This was due to the loss of records for many pits of Wylam.

Having used the Bonds and paybills to reconstruct individual employment histories, the average wage of each worker for every individual Bond year was calculated. This was done by dividing total wages earned by the number of fortnights present for each worker, to give a 'wage per fortnight' total. Fortnights of zero earnings were included to preserve the uncertainty of wages. Further calculations were then made in order to produce the following:

1. Average earnings for each worker based on each Bond year (in the period of Monthly Bonds, the calendar year was used).
2. The standard deviation of each individual's earnings throughout this year (in other words, how hewer's wages fluctuated over the year).
3. The average earnings for each occupation in each Bond year.
4. The standard deviation of average earnings for each occupation in each Bond year (for example, how deviated the average of an individual hewers' annual earnings were from the average of all hewers over the same period).
5. The average standard deviation of earnings for each occupation in each Bond year (how much, on average, a miners' wage would differ from the average each fortnight).

²¹¹ Colls, *The Pitmen of the Northern Coalfield*, 79; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 356; Jaffe, *The Struggle for Market Power*, 76.

6. The standard deviation of the standard deviation of earnings. Whilst point two demonstrates how varied an individuals' wages were over a year, this measure captures how much this variation varied.

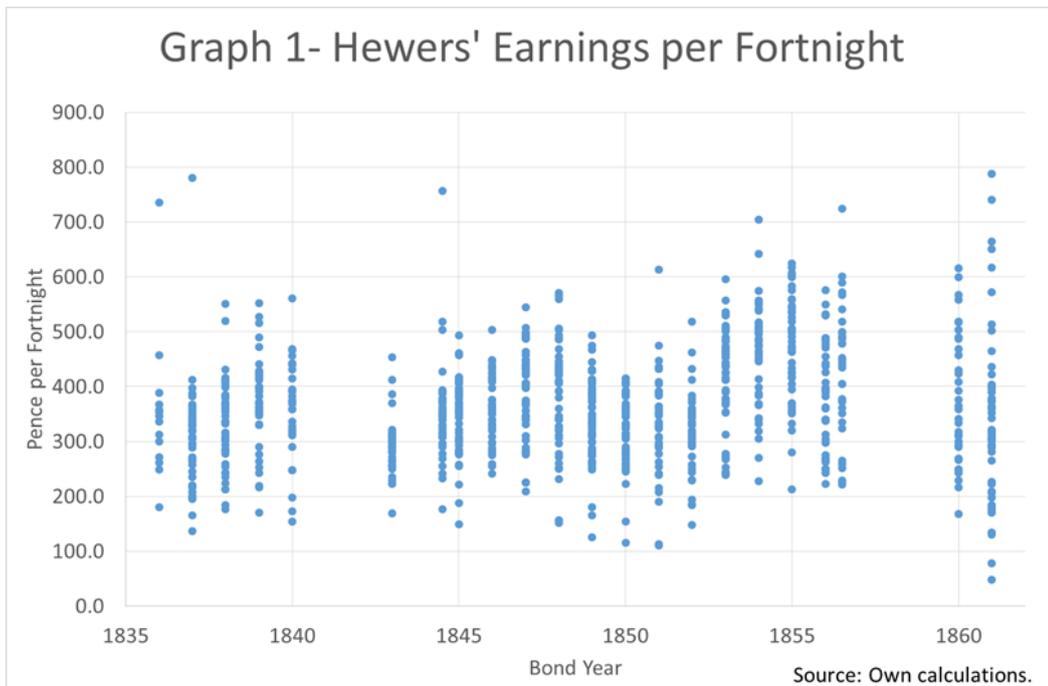
Whilst the aforementioned calculations have provided the majority of the data for this study, it has been necessary to quantitatively investigate other factors such as migration and skill level. Specific methodologies have been included in these sections in order to make it easier for the reader to place them in context.

Analysis

The General Pattern of Wages

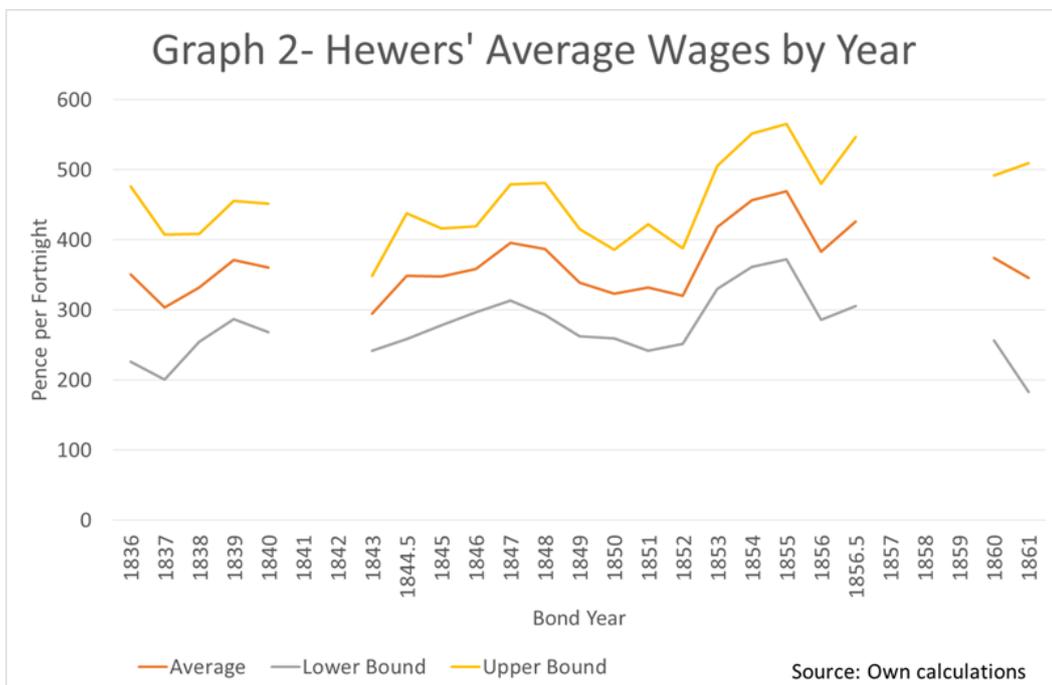
The first section of our analysis considers the general pattern of wages throughout the period of our data for hewers, putters, and other occupations. It looks to establish the general trends, and explain why these may have occurred.

Hewers

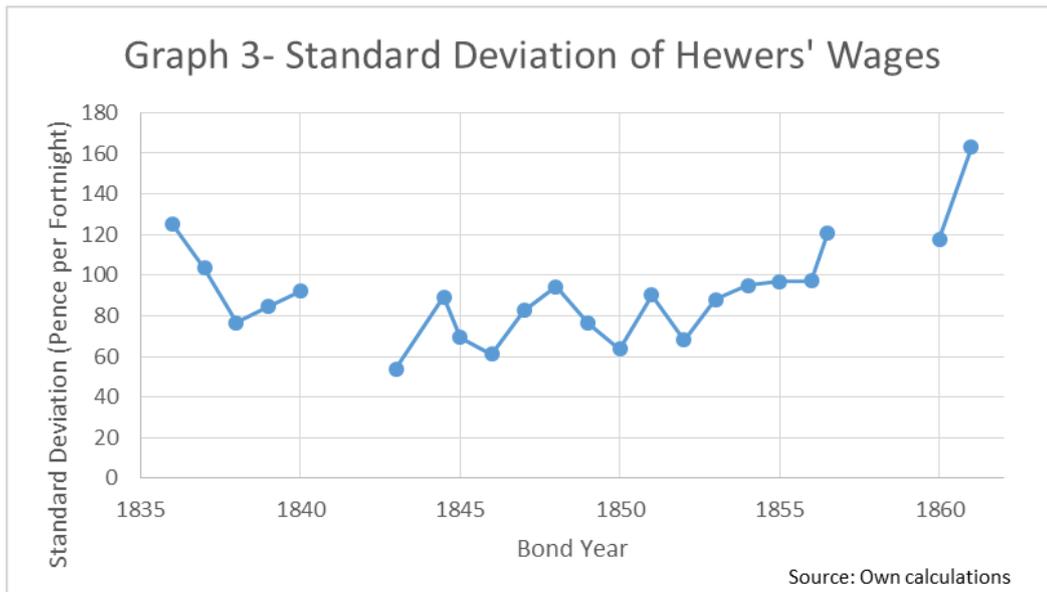


The first question for any wage study is usually 'is there a trend over time?' In this case, the answer is 'yes, but not a strictly linear one'. *Graph 1* shows the raw

scatter plot of all average wages by year for hewers. Wages climb from the first year (1836-1837) until 1840-1841. There is then a gap, but when we re-join the series in 1843-1844 it has dropped to its lowest level. It then climbs again from 1843-1844 until 1847, then declines until 1852. It then climbs until a peak at 1855, where it begins falling again. There is another gap in the data from 1857 until 1859, but when it re-appears in 1860-1861, it is declining again, although the clustering is far less close. This shows that the general level of wages fluctuated throughout the period of the late 1830s to the early 1860s, which would be missed by simply aggregating results at various intervals.



An examination of average wages further illustrates this trend. This is plotted (with upper and lower bounds of one standard deviation from the mean) in *graph 2*. The average wage fluctuated from 295 pence per fortnight (in 1843-1844) to 469 pence per fortnight (in 1855). From *graph 3* we see the standard deviation of these wages decreased in the early part of the period, and increased from 1852 onwards. This shows wages initially became less, and then more, varied. Average wages still show a clear cyclical trend; rising and falling over time. This tells us much more than simply comparing our first and last estimates. Indeed, the average of 351 pence per fortnight in 1836-1837 compared to the 346 pence per fortnight in 1861-1862 would lead us to believe wages were static throughout this decade-and-a-half, whereas we present evidence to the contrary.



There are several important questions here that warrant further examination. Firstly, why might the overall level of hewers' wages have remained stagnant between 1836 and 1862? Secondly, why might they have undergone cyclical fluctuations over several years? Thirdly, why were they more divergent at the end of the period? Whilst they are all interlinked, let us consider each in turn.

The main working cost of the coal industry was wages,²¹² which therefore had to be reduced as much as possible, in order to maximise profits. Unionised miners had won strike victories in 1831, only to feel the full wrath of the owners in 1832, and the following depression of wages. Strikes in 1844 ended in defeat for the miners, leading to the introduction of the Monthly Bond.²¹³ By this point, the owners- wary of the now national mining trade union- wanted the ability to change the terms of work at a months' notice and the tighter control over the workforce such power provided.²¹⁴ The workers favoured a six-month Bond, which would put them in a better negotiating position, along with various guarantees and insurances on their work.²¹⁵ With the victory of the owners, it is unsurprising wages failed to gain ground over the later-1840s, although more favourable terms in the 1847 Bond did cause temporary wage increases in the

²¹² Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 501.

²¹³ Colls, *The Pitmen of the Northern Coalfield*, 92-98, 296-301.

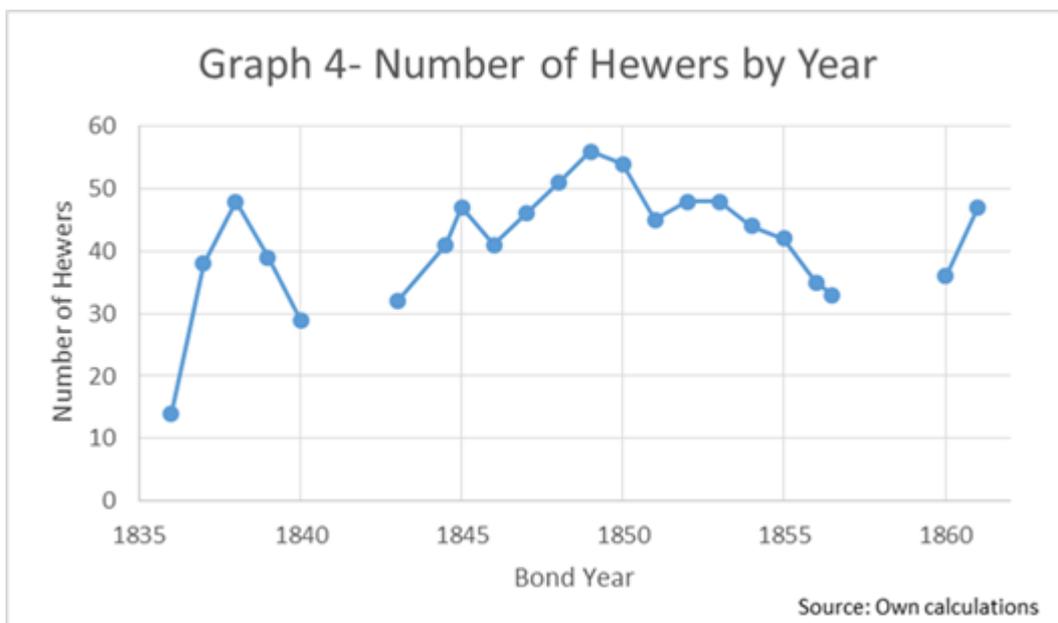
²¹⁴ *Ibid.*, 71, 73.

²¹⁵ *Ibid.*, 100.

middle years of the decade (before the supply of labour increased).²¹⁶ At Wylam, we only have two records of these Monthly Bonds- April 1844 (at its introduction) and February 1847. We do not know whether these are the only copies to survive, or if they were simply renewed every month.

Colls claims that the Monthly Bond lasted until 1854²¹⁷, but the first record after the Monthly Bond at Wylam is the introduction of a semi-annual bond in April 1856. The end of the Monthly Bond demonstrates a change in the respective power of owners and workers.²¹⁸ The strength of worker power in the 1850s coal industry²¹⁹ can account for the rise in wages during the early 1850s. Indeed, if we were to finish our analysis in 1856, we could conclude that the average wage had risen to 426 pence per fortnight, and workers were enjoying an extra £8 annually. However, over the gap in our wage data between 1856 and 1860-1861, average earnings again fell. Whilst we may not have the wages themselves for this period, we do have the Bonds which set out the piece rates of hewers.

Examination of these sources shows the rates of hewers did not change in most seams (see Appendix Two), which indicates that there must have been some other driver which determined wage levels. There are two explanations for this; either the colliery produced less coal in these years or there were more hewers



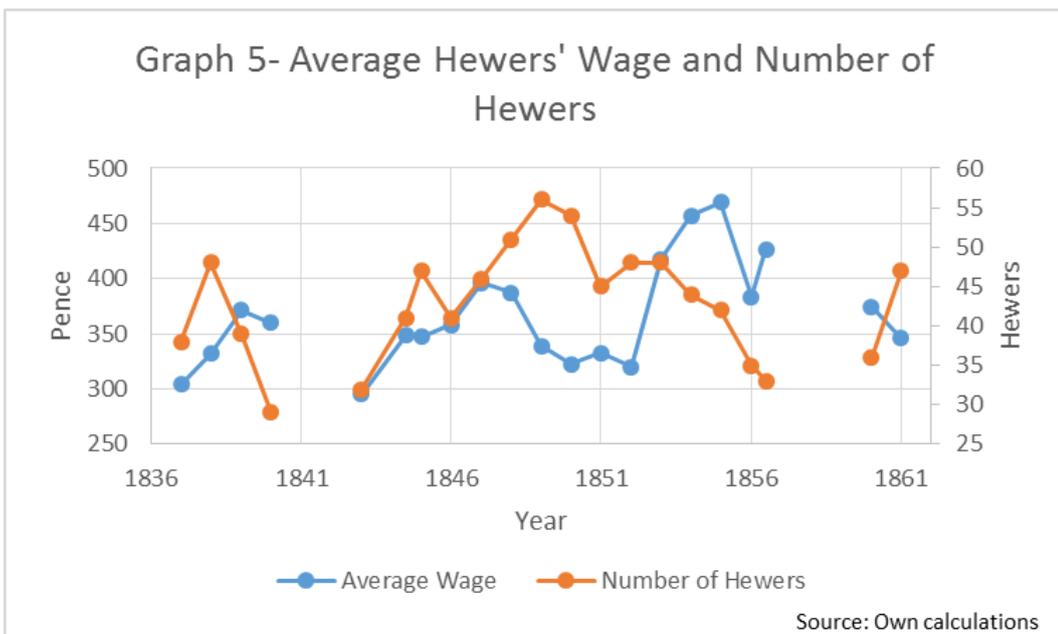
²¹⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 234.

²¹⁷ Colls, *The Pitmen of the Northern Coalfield*, 109.

²¹⁸ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 678.

²¹⁹ Ibid.

employed- both meaning hewers were more inactive. *Graph 4* shows that in our sample the number of hewers does increase between 1856 and 1860-1861, and 1860-1861 and 1861-1862. This suggests there was less work available due to a greater availability of labour. *Graph 5* shows the average wage of hewers and the number of hewers in each year. It demonstrates that from 1847 these two factors tended to move in opposite directions; an increase in the number of hewers generally corresponded with a decrease in the average wage (and vice versa). This further supports the idea that labour supply influenced the average wage. This trend also fits with data from the late-1830s, apart from the number of hewers in 1837. This is likely a sampling problem. For the period 1843-1846 this trend does not appear to be present, but this is exacerbated by the 1843-1844 entry, which was influenced by strikes. Overall it appears that available labour and average wage were certainly related.



Secondly, we must attempt to account for the cyclical fluctuations. This is closely linked to the determining factors of wages over the longer term- the relationship between workers and their employers. Piece rates again would seem to be the obvious cause, as there were minimal changes for some seams in the colliery, primarily in 1844, 1847 and 1856 (see Appendix Two). However this does not explain these changes in wages- the pattern which they follow is not mirrored by the piece rates. Again, this could be a question of colliery output. If Wylam produced more coal in some years, then more shifts would have been

available. Whilst- as has already been discussed- this was also tied to the amount of labour available, the general pattern of output was not as turbulent as that of wages (see Appendix Three). This indicates that cyclical fluctuations were not the outcome of only one factor- a combination of colliery output, piece rates, and available labour all helped to dictate wages. Ultimately all of these factors were linked to the relationship between management and labour.

Finally, we consider the divergence in the earnings of hewers. This occurs towards the end of our period, but unfortunately due to gaps in our wage series, the development of this trend is difficult to identify. Colls claims that by the 1850s the workforce had been de-skilled.²²⁰ Owners could not de-skill those workers already engaged in coal mining, but they were not required to enforce those same skills as a condition for entry to the trade. In this scenario, an influx of new workers from different industries could explain this divergence, with older hewers able to rely on their experience and out-earn their novice counterparts. However, this does not fit with Colls' timeline- as *graph 3* shows, the standard deviation of average earnings spikes upwards in 1860-1861/1861-1862.

However, an influx of labour may still explain this divergence. The number of hewers in our sample certainly increases in the early 1860s. Statistics for the output of the coal industry in the Northeast show a sizable jump between 1859 and 1860²²¹, which could only have occurred if the Northern coalfield was able to recruit more workers. Additionally, Church demonstrates that the Northeast was indeed drawing in workers from other industries during the 1860s.²²² Examination of the piece rates shows that from April 1856 until April 1862 there was no major change in the negotiated rates of hewers. There are limited changes in one of the five seams listed but the rate was actually higher in 1861-1862 than in 1856. This demonstrates that these new workers were not the result of surplus labour, as this would have resulted in a depression of piece rates. Therefore, as the workforce expanded, a greater proportion of it was made up of 'de-skilled'

²²⁰ Colls, *The Pitmen of the Northern Coalfield*, 102, 113, 114.

²²¹ B. R. Mitchell, *Abstract of British Historical Statistics*; (London, etc.; Cambridge UP, 1962), 115.

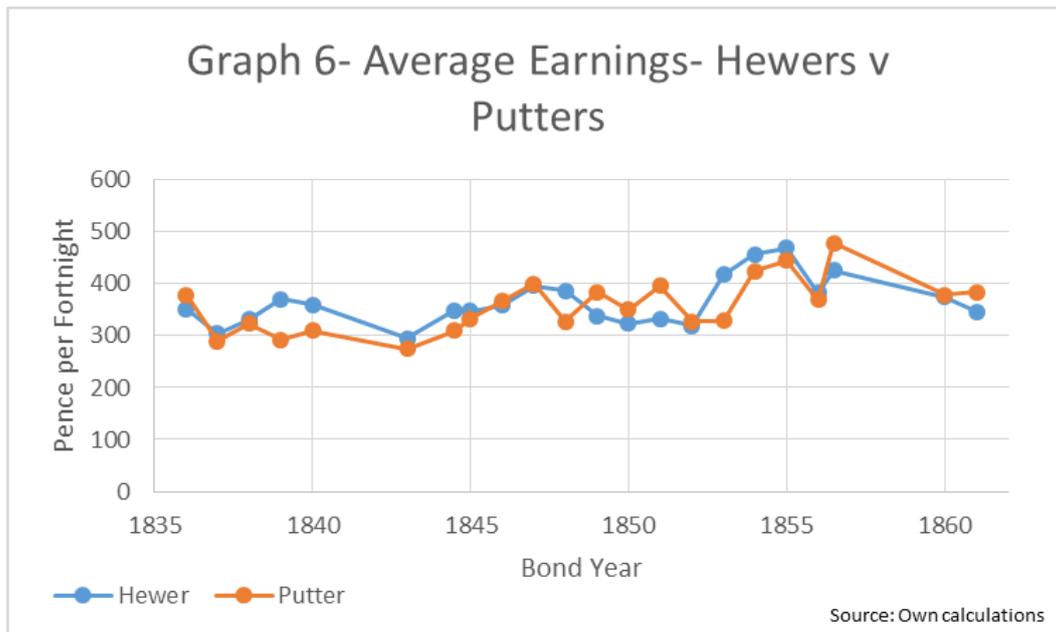
²²² Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 234.

labour. The coal industry was not able to recruit skilled pitmen; it had to train and development them. This meant that those new recruits to the coal industry took time to learn the trade and therefore we see a greater dispersion of average wages, as experienced workers were able to out-earn the new novice recruits.

Our findings with regard to hewers are therefore that wages at the start and the end of our series were of the same absolute level, but there were cyclical fluctuations throughout the period, which reached a high point in 1856. We conclude that these fluctuations were a consequence of the amount of work available, due to a combination of the number of hewers employed by the colliery, and the amount of coal which the colliery produced. We also identify that the wages of individual hewers became more varied at the end of the period, and suggest that this was due to the expansion of output in the Northeast, and the recruitment of unskilled labour that this required.

Putters

Returning to actual wage levels, putters appear to have followed a similar pattern, but with more drastic changes. Their wages still fluctuate, but appear to suffer a period of depression in the late 1830s and early 1840s. This was followed by a constant increase over the mid-1840s, to a peak in 1856, before falling in the early 1860s. Again, overall wages appear to have been stagnant over the period- at 379 pence per fortnight in 1836, and 384 pence per fortnight in 1860-1861. This appears to be roughly in line with the trend of hewers' wages. The increased magnitude of the changes could be due to the smaller sample size of these workers in our data, but more likely demonstrates an increased variance in the earnings of putters. There has been rather little quantitative investigation into the earnings of putters in the literature, but that they follow the overall trend of hewers is reassuring, and lends weight to our results



It is interesting to note the relative difference between hewers and putters wages. Whilst we shall see that there was a significant step up in earnings from driving to putting, the case is less so for putting to hewing. As *graph 6* shows, the calculated average wage of putters was closely comparable to that of hewers, the former even exceeding the latter in a number of years. Whilst this may initially seem like an error, there are several reasons for this being the case. Firstly, it is important to remember the methodological stand-point of this study. Hewers and putters were assigned as such by their primary occupation. As will later be demonstrated, many workers also took shifts in other capacities. This means that hewers may have also been working as putters at certain periods, and vice versa. The extent of this varied, but this study aimed to demonstrate that the ‘average hewer’ or the ‘average putter’ would not always have been employed in his primary occupation. Secondly, we must recall that these are the actual ‘take home’ earnings of these workers. This becomes especially relevant with fines. Hewers were harshly fined by viewers and overmen²²³- their complaints evident not least in their strike grievances of 1831, 1832 and 1844²²⁴- and we therefore may be seeing the impact of such fines. This becomes doubly important as putters were not subjected to such deductions for their workmanship.²²⁵ Unfortunately, as has previously been mentioned, it is not possible at present to

²²³ Colls, *The Pitmen of the Northern Coalfield*, 64.

²²⁴ *Ibid.*, 65–66.

²²⁵ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 378–379.

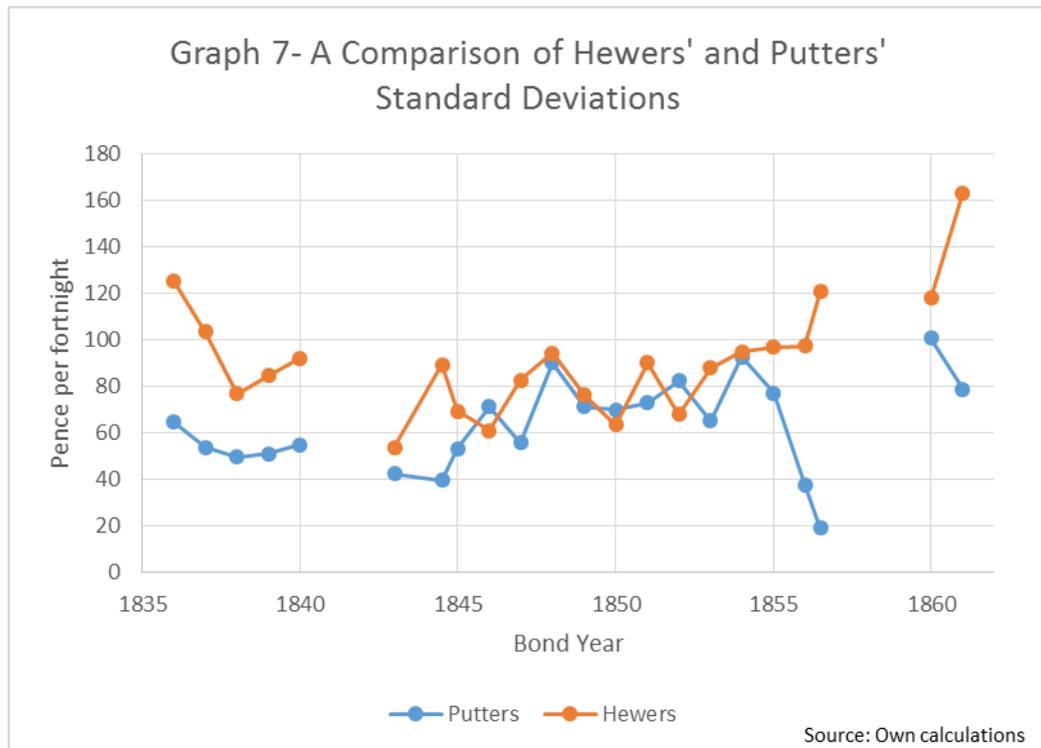
quantify the fines imposed on hewers. Whilst deductions for benefits such as medical care were compulsory (and quantifiable, at 6 pence per fortnight), others were optional (fire coal was taken only when required, and also charged at 6 pence), it is likely that the bulk of the deductions were due to fines. Thirdly, as this is a sample of the seams in the colliery as a whole it is possible that extra work for hewers has been lost. However this probably occurred in a minimal number of cases, and therefore should have little impact on our results.

The result of this is that hewers' and putters' wages were on a similar absolute level. Whilst putters were to some extent dependent on hewers (if there was no coal to transport, they were unable to earn any money), both worked on a system of piece rates. Changes to putters' rates were relatively minor and infrequent—rarely amounting to more than *1d* per tub. The most significant change was the distance which he had to transport coal in order to earn for each tub, and this occurred at Wylam in 1838-1839 when it changed from 60 to 80 yards.²²⁶ Additionally, the size of the tub the putter had to transported changed in 1844, when it became 20 rather than 16 peck (a unit of measurement where one peck equalled around nine litres). Much of the comparability between hewers and putters earnings can be explained by cross-occupational shift working. Later in this research we report our findings on secondary employment in the mine, but we are yet to quantify exactly how much of fortnightly income was typically attained in this manner.

This has drastic implications for the family economy. Putters were generally at the age where they would still be living at home, and therefore their income would still be going to their families as a whole. This means that the household may have had the equivalent of two or more adult male incomes, and therefore enjoyed a much higher standard of living than previous anticipated. For brief periods families may have had three or four of these incomes at the same time. Hewers' wages do not seem particularly high, so in order for Britain to enjoy a

²²⁶ A putters' work involved moving full tubs of coal from the face to the drivers (who would then transport it out of the mine). He was paid by the tub. For a description of putters' work, see; Jaffe, *The Struggle for Market Power*, 83.

‘high-wage’ economy (as suggested by more general literature²²⁷) ‘child’ labour would have had to have been a large contributor- which it seems to have been. This will be more fully discussed in later sections.



Additionally, the standard deviations of hewers’ and putters’ wages have been compared in *graph 7*. It should be observed that putters generally saw smaller deviations in their wages than hewers in the earlier part of the period (until 1845). From 1845 until 1854 levels of dispersion are remarkably comparable between the two occupations. Whilst the values for each of the semi-annual Bonds in 1856 for putters are very low in comparison to the rest of the series (likely due to the smaller size of the sample during those Bonds), the level of putters’ dispersion after 1855 does seem to be lower than that of hewers. Fines would have caused more variation in hewers’ wages than in putters’ (as more of the finable offenses applied to hewers’ work), and as putters were paid by the same rate no matter where they worked in the mine (whereas hewers’ rates varied) their earnings would likely have been more uniform. These factors point to the comparability of variation in earnings during the middle of the period as an oddity. If the distinction between a hewer and putter was looser during this period (due to cross-occupational shift working) then this might explain such a

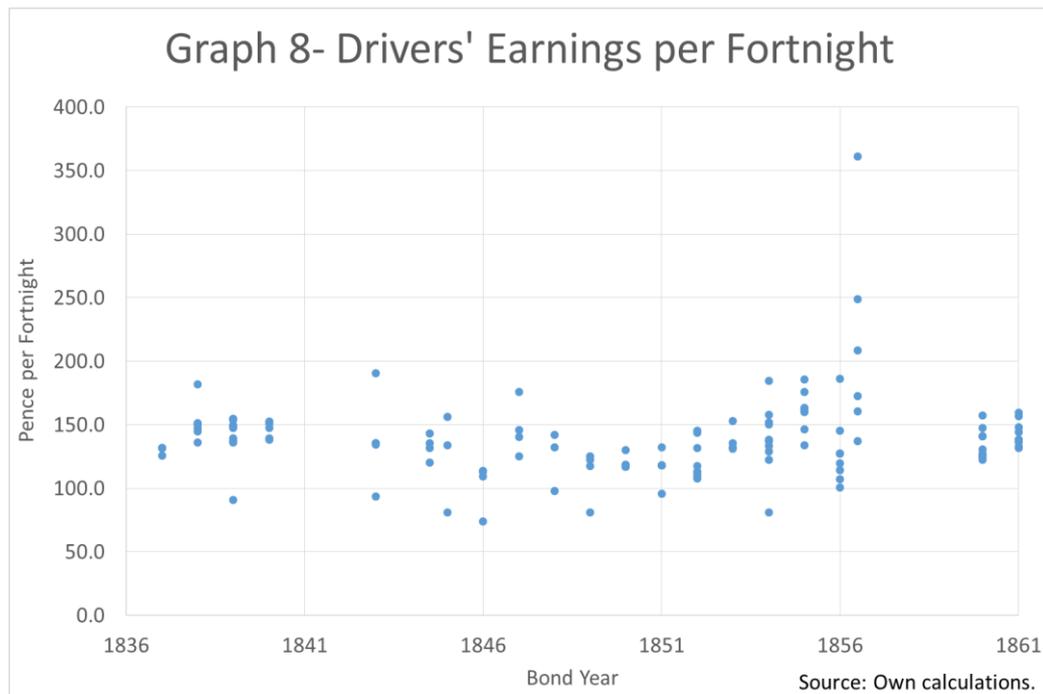
²²⁷ Allen, *The British Industrial Revolution in Global Perspective*, 137.

trend, but as previously mentioned we are yet to quantify this factor. In any case, this further points to the comparability of the earnings of hewers and putters; and whilst their typical wages varied by different amounts, the difference between them does not seem great enough to change our understanding of household income.

Drivers

The number of entries included for drivers is smaller than those for putters, but they do seem to follow a trend. Unlike hewers and trappers, drivers were paid by a daily rate, meaning vast fluctuations in their income were less commonplace. One added complication is that these daily rates are not always referred to in the Bonds, and drivers appear not to have signed a Bond every year. In these years, the Bond references “putting with the ponies” which seems an accurate description of driving work. It therefore seems that drivers signed the Bond under the title of putters in certain years. However, the paybills distinguish between drivers and putters throughout, and as occupation has primarily been determined from the wage data (with the Bonds used as secondary supporting evidence) this has been a relatively minor issue in the present study.

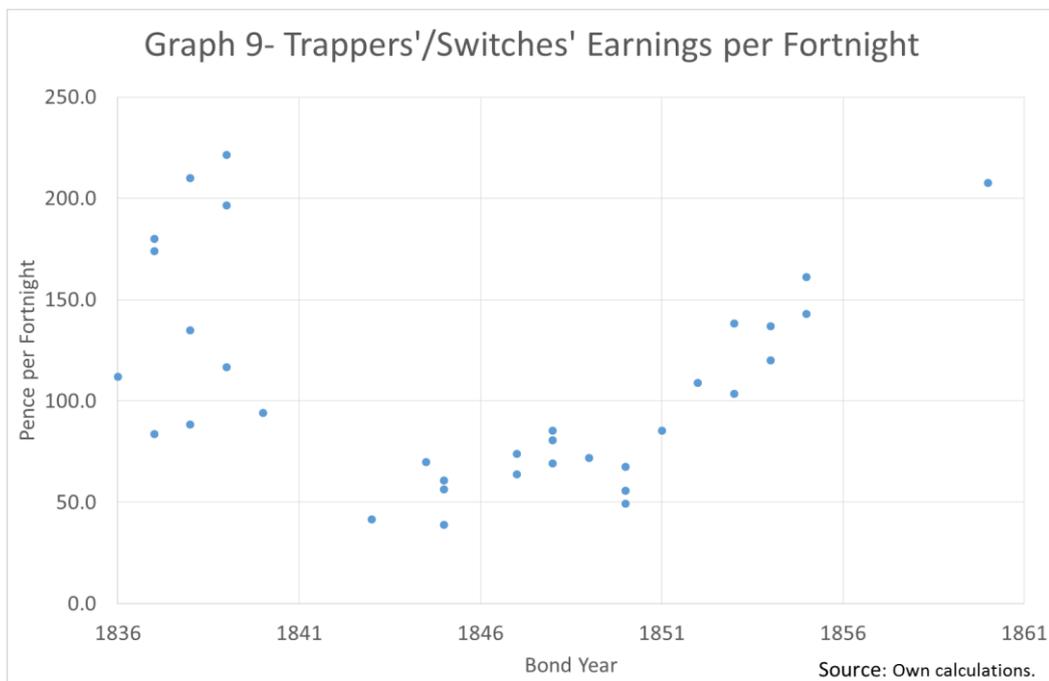
As *graph 8* shows, drivers appear to have been making slight gains from the mid to late 1830s, to then follow a downwards curve until around 1850. This then has an upwards trajectory until around 1855, when it again sees a downturn before the break in our series. It re-joins at roughly the same level in 1860-1861, and remains there for the following year. This is essentially the same pattern as other workers discussed, but with a much smoother curve due to being paid by a daily rather than piece rate.



These are all very small changes in comparison to other occupations which saw far more drastic trends. The relatively stagnant wages of drivers suggests that they were paid comparatively little attention in comparison to other occupations in the mine- both by the management and the workers themselves. Whilst the wage disputes of hewers (and to a more limited extent, putters) were on the forefront of industrial relations, the younger workers in the mine were considered less important; the sporadic nature of drivers being included as a separate category in the Bond testifies to this. This is likely because in comparison to putters and hewers they earned very little, and therefore were not a target of cost cutting measures which often prompted industrial disputes. As we shall see in the next section, trappers and switch-workers did see greater movement in their wages, but it is suggested this is more as a result of changes in working hours than in pay rates themselves.

Trappers (and working the switches)

The final category of worker this study investigated was trappers. Here we included those working the switches, as they were roughly of equitable status in the mine, received roughly equal pay, and boys often performed both roles. As shown in *graph 9* average wages of this group were very dispersed before 1840, showing no discernible trend. But from 1843 they do show a remarkably grouped increase until 1855, when the majority of these entries end. Just as remarkable is the change in wage level before and after 1843. Whilst there is a sustained increase after this year, this begins from an absolute lower level. We therefore seek to explain not only what caused this increase, but also what caused trappers' wages to drop in the early-1840s.



There are relatively few entries for these occupations in our data, due to the limited number of boys required to fulfil these roles in the daily working of the mine. However such a strong trend after 1843 suggests that there may well have been wage increases. This was not the consequence of a change in the daily rate, as Appendix Two shows that these were constant for the majority of the period. The driving force behind this was those primarily working the switches rather than trapping, although both saw wage increases over the period of discussion. This may have been a consequence of the 1842 Employment Commission and the subsequently imposed limits on the hours of boys in the mine. By imposing

an age restriction of ten²²⁸, the Mines and Collieries Act of 1842 ensured that those who had previously been used to trap were now banned from the mine. Older boys may therefore have been expected to attend work more regularly, rather than more unreliable younger ones who were not capable of working a full working week. Additionally, they were more likely to also work in other occupations which were more lucrative. There is a marked increase after 1842 in these boys also participating in driving work, among other tasks, which would allow them to supplement their income. These opportunities would not have been available to the very youngest workers who were employed in these roles prior to 1842. Whilst this explains why wages were able to gradually increase, with those in trapping and switch-working increasingly participating in other occupations, it does not explain the drop in wage levels around 1842. The potential reasons for this are discussed below.

The explanation for the drop in wage levels before this sustained rise is likely related to the changes brought about by the 1842 legislation, but the causality is less clear. We know that this is not a consequence of falling daily rates, as the Bonds do not show them dropping in the early-1840s (as shown in Appendix Two). This must therefore be related to the amount or type of work available. Our sample does not show an increase in the number of trappers and switch-workers employed, so it seems unlikely that there were more boys employed prohibiting the number of work-days available to each. The colliery being inactive might explain a drop for one year, but not why the general pattern and level of wages would fail to rebound afterwards. All of our entries before 1842 are trappers rather than switchmen, so this may be related to the amount of trapping work available in the mine changing in 1842. However, at present it is not clear what caused this change, or if this was the consequence of some other factor which has not yet been identified. Additionally, this trend may be overstated, as the highly paid but highly dispersed nature of wages before 1842 seems to be a consequence of two trappers who worked in this occupation for three continuous years. Without these entries, there would be a far smaller decrease, which could be explained by the loss of two working days per fortnight

²²⁸ Colls, *The Pitmen of the Northern Coalfield*, 133.

for each worker. Again, the factors surrounding this loss of work are unclear, but it is far easier to explain than the large decrease with no other apparent drastic change.

In sum, the present study comes to several conclusions about the general pattern of wages over the period of 1836 to 1862. The occupation with the greatest number of entries is hewing, and therefore presents the most reliable results. Here we find that wages were stagnant for most of the period, presenting evidence that the first (1836-1837) and last (1861-1862) points were only 5 pence per fortnight apart. However, these wages were not static, undergoing yearly fluctuations so that the difference between the highest peak and the lowest trough was 174 pence per fortnight. We also identify a greater divergence of earnings between hewers later in the period, but demonstrate that fortunes differed for individual hewers throughout the period.

Whilst the average trend of wages can give us a clue to how the standard-of-living progressed through this period, we see it as simply a piece of the picture which earnings describe, and that the deviations and fluctuations are just as important. We believe the static level of wages over our wage series as a whole to be a consequence of labour relations (and the onset of the Monthly Bond), with the colliery's owners actively depressing wages in an attempt to maximise profits by reducing working costs. We also believe that there was an increased amount of labour available by the beginning of the 1860s, but that this did not cause a depression of wages, due to the industry's simultaneously increased output- however, it did cause wages to become more dispersed, and further contribute to differences in the experiences of mining families. In relation to the annual fluctuations of wages, our analysis suggests that this was not simply a result of piece rates, but would also have been determined by demand for coal in each year.

We have also evaluated the trends in the wages of putters, drivers and trappers. We believe that the number of entries for putters makes our wage series representative (of Wylam Colliery at least), although we acknowledge our series for drivers and trappers do contain a less than ideal number of entries. However,

we maintain that the trends of these series do have explanatory power, despite these limitations. We find that putters earned wages on a comparable level to hewers, which had been asserted but not previously examined in the literature. We suggest that this was due to the fines imposed on hewers and the cross-occupational employment of many workers in the mine. This has significant implications for the family economy. We also found those earnings to be roughly in line with the wage trends of hewers.

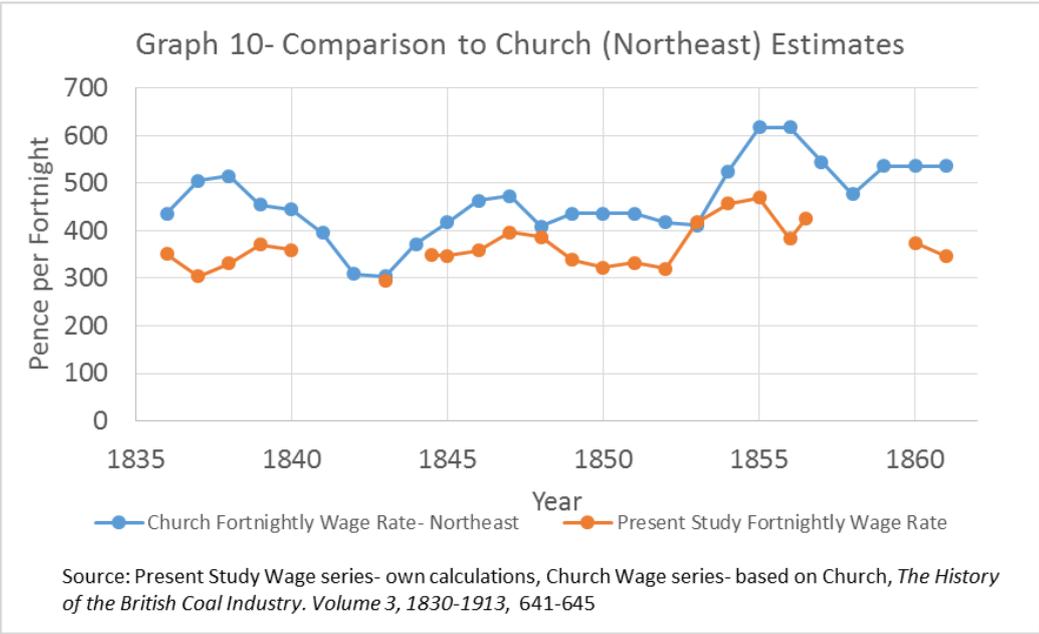
The story for drivers seems similar, their wages stagnant throughout the period—thanks to their relatively little importance in industrial relations. However, trappers and switch-workers saw increases after 1842 (after a fall from earlier levels, for which the reasons are unclear), which seems likely to be a consequence of the Mines and Collieries Act of the same year.

Comparisons to Existing Wage Estimates

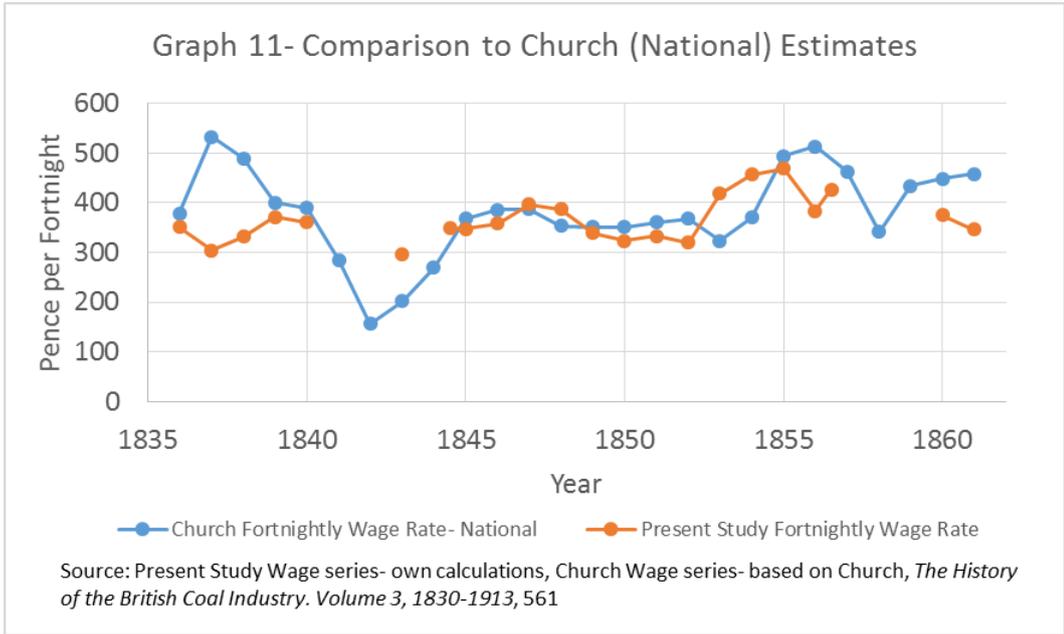
For estimates which compare directly to our own wage series, Church is the most widely used source. Whilst he later deflates them to produce a real wage series, his nominal wage estimates are also compared to the present study at both a national and regional level. As Church does not list these wage rates explicitly, a deconstruction of his index is required. For both series, Church lists an index of hewers' wages as a function of a base price.²²⁹ Using his index numbers, the actual wages (which Church has calculated per shift) are established. These are then multiplied by the number of days Church lists for each year that a hewer worked in a week²³⁰ and doubled to yield a fortnightly one.

²²⁹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 561, 641–645.

²³⁰ *Ibid.*, 248.



As the present study uses Bond years for its wage estimates and Church used calendar years, comparison is not completely exact, but the first year of the Bond was selected from the present study for comparison (as the majority of the Bond was valid in that year). The comparison is illustrated by *graph 10* and *graph 11*.



The first thing to note is that in a regional comparison the estimates of the present study are consistently lower than those of Church’s series. Only at three points (1843, 1848 and 1853) do the two series appear to agree on the same level of wages. In the mid to late 1830s the two series take opposite directions, before both taking a downwards trajectory from 1839. Although a gap in the present series then follows, both seem to agree on a low point in 1843. They then take

different trajectories before meeting again at 1848. From there, the present study sees a downwards trend in wages until 1852, whereas Church's series sees a slight increase so that its level is almost the same as it was at 1848. Church's series then sees a far greater jump in wages, but this occurs a year later (1853) than the present study (1852). Church's estimate then sees a static wage rate in the early 1860s, whereas the present study sees a decline.

The national estimates show a related, yet different picture. They are far more comparable on an absolute level, whilst demonstrating roughly the same shape as Church's estimates for the Northeast. There is a more considerable drop in 1842, which the Northeast appears not to have suffered, and a larger spike in 1837, but overall the trend is comparable to both other series.

That the general shape of both the present series, and that calculated by Church for the Northeast are similar reinforces their validity, as they have been compiled from different sources. However, the lower relative level of the present series could have drastic affects for the standard-of-living of miners. The evidence that Church used to construct his estimates can help to explain why they differ. Church uses a variety of sources; his series for the Northeast appears to be based on the Children's Employment Commission of 1842 and other official reports from later in the period. He also uses records from nineteenth century observers and unpublished PhD theses.²³¹ These are included, along with other regional studies and comparable reports to those used for the Northeast, in his national series.²³² Official reports are very different documents to actual pay bills. They may record the expected wage rate, or the supposed wage rate, but working from the records of the wages that workers actually received seems superior in source material in this regard. Of course, it is possible that Wylam was simply less well paid than other collieries in the period. Kirby's comparisons to the coalfield as a whole suggest that it was a little smaller than average²³³, but it seems unlikely that this would have meant significantly lower wage levels. There are other reasons for which Wylam might have had lower wage rates. It may have been

²³¹ *Ibid.*, 645.

²³² *Ibid.*

²³³ Kirby, "Attendance and Work Effort in the Great Northern Coalfield, 1775–1864," 966.

able to attract workers through other benefits- for example better housing, preferable working conditions or added incentives- but there are no indications that this was the case. It may have been able to negotiate workers down, but with a relatively integrated labour market this seems unlikely. We therefore show that there is a real difference between Church's estimates and the actual pay level of hewers during this period.

As has been established, the present estimates report a much lower level of pay than Church's did. Colls refers to Church's estimates as providing a picture of "quite desperate levels of poverty in the 1830s and 1840s"²³⁴ and that hewers' earnings were "consistently below cost of living subsistence levels"²³⁵. This obviously causes a problem, as our lower estimates would put hewers even further below the subsistence level. The solution to this problem lies in the family economy. It may well be that hewers' wages were well below subsistence, but the labour of the rest of the family allowed it to buy the necessary items to survive, and even generate a limited amount of surplus income. As we have already seen, a putter's wage could equal that of a hewer, and even the addition of a driver would significantly raise income above the level of earnings which Church advocates for hewers alone.

Church also calculated a cost of living index from 1830. Taking 1900 as a base year, the cost of living for 1836 to 1861 (the time span relevant to our wage data) was highest in the late 1830s and early 1840s, seeing a spike in the mid-1840s before dropping down almost as low as 1900 in the early 1850s. It then proceeded to rise again from the mid-1850s.²³⁶ He describes the 1850s and 1860s as a "transition [...] towards less severe short-run fluctuations in living costs beginning in mid-Victorian Britain"²³⁷. We can apply this to our present study in order to produce our own real wage series. For 1830 to 1850, Church uses the Gayer, Rostow and Schwarz index (GRS), although he does highlight its shortcomings, which are explained below. After 1850, he opts for G. H. Wood's

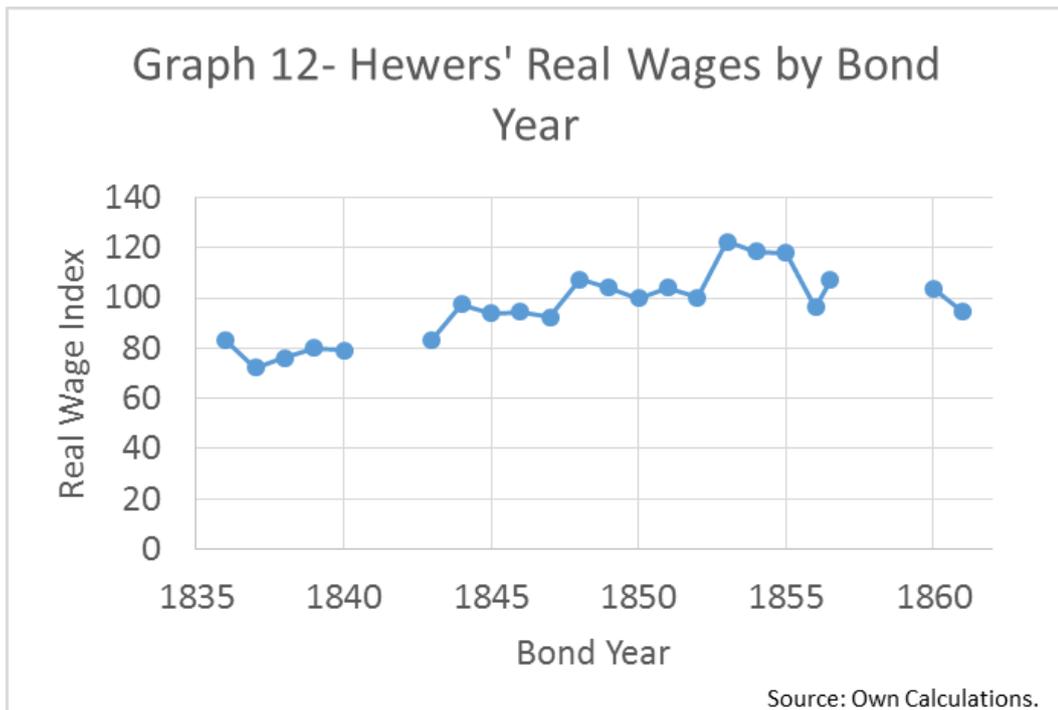
²³⁴ Colls, *The Pitmen of the Northern Coalfield*, 50.

²³⁵ *Ibid.*

²³⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 568.

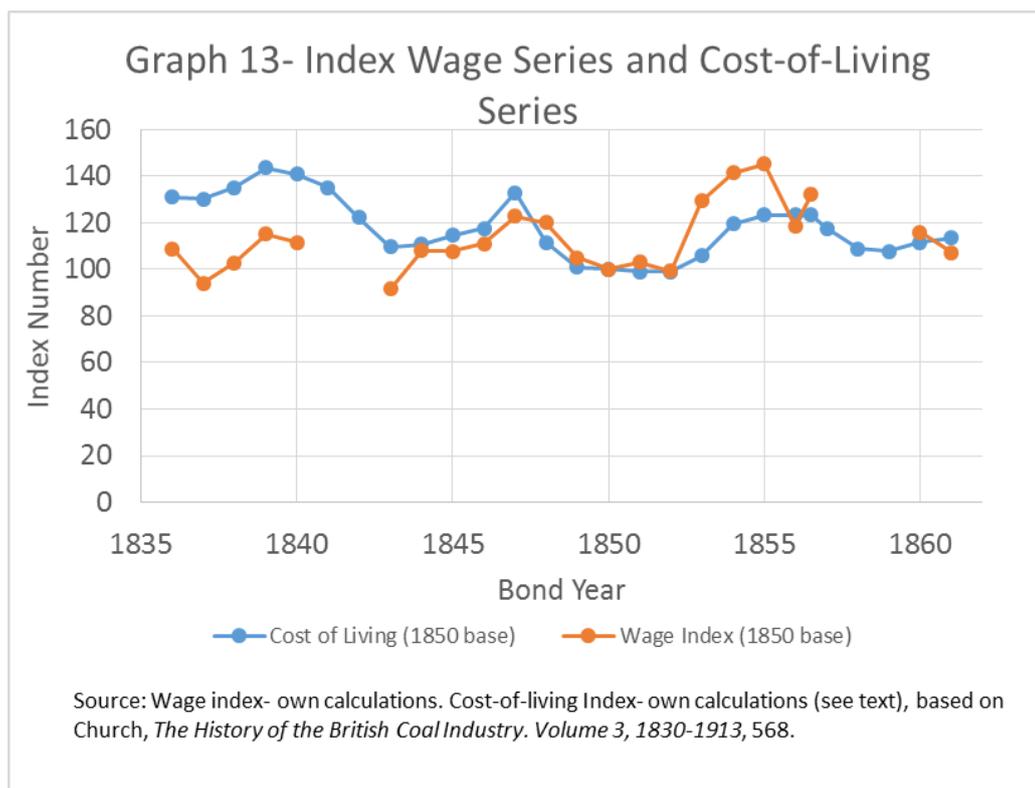
²³⁷ *Ibid.*

series.²³⁸ Rebasing Church's index to 1850 and applying it to our wages yielded the real wages series in *graph 12*. This clearly shows an upwards trend of real wages from the mid-1830s until the mid-1850s, then with a drop off in the early 1860s. In a comparison of the index of wages against the cost-of-living index (as shown in *graph 13*) we see that the series move broadly in step, but with a much lower starting point (after the first gap in our wage data) in 1843-1844, and far



greater acceleration of wages- beginning in 1852 and continuing until a sudden drop in 1856. As these series track each other so closely, this does not change our interpretation of wage trends dramatically, although the acceleration in the early 1850s does mean that living standards jumped more noticeably after 1852. The decrease in wages in the late 1840s/early 1850s also disappears due to an almost equal decrease in cost-of-living.

²³⁸ Ibid., 566.



The GRS index consists of twenty-six domestic and fifty imported commodities.²³⁹ Taylor describes it as “a highly sophisticated compilation based upon much detailed and well-shifted information, and carefully weighted”²⁴⁰, however he also highlights that it “contains many substantial elements far removed from any household budget”²⁴¹. Additionally, it does not account for “varying distribution and middlemen’s costs”²⁴². Wood’s series is constructed mainly from the Board of Trade’s “Report on Wholesale and Retail prices”²⁴³, however it also contains data from “personal inquiries”²⁴⁴, other “short series and isolated statements”²⁴⁵ and one other published source (for Staffordshire prices)²⁴⁶. Wood describes the result as “frankly experimental”²⁴⁷. However, Church describes it as “the most reliable available indicator of living costs in the

²³⁹ Arthur D. Gayer, *The Growth and Fluctuation of the British Economy, 1790-1850: An Historical, Statistical, and Theoretical Study of Britain’s Economic Development* (Oxford: at the Clarendon Press, 1953), 475.

²⁴⁰ Arthur J. Taylor, *The Standard of Living in Britain in the Industrial Revolution* (London: Methuen, 1975), xxv.

²⁴¹ Ibid.

²⁴² Ibid., xxvi.

²⁴³ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 647.

²⁴⁴ George H. Wood, “Real Wages and the Standard of Comfort since 1850,” *Journal of the Royal Statistical Society* 72, no. 1 (March 1909): 95.

²⁴⁵ Ibid., 94.

²⁴⁶ Ibid.

²⁴⁷ Ibid., 95.

nineteenth century²⁴⁸ due to the wide spread of regional evidence, the number of contemporary sources²⁴⁹ and the checks that Wood conducted against “actual consumption and expenditure”²⁵⁰. Church opts to use the GRS as he argues the “distortion likely to result from splicing the GRS with the Wood index would be less than [...] the alternatives.”²⁵¹ An issue with using Church’s series is that when selecting his data for after 1850, he opts for Wood’s index which includes an estimate for rent.²⁵² Rent was controlled in our data, and therefore this is unnecessary. When using Wood’s commodity series without his estimate for rents, minimal changes are observed, but nothing significant enough to alter our view of the overall trends. We therefore conclude that real wages improved from the beginning of our series until the mid-1850s, before falling in the early 1860s.

As a point of comparison, Gregory Clark’s recent index has been used. This index uses 36 items “including such exotica as stockings, gloves, and trenchers”²⁵³, which “were amalgamated into 12 subcategories: grains and potato, dairy, meats, sugars, drink, salt, fuel, light, soap, clothing, lodging, and services”²⁵⁴. Clark recently used this index to produce real wages for his farm labourers between 1209 and 1869.

Using a similar procedure as was used with the GRS/Wood index, we have rebased this index to the year of 1850. It has then been used with the nominal wage series of the present study. The results of this are presented in comparison to Church’s index in *graph 14*. As will be evident, there are some minimal changes in the real wages of our coal miners, but the overall trend remains the same.

²⁴⁸ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 647.

²⁴⁹ Ibid.

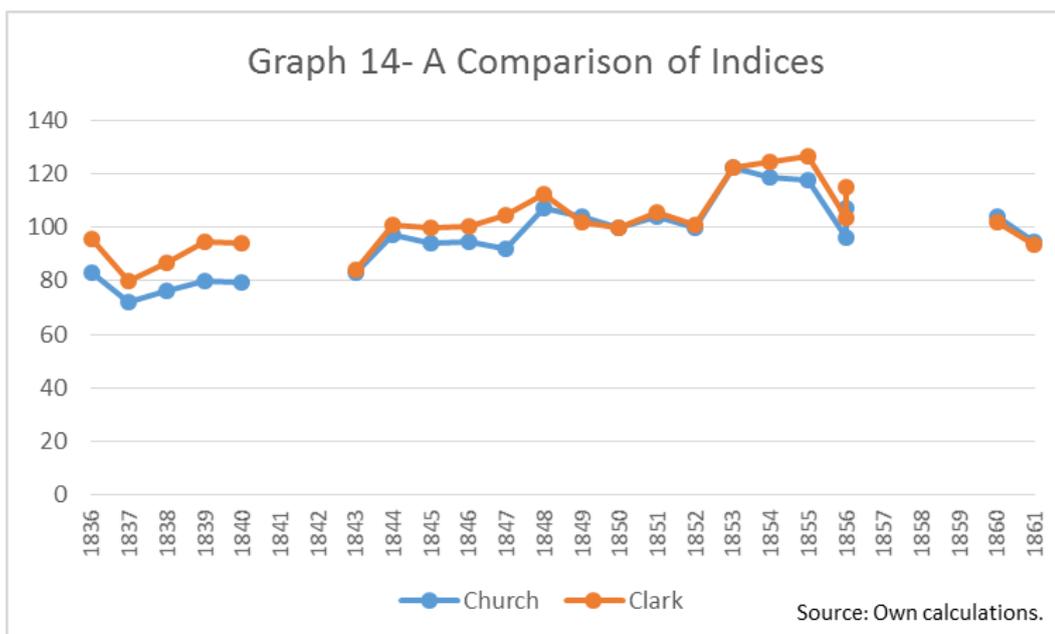
²⁵⁰ Ibid.

²⁵¹ Ibid., 567.

²⁵² Ibid.

²⁵³ Clark, “The Long March of History,” 107.

²⁵⁴ Ibid.



One thing that becomes immediately clear is that the real wages of miners in the mid-to-late 1830s are higher using Clark's index than Church's. This is due to the basket-of-goods selected for comparison. But following the first gap in our wage data, the series are mostly similar. Clark's index gives a smoother curve (and slightly higher level) for real wages during the mid-to-late 1840s, but the early 1850s are almost identical. Clark's index then gives a slightly higher level in the mid-1850s, and increases between 1853 and 1855 (whilst Church's declines), but these differences are minimal. Both series show the jump between different Bonds in 1856, with the change to semi-annual bonding from the years of the Monthly Bond. After the second gap in our wage data, both indices give very similar values for the early-1860s.

The key talking point here is clearly the early part of the series; in particular before the first gap in our wage data. Both show the same shape in the mid-to-late 1830s, but Clark's index estimates this relatively higher than Church's. However, when considering this period in relation to the rest of the respective series, this does not change the picture dramatically- both series still calculate a gradual increase in real wages over the period, from 1836 until 1856. The main difference is that in Church's series, the 1843-1844 point appears as a continuation of the level in the 1830s, whereas Clark's shows it as an actual depression in wages.

This affects our understanding of the earnings of miners in the 1830s, relative to the rest of the period. Certainly, there were still gains, but these were far more minimal with Clark's index, and similar to the level of the 1860s (even after an influx of unskilled labour). However, it should be recalled that the relative dispersion of wages in 1860s was far greater than in the 1830s, so the effect of this difference in skill levels would still have been a factor in earnings.

Overall, whilst these indices give slightly different pictures of real wages over the period, they both endorse the overall trend of real wages rising from the 1836-1837 until 1856, and then returning to a lower level in the early-1860s. The relative level of the 1830s is an important issue, but it does not alter the overall trend. These real wages help us understand changes in the standard-of-living of these mining families over the period, despite not making up the whole picture, as has already been discussed. But they do show very tangible changes in the income of mining families over the period, which would certainly have affected their purchasing power, and therefore living standards. In material standards, a mining family would almost certainly have been better off in the mid-1850s than any other point in our wage series.

Additionally, Flinn records some estimates for other occupations. He claims that in 1831, trappers were paid *10d* per day, drivers *14d* per day, and putters earned somewhere between this and a full hewers wages.²⁵⁵ Flinn does not take this idea of putters having wages equitable to hewers any further, as we have done in the present study, presumably due to lack of evidence. Church calculates the percentage of an adult's wage which "juvenile"²⁵⁶ workers earned, but claims that from 1842 to 1886, those aged fourteen to eighteen years earned "between 45 and 60 per cent of an adult hewer's wage."²⁵⁷ This has already been shown to be inaccurate in reference to the present study with the wage levels of putters.

In conclusion, we have compared the estimates for our calculated wage series to those already existing in the literature. We find when comparing our estimates to

²⁵⁵ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 391.

²⁵⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 565.

²⁵⁷ *Ibid.*, 565-566.

Church's (who has the most overlap with the present study) that his data for the Northeast show a similar trend, but that our absolute levels are lower. We have discussed the implications of this for standard-of-living.

We have also reused Church's cost-of-living index with our own data. After adjusting the base year to 1850, we find that standard-of-living appears to have increased gradually over the period, until it begins to fall off again in the late 1850s/early 1860s. The cost-of-living appears to very closely match the movement in wages, causing this increase. This does not differ significantly from the pattern of nominal wages observed in this period. As a comparison, we have also used Clark's recent index with our data. Whilst this yielded a slightly different relative level of the late-1830s, compared to the rest of the series, again the shape of our wages remained broadly the same.

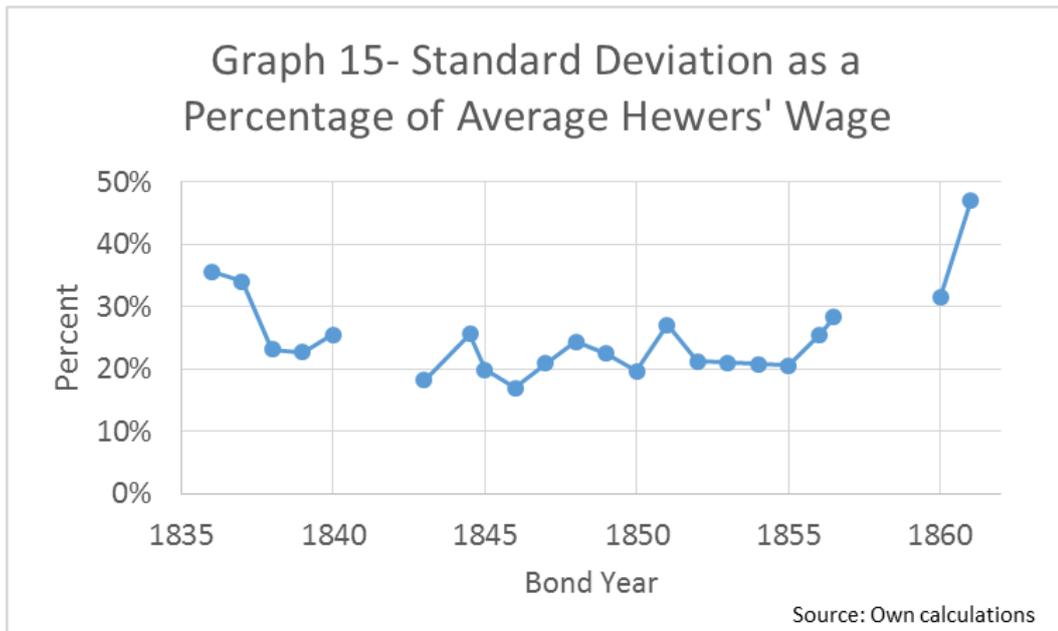
Deviation in Wages

Whilst the general pattern of wages certainly aids our understanding of the fortunes of mine workers in this period, perhaps just as important are the relative fortunes of different individuals in the mines. It would be easy to assume that all miners earned the same wage rate in each year, and that the only movement was on a year-on-year basis; but this was certainly not the case. This further demonstrates the potential problems with using wages as a proxy for standard-of-living. However, to examine each individual case separately is impractical, and therefore a certain level of generalisation is required. However, it still remains important to consider the extent to which the fortunes of workers differed. The current section will concentrate on hewers, in order to provide robust comparisons. Hewers wages began to see further deviation towards the end of our series, and the reasons why this might have been the case have already been discussed. This section considers the distribution of wages throughout the period, and its impact on standards-of-living.

Let us return to *graph 3*, which we have previously examined to find that the standard deviation of average earnings is higher at the end of the period, in particular 1861-1862. It starts off high in 1836-1837, and rapidly falls until 1838-1839, where it gradually rises until 1840-1841 and the first gap in our series. We

re-join in 1843-1844, at the lowest level for the whole of our series. It then rapidly climbs and falls, but maintains an overall upwards trajectory, before gradually climbing from 1853 to 1856. The second Bond period of 1856 then sees a rapid spike. This is still at roughly the same level when we re-join our series in 1860-1861, peaking in 1861-1862.

What did this mean for our workers and their standard-of-living? Here, we must consider not only the trends of this deviation, but also the absolute values. The smallest standard deviation of an average wage was 54 pence per fortnight in 1843-1844. The average wage for this year was 295 pence per fortnight, meaning the upper bound for this year was 349 pence and the lower bound 241 pence. Albeit this was the low point for average wages overall, these are very different fortunes on each end of the scale in the least varied year. The maximum standard deviation was 163 in 1861-1862- with an average wage of 346 pence per fortnight, this means the upper and lower bounds were 183 and 509 pence. Such different fortunes mean that the trends which describe average wages do not apply to all workers. Therefore, an increase in average wages did not necessarily mean that standard-of-living improved, as increases in deviation could mean that not all workers would have shared in these gains.



We have also compared the standard deviation by calculating it as a percentage of the average annual earnings in that year, shown in *graph 15*. This presents slightly different results. Relatively, the value for 1837-1838 is much closer to

that of 1836-1837, which means there is a much larger drop from 1837-1838 to 1838-1839. There is also a slight drop, rather than rise the year after. The level at which we re-join the series after the first gap in our data appears much closer, and 1852 to 1855 are much lower relative to the rest of the series. The spike around 1856 also occurs sooner, but fails to reach the level of 1860-1861, as it had done in the absolute series. We do not claim that either method is better than the other, but simply that there are two different ways to represent the data. The lowest percentage of the average wage in our data was 17 percent, the highest being 47 percent. These corresponded to the absolute lowest and highest years. The general shape of the series, apart from the differences already highlighted, remains largely unchanged. We still see a drop in the early years of our wage series, a period of rapid ups and downs from the mid-1840s until the early 1850s, a plateau in the early to mid-1850s, followed by a rise, and finally a large rise in the early 1860s.

Whilst the general shape of the series may be similar, this method certainly aids comparison of these deviations in different years. For the majority of years, the standard deviation was between twenty and thirty percent of the average wage. This means that some families would have been up to thirty percent below our already revised wage estimates (conversely, some families would have been thirty percent higher). This is a significant proportion, and would certainly have restricted the already limited disposable income. It would have reinforced their need for children to enter employment at a young age, and likely kept them (boys, at least) in the mines- a reciprocating cycle.²⁵⁸ The opposite would have occurred for families earning higher than the average wage, but the general low level of wages make it doubtful that they would be able to break the cycle of child labour.

To recap, the standard deviation of average earnings sees a spike in 1854, and again in 1861-1862. However, even in 'normal' periods (away from the spikes) the standard deviation of hewers' wages falls somewhere between 85 and 100

²⁵⁸ This demonstrates the validity of the Basu "luxury" axiom (usually applied to the explanation of child labour in modern developing economies) to the historical past; Kaushik Basu and Pham Hoang Van, "The Economics of Child Labor," *The American Economic Review* 88, no. 3 (June 1998): 412.

pence per fortnight. We earlier calculated that the average wage per fortnight between 1836-1837 and 1856 increased by around £8 per year. The standard deviation of hewers' wages could translate into a difference in wages of over £17 per year. This suggests that whilst the average wage does represent the changes in income of hewers, it fails to account for in many ways a more significant factor- the dispersion of wages around this mean. This demonstrates the extent to which the average wage may misrepresent the fortunes of all workers, and that the degree of deviation from this mean could have a tangible effect on standards-of-living.

Fluctuations in Wages

So far, we have considered general wage levels, and their deviation. We have also looked at the cyclical nature of wages on a year-on-year basis. At this point, we also consider fluctuations in wages on a fortnightly basis, and suggest the impact that this may have had on standards-of-living. We have therefore calculated the standard deviation of the wages in each Bond year for each worker. In order to preserve the uncertain nature of a miner's' income, fortnights where a worker is recorded as having been paid zero earnings have been included. We have already seen the standard deviation of hewers' wages from the mean, but we now examine this phenomenon on an individual level.

On this basis, the selection of any worker in our data would demonstrate fluctuating wage levels. This was far more apparent in workers paid by piece rates than by daily rates- although the latter did see more limited fluctuations due to varied working hours. The following examples have been selected to demonstrate that fluctuations varied in magnitude, but that workers could rarely predict how much they would earn on a fortnightly basis. This would have impacted on their spending and standards-of-living. A run of well-paid fortnights must always have been soured with the knowledge that such prosperity was not to last. It may also have led families to stockpile resources. A good example of this is the 'fire coal'- cheaply available to colliery workers. Whilst some opted to buy this coal every week, others bought it sporadically- as demonstrated through our employment histories. Obviously this was influenced by consumption, but

families may well have been stockpiling when they were able to afford the extra expense. There is no reason to believe this could not have occurred for other longer-lasting items.

Hewers and putters saw the most varied wages by fortnight. There are many examples. John Kenady (hewer, 1845) earned nothing in one fortnight (presumably due to injury or illness), but as high as 408.5 in another. His average wage was 280, and the standard deviation 134. Thomas Armstrong (hewer, 1846) earned as low as 207 pence and peaked at 528.5 in a fortnight. His average fortnightly wage as 409 pence and the standard deviation of his wage for that year was 84 pence. Edward Thompson (hewer, 1861-1862) earned as much as 439.5 pence, as little as 94.5, averaged 293, and had a standard deviation of 103. John Graham (putter, 1850) earned between 63 and 462 pence, with an average of 287 and a standard deviation of 108. The large standard deviations in some of our examples- and plenty more in our data- were not always a result of different work efforts, although this was a factor. Incapacitation and illness²⁵⁹ explain some of the very low figures, but this speaks to the uncertain nature of coal mining- and the high risk of these factors needs to be included in the variation of wages. Additionally, seasonality would have played a role- in the months before high demand periods the mines might operate almost continuously, whereas in the summer months they may have been more inactive.²⁶⁰ This would have impacted the ability of miners to work, and therefore altered their wage levels. Future investigations will quantify the extent of seasonality in miners' wages, but as this is a large undertaking, time and space constraints have not allowed for this in the present study.

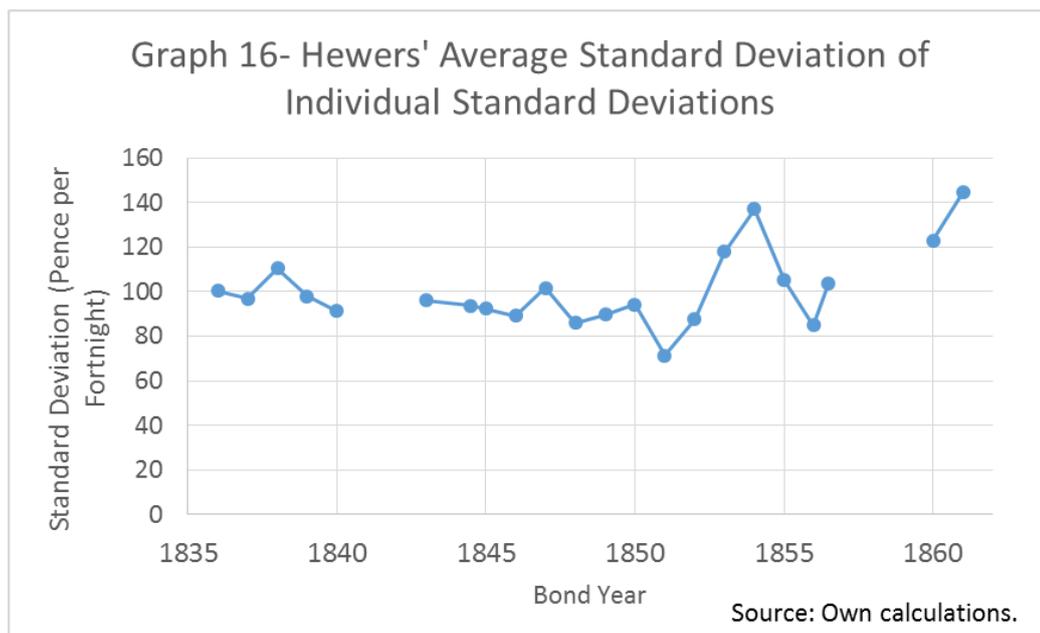
If we take an example of a driver, we still see fluctuations in pay. Thomas Appleby has a very complete record for 1850. He moves between seams over the year, but common practises indicate it would be more surprising if he did not. The standard deviation of his wages was 18 pence, with an average fortnightly earning of 119. His largest earnings in a fortnight were 154 pence, and his lowest

²⁵⁹ Colls, *The Pitmen of the Northern Coalfield*, 124.

²⁶⁰ Kirby, "Productivity and Household Economy in a Tyneside Mining Community, 1774-1867," 968.

84. Due to his relatively small absolute earnings, the standard deviation actually made up a sizable proportion- around 15 percent of his average wage. In our 1850 example, the average wage of a male hewer was 323 pence per fortnight. In a family containing only a hewer and driver (which would have occurred when only one son was old enough to work) then the drivers' wages would make up roughly one quarter of the families' income. Fluctuations in this wage could have a very real effect on the surplus income of that family, as it would likely have a large number of dependents at that stage (family's tended to have children relatively close together, and therefore if the eldest child was young enough to be working as a driver, there would likely have been younger children not yet in employment), and therefore be under financial pressure.²⁶¹

We then take the individual standard deviations of hewers wages, and calculated how deviated they themselves are from their mean (*graph 16*). This allows



examination on a larger scale of individual fluctuations in workers' wages. We find that this spikes upwards in 1854, and then again in 1860-1861/1861-1862. It is lowest in 1851, where there is a small downwards spike. There are also smaller upwards spikes in 1838 and 1847. Overall, there is a downwards trend for the first half of our period, although there appears to be a slight rise in the gap between 1841 and 1843. Between the 1847 and 1851 spikes there is a slight

²⁶¹ Rowntree, *Poverty*, 136–137.

upwards trend. But the differences become more noticeable after 1850. There is a rapid increase until 1854, and an equally rapid decrease until 1856, before shooting up again in the second Bond period of 1856. After our second gap, it reaches its peak in 1861-1862.

We must ask therefore how this affected standard-of-living and our workers' lives. Whilst hewers could subscribe to friendly societies which would compensate them in the case of illness and injury, and the Bond provided limited sick pay, this was certainly short of a fortnight's wages. Additionally, the mine being inactive for several days a week reduced wages. Church has compiled evidence which shows miners worked on average four to four-and-half days per week during the period of our wage series.²⁶² He claims that on a national level this was mainly a response to "depressed trade and lowered prices".²⁶³ This would have affected the entire family in a way which illness to one worker would not, and caused serious problems for a family reliant upon mining.

A lack of steady income had several implications. Firstly, whilst we are able to calculate an average wage for the entire year, those working at the time did not have such a luxury. The variability of fortnightly rates meant they could not be sure of what they would earn for the rest of the year, and this meant it was difficult to commit to spending over a yearly period. It could also have led to the stockpiling of durable resources, as has already been discussed. It likely, as per the Basu luxury axiom²⁶⁴, also encouraged child labour, as families were keen to maximise their income in case of times of austerity.

This section has evaluated fluctuations in the fortnightly wages of individual workers. It has identified that this was the norm for all those in the mining industry- even those paid by a daily rate. It has also discussed the potential impact of this on the standard-of-living of these miners, concluding that an unsteady income stream probably had detrimental effects on the family economy and encouraged child labour. Additionally, factors such as the mine being idle

²⁶² Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 258.

²⁶³ *Ibid.*, 238.

²⁶⁴ Basu and Van, "The Economics of Child Labor," 412.

compounded problems for the family, as unlike illness it impacted upon the ability of all family members to work.

The Spread of Occupations and Progression in the Mine

We should note that each year, hewers tend to make up 60 to 75 percent of persons considered. This was not intentional, and our sampling method therefore allows us to consider this a rough occupational distribution of underground workers. This makes sense logically- supporting roles were required, but the most man-power was needed at the coal face itself. This does beg the question how those in supporting occupations progress through the mine, ultimately becoming hewers in their own right. Firstly, it should be established that not all young boys did. Some died or were crippled²⁶⁵, others were recruited to other industries (although this was relatively few).²⁶⁶ However, hewing was always the goal.

Those who were promoted from putting to hewing were identified for each year (see the section on *Migration* for an explanation of data and methodologies). On average 1.7 putters were promoted to hewers per Bond year, with no more than four any year. The progression within the same mine, therefore, appears to be somewhat limited. Putters would typically spend seven or eight years in that role, building up their physical strength, although age was an important factor in their promotion.²⁶⁷

A similar investigation was carried out for the progression of drivers to putters, but the small sample size resulted in very mixed results. Drivers are not identified as such in the Bonds during some years, but the task of “putting with the ponies” is specified. This suggests they may have signed as putters, or not at all. Church uses evidence from the 1842 Employment Commission to suggest the latter was the case²⁶⁸, but the present study finds evidence which contradicts this.

²⁶⁵ Colls, *The Pitmen of the Northern Coalfield*, 124; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 194–195.

²⁶⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 226, 228.

²⁶⁷ *Ibid.*, 195.

²⁶⁸ *Ibid.*, 260.

Signatories of the Bond signed under the heading of ‘driver’ in many years. For those years which a separate ‘driver’ category fails to appear, it is likely they signed as putters, but were employed as drivers (in other words “putting with the ponies”).

Men also frequently took shifts in other capacities. This was not only in filling in for what were presumably unexpected absences, but also ‘ad hoc’ jobs which could be quite valuable to an individual or gang. When assessing our data, it quickly becomes apparent this occurred with regularity. As the present study focuses on those in hewing, putting, driving and trapping, it obviously will see more of those men and boys taking part in other occupations. However the paybills also identify shift workers taking work in those occupations.

In a year, an average 39 percent of hewers also took at least one shift in another occupation. This ranged from 22 percent (1846) to 74 percent (1839-1840). There appears to be no long-running trend, but most years are between 30 and 50 percent. For putters, this was far higher. The average over all years was 89 percent, with eight years seeing 100 percent of putters also working in another occupation. Again, there appears to be no trend over time, but as only two years saw values of less than 80 percent, it seems putters rarely worked only in a putting capacity. Overall, this means that 50 percent of our workers took shifts in other occupations over the year.

How might this impact on our understanding of progression through occupations? We already know promotion depended upon the age of the worker, and his experience. ‘Age’ may well have been a guide for ‘strength’ in this scenario. We now present an explanation of how this experience was obtained without a formal apprenticing system, as was present in other mining regions.²⁶⁹ Whilst younger workers must have initially been shown how to perform tasks, a far more efficient way for them to hone their skills was practise ‘on the job’. This also explains why this practise was less common for hewers- already being at the

²⁶⁹ Ibid., 259–260.

top of the tree, they didn't require the experience and had to be forced to take other work. For putters, drivers and trappers, it was vital for their progression.

The Bond itself specified that hewers must receive a particular daily rate in order to work in an occupation other than hewing. However the literature, by highlighting the demands of striking hewers that they were not be used in other occupations,²⁷⁰ implies that it was the discretion of the overman²⁷¹ which determined in which occupation a man worked. However, despite the reluctance of mine workers to do so, it appears that experience in other occupations was certainly not uncommon. Whilst it is understandable that hewers did not wish to be forced to work in a capacity they considered below their station, the reverse seems to have been met with little opposition- it being in accordance with the aims of the individual to obtain more prestigious employment. Additionally, we need not assume that just because the Bond forced workers to comply with the viewer's²⁷² demands meant all workers resisted it. The Bonds terms were mainly focussed on hewers, meaning that the clauses may not demonstrate the attitudes of workers in other occupations. We should also consider the interest of hewers in their families progressing through the mines. They had an economic (and social) interest in seeing family members gain experience in other occupations. A man might prefer for his driver son to 'step up' to cover a putting shift than he himself to 'step down' from hewing not only for the added wages it brought his family, but also because it established his son in a better position to do the same task again in the future.

To summarise, our data contain a large number of hewers in proportion to other workers, but this does not necessarily make it unrepresentative of the employment structure in the mine. We have established that a large number of underground workers took shifts in other occupations, and suggested that this was the case in order to progress through the occupation hierarchy in the mine. We have acknowledged the resistance of hewers to this practise, and highlighted that as they had reached the top of this hierarchy they had nothing to gain from

²⁷⁰ Colls, *The Pitmen of the Northern Coalfield*, 100.

²⁷¹ A supervisor of the workforce, who reported to the viewer. See; *Ibid.*, ix.

²⁷² The man in charge of the daily running over the colliery. See; *Ibid.*, x.

the activity. Indeed, we have argued that they stood to gain more from their younger family members fulfilling these tasks. Finally, we have acknowledged the general stance of the literature that viewers and overmen were the driving force behind this practise, but have incorporated this into our own argument and highlighted the merits of our alternative interpretation.

Migration

As previously mentioned, there appear to be two conflicting arguments in the literature related to migration. The first is that workers gained a set of skills specifically tailored to the district in which they learnt their trade. Church even suggested that this went as far as individual collieries.²⁷³ We might therefore assume that a miner was at an advantage if he stayed at the same colliery for an extended period. In the same chapter, it is suggested by Church (and others such as Hair), that the labour market in the northern coalfield was highly mobile, with workers moving around frequently in search of better terms of employment.²⁷⁴ Church argues that the “system of annual hiring may have encouraged these migrations once a year”²⁷⁵ and that after 1850 “the decline of annual hiring [...] had the effect of reducing the incentives for perpetual motion.”²⁷⁶ Whilst Church also claims that the decline of “small, rapidly exhausted pits”²⁷⁷ contributed to the decline in movement after 1850, he ties migration directly to the system of hiring. Overall, there seem to be conflicting ideas that miners gained an advantage by remaining at the same colliery, yet they were highly mobile.

We look to address this contradiction, and the relatively little quantitative evidence on this topic. By examining those included in our data for each Bond year, we are able to draw some conclusions about the mobility of the labour force at Wylam. In this scenario if a hewer moved away from the colliery for a period of time, he would then be classified as a new worker on any return, as even temporary absences signify mobility. As these estimates make no attempt to account for the size of the labour force in the northern coalfield, this does not

²⁷³ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 206.

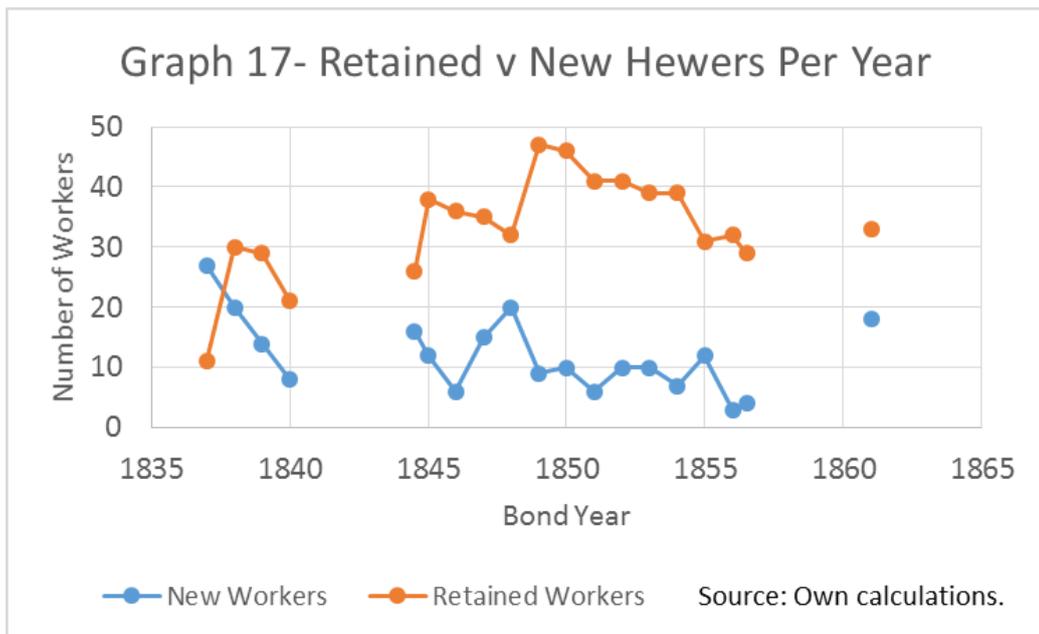
²⁷⁴ *Ibid.*, 218.

²⁷⁵ *Ibid.*

²⁷⁶ *Ibid.*, 219.

²⁷⁷ *Ibid.*

cause any further methodological problems such as double counting. Those retained in the colliery were either hewers the year before, or putters who were then promoted. As *graph 17* shows, apart from one year (1837-1838) Wylam retained more workers than it lost. The 1837-1838 exception appears to have been caused by lack of data- there are relatively few entries for 1836, meaning more workers were likely to be identified as ‘new’ to the colliery. For all subsequent years, the number of new workers did not rise above 40 percent of those employed.



This seems to reinforce Hair’s calculations, which based on parish records, produced a 10 to 35 percent movement.²⁷⁸ Church asserts that the peak of this movement was the first half on the nineteenth century, but pays particular attention to the 1830s and 1840s.²⁷⁹ The average number of new workers in 1838-1840 was 33 percent, where in the latter period of 1844 to 1856 this was 21 percent, potentially supporting this conclusion. If we break down the latter period, we do see a drop, from 27 percent 1844-1849, to 17 percent 1850-1856. This suggests that even relative to the middle and late 1840s, the 1850s saw far less movement- adding further weight to Church’s argument. Whilst the earlier period of 1844-1849 does coincide with the Monthly Bond, it should be remembered that the latter is also largely under that Bond as well- ending in

²⁷⁸ P. E. H Hair, “The Social History of the British Coalminers, 1800-1845” (University of Oxford (unpublished D.Phil thesis), 1955), 144 cited in; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 218.

²⁷⁹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 218.

1854.²⁸⁰ The Bonds at Wylam do not restart in 1854 (instead reappearing in 1856), but using the period 1844 to 1854 average annual movement under the Monthly Bond was 22 percent. The three Bonds in the two years following (due to semi-annual bonding) then average 16 percent- after a spike in 1855 seeing the two lowest movement rates in our data, 9 and 12 percent. This would suggest that the hiring system may have had a role to play in controlling migration, but as even during semi-annual bonding migration was low, this cannot have been the only factor. Whilst there is only one entry for the 1860s (1861-1862), this was 35 percent- one that had not been matched since 1848. With this in mind, we now attempt to explain these trends.

The first period of our data (1837-1841), ignoring the likely anomalous 1837-1838 entry, shows a decline in labour of both retained and new alike. The colliery also bound its joint-highest number of hewers who had been putters in the previous year in 1839-1840, suggesting a need for labour- although these numbers remain small throughout the present study. Colliery records show that output dropped dramatically between 1837 and 1840, going from one of its highest points to the lowest recorded year for the entirety of our period (see Appendix Three). We therefore suggest that Wylam likely became a less attractive prospect for labour, as it was seeing a decline in its operations over this period. Wylam's decline in production would likely have driven hewers away from the colliery, therefore giving opportunities to those such as putters looking to move up in the workforce hierarchy. Average wages actually climbed from 1837-1838 until 1839-1840, although piece rates did drop in one seam going into the final Bond year, which also may have dissuaded some workers from signing at Wylam (see Appendix Two). These average wage increases may well have been a consequence of increasing amounts of work available to those who did remain at the colliery.

For 1844-1856 the overall trend of new workers joining Wylam colliery is that of a decline, although there are a few spikes in the trend; specifically levels dropped below the overall visible downwards trend in 1846, and climbed above the

²⁸⁰ Colls, *The Pitmen of the Northern Coalfield*, 109.

overall trend for 1847-1848 and 1855. This reduction in new workers fits with Church's interpretation that in the years of the Monthly Bond, mobility was reduced²⁸¹, although as has already been suggested, migration in the years after 1854 did not see a return to earlier levels which Church ties to the decline of small pits.²⁸² Retained workers mirror some of these large spikes which goes some way to balancing out increases in new workers- such declining from 1845 to 1848 (whilst new workers increased). However retained workers do see a large upwards spike in 1849. They then follow a gradual downwards trend until 1854, when there is a more sudden drop, and sustained lower levels from 1855 onwards.

The 1847-1848 spike in new workers was likely driven by three factors. Firstly it is likely exaggerated by the dip in new worker recruitment in 1846. Additionally the Monthly Bond was renegotiated in 1847, which appears to have attracted new hewers with various wage increases. However, the sinking of a new pit at Wylam in 1848 was certainly the most important factor for the number of new workers recruited, especially in the latter year. Additionally this is demonstrated by the increase in the number of retained workers in 1849. With the additional opportunities for work, an additional number of hewers chose to remain at the colliery. The amount of coal produced would also have had some influence here. Wylam's output increased throughout the mid-to-late 1840s, and therefore the colliery required more hewers to produce additional coal. Indeed the overall number of hewers rose from 42 in 1846 to 50 in 1847 and 52 in 1848, reaching its peak of 56 in 1849.

After 1849, retained workers steadily declined until 1854, when there was a sharper drop. New workers continuously declined with the exception of 1855. The 1855 upwards spike of new workers coincides with the high point of hewers' average wages in our period, which likely encouraged more to bind there. However, the accompanying drop in retained workers indicates this may have simply been a replacement of lost labour, as it was recruited elsewhere with the end of the Monthly Bond. It may initially seem odd that labour would choose to

²⁸¹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 219.

²⁸² *Ibid.*

relocate from a colliery enjoying its highest wages for two decades. However Wylam's hewers were not alone in their prosperity, and they may well have attained better terms elsewhere. Additionally, if the Monthly Bond did end in 1854, then it is unsurprising to see high levels of movement in the year afterwards, as workers sought to find the best terms possible. We must also be careful not to overstate the size of this movement- whilst a 28 percent new worker ratio is higher than the surrounding years, it is certainly not the highest in our period.

The mid-1850s was one of the highest points of worker power in the coalfield²⁸³- with the introduction of a semi-annual Bond (their original demand in 1844) by 1856 at Wylam. If "the decline of annual hiring"²⁸⁴ had caused a decline in internal migration, as Church argues, then its reinstatement should have prompted the number of new workers per year to rise again. However, other than in 1855, they do not. This suggests that there were other factors at play in determining migration in the coalfield during this period.

The final period in our wage data contains only one entry- 1861-1862. As previously mentioned, the higher 'new worker' rate may have been a consequence of the reintroduction of the annual Bond. There is a gap in Wylam's wage data between 1856 and 1860-1861, but we know the annual Bond was reintroduced in 1857-1858. Annual bonding at Wylam stands out as a bit of an oddity. Colls and Church both agree that the Monthly Bond lasted until 1854.²⁸⁵ But at this point both seem to imply that annual Bonds were reintroduced "probably on a much less rigorous basis than before".²⁸⁶ Neither mentions semi-annual bonding, although they do both agree that the miners were in a position of strength. Semi-annual Bonds fit with this position- it was what the miners had favoured in previous strike action. But it seems strange that there is no reference to this in the literature. Church then argues that the owners tried to re-assert the

²⁸³ Ibid., 678.

²⁸⁴ Ibid., 219.

²⁸⁵ Colls, *The Pitmen of the Northern Coalfield*, 109; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 678.

²⁸⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 678.

annual Bond in the early 1860s, but this was after our period of study.²⁸⁷

Retained workers are at a slightly higher level than in the mid-1850s, but not significantly so. However new workers are much higher. This is consistent with the previously mentioned notion of more labour being available towards the end of the period.

Having identified and explained the trends in our data, we now evaluate how migration might have impacted standard-of-living and the family economy. As will be discussed in *The Family* section of this investigation, family members tended to move to and from collieries together. This means that the decision was not always based purely on what the male head of a household could earn, instead on what the family could earn as a whole. This may have also been influenced by female employments in other industries- usually in agriculture or domestic service.²⁸⁸ However, as the bulk of wages would have come from the breadwinner and child labour in the mines, it is likely that was a minor influence.

Additionally, as workers rarely stayed at the same colliery for their entire lives, their families would be required to move villages with them.²⁸⁹ Single hewers may have had an additional propensity to move in search of the best rates, but it is unlikely that they accounted for the entirety of internal coalfield migration. Colliery housing may have made this easier, but newly married hewers were lower down the list for allocation of such housing, which may have adversely affected their ability to start a family. Those with full-fledged families were less likely to have this problem, but being uprooted on potentially an annual basis must have been a traumatic experience.

This factor could also have persuaded some mining families to stay at collieries even though they knew that the male breadwinner would be able to get a better rate elsewhere. If a hewer's sons were known to be able to obtain work in the colliery, then it may have meant that in order to maximise earning opportunities, the best option was to remain. However, the process of the binding meant it

²⁸⁷ Ibid., 261, 678.

²⁸⁸ Jaffe, *The Struggle for Market Power*, 81.

²⁸⁹ Ibid., 76–77.

would be relatively easy to discover if an entire family could obtain employment elsewhere. Other unquantifiable factors, such as loyalty to the owner of a particular pit, may also have had a part in persuading some families to stay put.

In summary, we agree with the literature that internal migration was between ten and forty percent. We have used a different methodology and data to Hair, so to produce similar results is encouraging. However, we feel tracing the causation to hiring systems (in other words, the annual and Monthly Bonds), fails to account for all factors and does not explain the whole picture. We have explained these trends as well as possible with the data available. We have also sought to highlight and address the contradiction in Church's work between advantages gained by remaining at the same colliery, and a highly mobile workforce. Finally, we have again considered the impact of this on standard-of-living, and suggested that the family economy played an additional part in determining migration, rather than simply maximising the male-breadwinners' earnings. The effects of families being forced to move on an annual basis has also been discussed.

The Family

The family was an important part of the mining trade and the mining community. Boys were taken into the mines at a young age by their fathers, in order to impart the necessary skills to prosper in the profession. They would work their way up from trapping and working the switches at ten (or younger), to hewing around the age of twenty-one.²⁹⁰ This made the family unit central to the mining trade. We opt for a simple, but effective, measure of potential familial relationships. By using a sampling technique based on surnames, we have preserved families working together in the mine. We then sum those with the same surname. Whilst this is by no means a perfect measure, and is unlikely to be completely accurate, the preponderance of certain names in the wage data suggests some form of connection. Across all workers we find that of the 290 individuals originally identified in the paybills, 217 of them had the same surname as someone else in the data. Whilst this might be expected for more common surnames such as

²⁹⁰ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 195–196; Colls, *The Pitmen of the Northern Coalfield*, 14, 43–44; Jaffe, *The Struggle for Market Power*, 82–84.

Armstrong (19) or Ramsey (13) this list includes those such as Varty (10), Turnbull (9), Appleby (6) and Cowings (6). This seems far more than coincidence.²⁹¹

Furthermore, we present evidence of those of the same name joining and leaving the colliery at similar times. If we take the Varty family as an example, after 1843, there are consistently six to eight Varty's visible in the data until 1854, when a couple of the longer serving hewers move on. There are then around five of this name until the second gap in 1856, with six present in the final year of 1860-1861. It is also possible to track younger members of the family entering the mine, and progression through occupations. Whilst James (1836), Thomas (1837) and John (1838) all joined the mine as hewers, Michael first appears in 1843-1844 as a driver, graduating to putting in 1845, and eventually hewing in 1850. Similarly, Henderson begins working the switches in 1850, before moving on to driving full-time in 1852 (having been doing it as a secondary capacity for two years). At this point he vanishes from the data, most likely working in a different seam (although it is possible he moved to a different colliery) but reappears as a putter in 1855. By 1856 he has picked up secondary hewing responsibilities, and became a fully-fledged hewer somewhere between 1856 and 1860-1861.

Another example are the Appleby's, although this is more complex. Christian and Thomas both started work in 1848 as drivers and working the switches. What is interesting is that there appears to be no senior male figure working as a hewer. This could be because he was working at another colliery, or this could be an example of a family without a male breadwinner, as Humphries claims occurred on a regular basis.²⁹² John joined them at Wylam in 1854 as a driver, suggesting this was his first employment. There were then three more Appleby's (William, John and 'H'), who may have been related to those previously mentioned, who appear in the colliery records for 1860-1861 and 1861-1862. That all these boys

²⁹¹ Ideally, work would have been undertaken to reconstruct families from a combination of census and parish records. This will be carried out in future research, but time did not allow for it here. The adoption of this simple method allows preliminary investigation into this topic and has produced some interesting results, which we feel worth resending here.

²⁹² Humphries, "The Lure of Aggregates and the Pitfalls of the Patriarchal Perspective," 706.

started in junior occupations (trapping and putting) suggest that they may have been related. By this point, Christian had achieved the status of hewer, so they may have been his children.

The initial lack of a male family head is interesting, as whilst Humphries contends 18 percent of British families lacked a male breadwinner through mortality and absenteeism²⁹³, the hereditary nature of recruiting labour into mining would suggest that this would not be as common in this industry. Young labour may have been recruited from local families in other industries, but without the system of apprenticeships present in other mining regions, it would probably have required a personal relationship with someone already working in the mine. In any case, the earnings of the boys alone would have been insufficient to support a family by themselves.

If we look at some of the entries with fewer occurrences of the same name, it is perhaps easier to see the presence of families more explicitly. The Cairns family, consisting of James, Peter and Joseph, all joined Wylam in the second half of 1844 (working as two hewers and a putter respectively) and left again following 1845. Mark and Thomas Graydon both arrived at Wylam in 1839-1840 (as a hewer and a putter) and both left the year after. George and Thomas Muse both worked at Wylam between 1848 and 1856. George was the head of the family, a hewer. Thomas began trapping, progressing as far as putting in his tenure. A second George and Jacob both began work in 1854, working the switches and driving. George Jr. left with his two elders in 1856, whilst Jacob disappears from the records a year earlier. Whilst this pattern by no means holds in every case, there are many more that do. It is hoped these examples help convince the reader it is possible to demonstrate qualitatively the importance of family through our data.

The Rowntree life-cycle cites several specific times of life at which an individual would undergo particularly strong financial strains- emphasising the point that poverty was not static. He believed people would be poorest at a young age when

²⁹³ Ibid., 708.

they were one of many dependents, when they had a large number of dependents, and in old age.²⁹⁴ The comparability between hewers' and putters' wages means that following these periods, families would enjoy an especially high standard-of-living in periods afterwards, as children would be earning a higher wage whilst they were still in the family home. It therefore seems that the cycle would have seen higher peaks and lower troughs in mining villages.

The larger size of mining families also meant they had increased earning potential.²⁹⁵ Later in this section we will discuss the potential earnings of mining families in relation to family budgets, but it should initially be clear that the greater the number of children, the more dependents in early family years but also the greater earning potential in later years. Even a trapper could be worth around 3000 pence per year to a family. Drivers could contribute another 4000, and putters could earn a wage the same as- or in some cases superior to- a hewer, around 9000 pence per year. If a family were to have children at two-year intervals, and have three children (not uncommon in mining families) there would be a period of around four years where all of these children would be dependents, until the eldest became ten. This would be a period of financial strain- with three extra mouths to feed, the earnings of a single hewer and whatever employment his wife could find, would have to suffice. From there onwards, things would get significantly better. The additional earnings of each of the children (assuming they were male) as they joined the workforce in the mine would then contribute to the family's income until they began to leave home and start families of their own.

Miners were expected to move out of hewing and into less physical tasks if they reached the age of fifty-five.²⁹⁶ This would also have impacted on their earnings, but with few dependents this may not have been overly severe. However, they would also have lost colliery housing, which was reserved for hewers. When this work (probably still involving significant manual labour) became too much for an aging miner he would have been forced out of the industry all together, into a

²⁹⁴ Rowntree, *Poverty*, 136–137.

²⁹⁵ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 616–619; Colls, *The Pitmen of the Northern Coalfield*, 263.

²⁹⁶ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 203.

job which he may have had little experience of, having been the mines his entire life. This would have undoubtedly reduced his wages further. We should also recall the long-term ailments which would likely have affected former hewers by this point. Working conditions in the mine hardly encouraged a healthy lifestyle, with physical activity often crossing the border to damaging, and inhaling coal dust impacting on an individual's breathing abilities.²⁹⁷ This may well have damaged his chances of gaining employment outside the mining industry.

Those in receipt of colliery housing are marked in the paybills, and the terms on which it was provided mentioned in the Bonds. Current literature emphasises the importance of this housing²⁹⁸, but in our records relatively few hewers appear to receive it. Most scholars have noted the almost universal concept that colliery housing (although limited) was free to workers and present at every colliery in the northern coalfield. Wylam's Bonds also specify a rent for this housing, which seems to contradict this idea. It is therefore hypothesised that those marked as receiving accommodation were required to pay for it in those years. In years when it was free, it was not noted in these sources. The Bonds also help us to value this housing, as they provide those not in receipt of it (for certain years) with 720 pence (£3) compensation. The quality of housing has been considered poor by much of the literature, at least in the earlier part of our study.²⁹⁹ As was earlier mentioned, miners housing was hardly luxurious, although remarkably well furnished.³⁰⁰ This indicates that they were acquiring durable goods with their disposable income. Houses often consisted of two rooms (including the attic, which was often rented), although they were almost universally built of stone by the mid-1840s.³⁰¹

The finding that colliers were required to pay rent is a significant one. As our present estimates are lower than those in the literature and we find hewers were

²⁹⁷ McIvor and Johnston, *Miners' Lung*, 41.

²⁹⁸ Colls, *The Pitmen of the Northern Coalfield*, 262–263; Jaffe, *The Struggle for Market Power*, 58–59; Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 430–431.

²⁹⁹ Colls, *The Pitmen of the Northern Coalfield*, 263; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 606.

³⁰⁰ Church uses evidence from a contemporary observer which claims miners homes were well furnished in the 1840s, including clocks, chests of drawers, and four post beds. See; Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 609–610.

³⁰¹ *Ibid.*, 606.

expected to pay rent out of this wage in some years, we further downgrade their standard-of-living. This should not be overstated; if we assume that rents were £3 a year (in line with the compensation given to those in years of free housing), this converts to 720 pence. Split over 26 fortnights, this equates to 28 pence each. This would not drastically affect the pattern of wages, but might alter it enough in some cases to influence our conclusions in comparisons to other years.

At present, the best family budgets available are those of Horrell and Humphries. These range across a large number of industries and time periods.³⁰² They do contain entries for mining, but this is not always coal (tin and ore mines are included) and there are few entries from the northern coalfield.³⁰³ Using their sources, we find the most suitable entries in this regard are those from the Report of the Children's Employment Commission of 1842, in which John Leifchilde, Esq. lays out an 'average expenditure' for a mining family for a fortnight in the Northern coalfield. This is calculated to be £4.7s.10½d. In Leifchilde's survey, the income of an adult hewer, a putter, a driver and a trapper should amply cover such expenditure, bringing in a total of £5.3s.7d.³⁰⁴ If we convert these totals into pence to make a direct comparison to our wage rates, we see an expenditure of 1054.5 pence and an income of 1243 pence. The family budget contains mutton and bacon, as well as flour, oatmeal and muslin, all of which might be considered relatively standard in the family budgets of this period. There is however considerable expenditure on butter, milk, tea, sugar and coffee, with a sizable tobacco and beer allowance. The food portion of the budget totals £3.0s.10½d. The rest is portioned between shoes, sundries and clothing- the latter of which also constituting considerable expenditure.³⁰⁵ This is in line with the notion above that miners purchased durable and semi-durable goods with their disposable income.

We shall now compare this budget to our own data. Firstly, let us consider our sample. Unfortunately, we do not have wage data for 1842. Instead, let us use

³⁰² Horrell and Humphries, "Old Questions, New Data, and Alternative Perspectives," 852.

³⁰³ *Ibid.*, 873–878.

³⁰⁴ Great Britain. Parliament. House of Commons, *Children's Employment Commission- First Report of the Commissioners- Mines, 1842. Appendix One. [electronic Resource].*, 536.

³⁰⁵ *Ibid.*

1843-1844. A hewer in this year averaged 295 pence per fortnight, a putter 274, a driver 138, and a trapper 41. This totals 748 pence, a far cry from the 1243 Leifchilde claims to be the norm. These wages rates are undeniably low- especially that of the trapper (which is based only on one entry), but that the rates for each occupation were all low in the same year suggests a depression in wages across the industry. Therefore let us also consider the last year we do have wage data for before the report- 1840-1841. In this scenario, a hewer averaged 360 pence per fortnight, a putter 310, a driver 147 and a trapper 94. This totals 911 pence per fortnight, closer to but still significantly short of Leifchilde's totals.

Let us then ask ourselves what the families in our sample could afford. The difference between the 1840-1841 income and budget is 143.5, and the 1843-1844 306.5 pence. What could the family have ceased to consume? The first thing to go would have been luxury items. Removing coffee would have saved the family 36 pence, as would consuming half the amount of butter and milk. The clothing allowance, the single largest expenditure, would also likely have been cut. Reducing this by half would save 105 pence. This brings us within the 1840-1841 budget. In times of more severe austerity- as seems to have been the case in 1843-1844, all luxuries might have to have been foregone. Keeping half the amount of milk and butter, but losing coffee, tea and sugar, would save 114 pence. Retaining a halved clothing allowance saves 105 pence again. We still need to save another 86.5 pence, so reducing mutton consumption from fourteen pounds to ten pounds, flour from five stone to four stone, and bacon from fourteen pounds to ten pounds saves 94 pence. It is therefore possible that miners could have survived on these incomes, but they could not have enjoyed the same standard-of-living which Leifchilde accredits to them.

Table 1- Comparison Between our Hypothetical Mining Family and Leifchilde's Estimates. (Source: Own calculations and **Great Britain. Parliament. House of Commons, *Children's Employment Commission- First Report of the Commissioners- Mines, 1842. Appendix One. [electronic Resource].*** (Cambridge eng: Proquest LLC, 2006), 536.)

Year	Income of Hypothetical Mining Family (pence per fortnight)	Leifchilde's Total Expenditure (pence per fortnight)	Difference Between Mining Family Income and Leifchilde's Expenditure (pence per fortnight)	Leifchilde's Total Income (pence per fortnight)	Difference Between Mining Family Income and Leifchilde's Income (pence per fortnight)
1840-1841	748	1054.5	306.5	1243	495
1843-1844	911	1054.5	143.5	1243	332

What might have motivated Leifchilde in his reporting? His commentary before presenting this budget suggests that the data were collected “from several instances”³⁰⁶ and was “very far from an extreme case”.³⁰⁷ The family in his selection is around average- the same report claims an average family size of 4.5.³⁰⁸ And this should (in theory) be one of the more affluent times of life for the family- with four people in employment, two of whom were earning ‘adult’ wages. Therefore, the difference between the two is somewhat surprising. The 1843-1844 estimate certainly seems to have been the low point of the period, and by a significant margin. If we consider these to be times of extreme austerity, then it is unsurprising that a mining family would be unable to afford what appears to be a relatively well-off basket of goods. The 1840-1841 comparison should therefore be preferred. Whilst there is still a rather sizable gap, this could easily have been account for by the general skill of the hewer and putter in many families. Leifchilde also seems to be of the opinion that miners were rather well off³⁰⁹, and therefore in constructing this basket may well have taken better off

³⁰⁶ Ibid.

³⁰⁷ Ibid.

³⁰⁸ Ibid., 514.

³⁰⁹ Ibid., 518.

examples to reinforce this view. Of course, Wylam could simply have been an exception with especially low wages. However, it was not an insignificant colliery, and a gulf between it and the rest of the coalfield would create more questions than it answered- especially with the mobile labour market demonstrated in the previous section.

We additionally consider a budget from a Northumberland agricultural family, which was also under a bonded labour system, as a point of comparison. Agricultural workers were bound under the Hind system, which like the Pitmen's Bond, allowed them specified payments (in cash and in kind) in return for their labour, for yearly intervals. Unlike the Pitmen's Bond, the agricultural labourer was also required to provide the labour of his wife (or a female servant) when required by the farmer. He was also given perks as part of his contract; for example, grass for a cow was specified (see Appendix Four for a more detailed discussion).³¹⁰

The yearly income of this family (including goods in kind) was £76.0s.10d, with expenditure calculated to be £75.13s.7d in 1837. Most of this was in the form of goods- only £4 was received in wages of the male breadwinner, although employment of his wife and his sixteen, twelve and ten year old sons provided an additional £26.6s.0d in monetary wages. The family is said to have three other dependent children (the youngest three months old). Like a mining family, a large proportion of the family's earnings was accounted for by child labour.³¹¹ The added female employment is something not accounted for by our data, so we must bear this in mind when making comparisons.

The family was located in Chillingham, Northumberland (less than 50 miles from Wylam). An annual income of £75.13s.7d for our Northumberland labourers converts to 18163 pence per year. If we compare our miners wages from 1838-1839, the average wage of a hewer was 332 pence per fortnight. This converts to 8632 pence per year. This, clearly, is far short of the wages generated by the

³¹⁰ L. Hindmarsh, "On the State of Agriculture and Condition of the Agricultural Labourers of the Northern Division of Northumberland," *Journal of the Statistical Society of London* 1, no. 7 (November 1, 1838): 404.

³¹¹ *Ibid.*, 405.

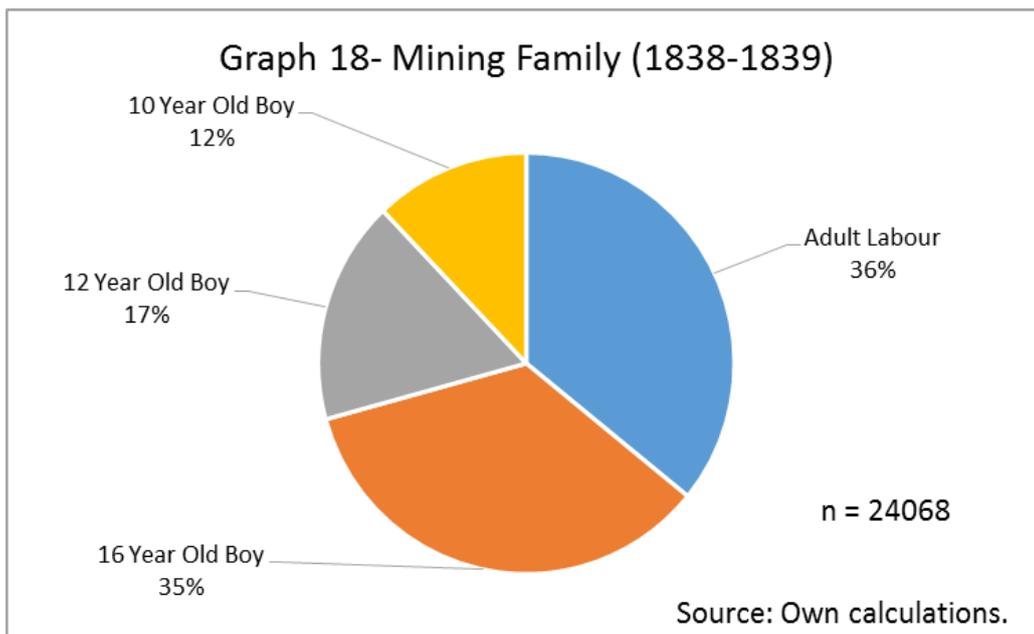
labourer, but this is an unfair comparison as the labourer's entire family are included in the earnings.

A putter's average wage was 323 pence per fortnight in 1838-1839, or 8398 pence per year. Together, this makes 17030 pence per year- not equal to the expenditure of this agricultural family, but far closer than the hewers wage alone. This seems to be a fair comparison to the male breadwinner and his sixteen year old son, but the two younger sons and the labourers' wife are still unaccounted for in our hypothetical mining family. The boys in 1838 would likely have been trappers or drivers. As agricultural labourers tended to have undergone plenty of physical exercise, let us assume that the twelve year old was physically capable of driving, and his younger brother trapping. These yield fortnightly rates of 159 and 112 pence. Converted, these give the family an extra 4134 pence and 2912 pence per year. Now our mining family appears to be doing very well- together this makes 24076 pence per year, even before factoring in any female employment. This exceeds the agricultural labourers' family income of 18163 by 5913 pence per year.

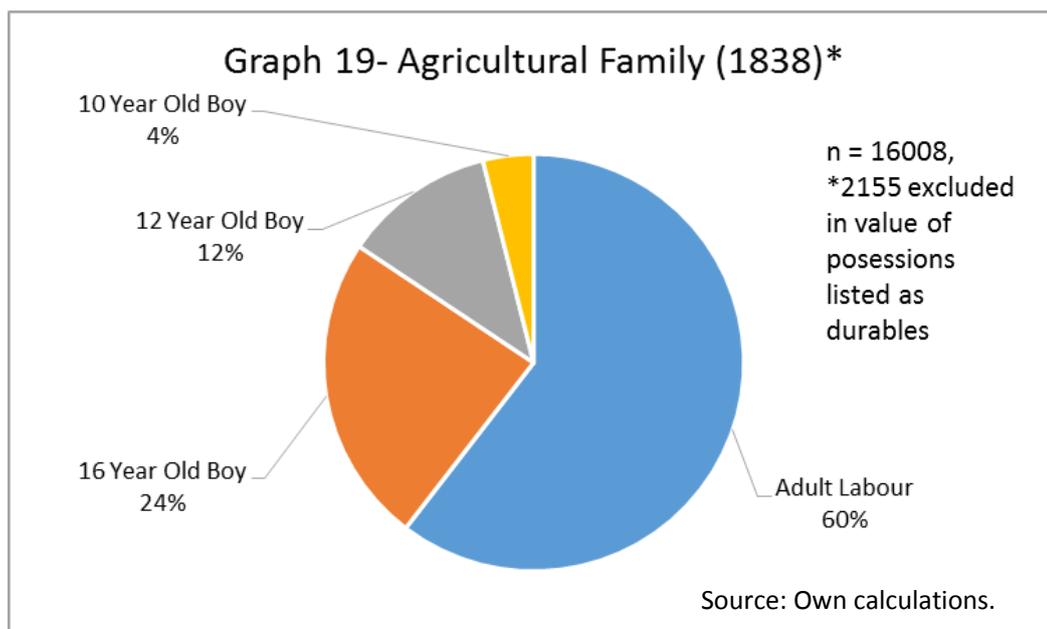
However, whilst this may initially seem that mining families were better off than their agricultural counterparts (and indeed, in this example they appear to have been), there are several issues that need to be addressed. Firstly, the agricultural family kept a variety of livestock, including a cow. They would therefore have been able to enjoy some of its produce without incurring additional expense. Whilst it is true that enclosure had removed the access of labourers to common land, and therefore owning livestock, Hindmarsh and Greg, contemporaries writing in 1838, claim that the Hind system provided a means for families to do this, with their master's providing the land for it to be kept.³¹² Whilst it is likely that this did not occur in all cases, this may well have been part of the hind agreement. Hindmarsh's report may well have been overly positive in places, but as was much contemporary reporting. This agricultural family may have been a little atypical, but at present no better family budget has been identified for comparison.

³¹² Ibid., 412.

Secondly, when we break down the income of these two families, we see that much of the difference in income is due to child labour. According to the same source, an agricultural worker and his wife would have been able to generate 15s 6d per week if they had no children capable of working.³¹³ This converts into 9672 pence per year. As already discussed, the average hewers' wage for the same year was 8632 pence. Whilst his wife may have been able to supplement his income to some extent, it is unlikely this would have raised the household's income significantly above that of the agricultural labourer. As *Table 2* shows, it was in utilising child labour that the mining family moved ahead in income. Each child contributed significantly more than their agricultural counterpart. Whilst this is not a perfect comparison, as the ten year old agricultural child was only employed part time, whereas the ten year old mining child was in full employment, the difference is striking- especially with regards to the sixteen year olds. This demonstrates that it was not that the adult male who was better paid in mining families, but that the family economy provided a higher standard-of-living. This is more clearly demonstrated by *graph 18* and *graph 19* which show the proportion of annual earnings which each family member contributed. Whilst the children undoubtedly contribute a sizable proportion of the income of the agricultural family's income (40 percent), this is far smaller than the contribution of the mining family's income, where child labour contributes 64 percent.



³¹³ *Ibid.*, 406.



Finally, this hypothetical mining family’s first three children were all male children. This means that they were all able to be employed in the mines. The statistical probability of this happening is around 12 percent. Whilst girls could have potentially found work in other industries, this was relatively limited in mining villages and not as valuable. This would therefore have reduced the income of the family.

Table 2- Child Earnings in Agricultural and Mining Families, 1838. (Source: Own calculations and Hindmarsh, *On the State of Agriculture and Condition of the Agricultural Labourers of the Northern Division of Northumberland*, 405.)

Child	Agricultural Family Earnings- 1838 (pence per year)	Mining Family Earnings- 1838- 1839 (pence per year)	Difference (pence per year)
10 Year Old	624	2912	2288
12 Year Old	1872	4134	2262
16 Year Old	3840	8398	4558

Additionally, we must consider if this comparison is a fair one. Flinn found on the Tyne average family size was 4.75³¹⁴, with an average 1.95 members “employed in the mines”³¹⁵. Whilst this is from 1815, it is probably the best estimate we have, as it was taken from a survey of the Coal Owners Association. It is also close to the estimate of 4.5 provided by the Commission investigating

³¹⁴ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 392.

³¹⁵ Ibid.

mines and collieries.³¹⁶ This suggests that comparison to a family of eight is unfair, as realistic family sizes of miners were much smaller. However, we have constructed our hypothetical mining estimates to account for this.

If we consider Flinn's family size, we would likely have two family members working in the mine. Usually, one of these would have been a hewer. The other would likely have worked his way through the mine as he got older. If we continue to use 1838-1839 as an example, a hewer with one son working as a driver would have seen an annual income of 12766 pence per year. A hewer with a putter son would see an annual income of 17030, as has already been established. The step between a driver and a putter's wage can therefore be seen as a significant gain in earnings, which would go a long way towards his family's welfare and standard-of-living. Whilst the gap may be a little exaggerated (a boy would likely earn above average in his final year of driving, and below average in his first year of putting), the gap remains substantial. If experience really was the key to progression through occupations, then it is understandable why children were taken into the mines at such an early age.

This changed slightly with the 1842 Mines and Collieries Act, which restricted the age at which children could work in the mines to ten years old.³¹⁷ How well these restrictions were enforced is questionable and realistically it just seems to have delayed entry into the mine by a couple of years at most. However it did mean when children started work in the mine, they were expected to fulfil their task on a more regular basis. This has been seen with the increase in trappers' wages (and other similar workers) due to additional time being worked in the mine.

As has been mentioned in the comparison of family budgets, women are not accounted for by our data. As our wages are drawn directly from mine records of underground workers, women do not feature in them. It has already been established in the literature that women very rarely participated in mining in the

³¹⁶ Great Britain. Parliament. House of Commons, *Children's Employment Commission- First Report of the Commissioners- Mines, 1842. Appendix One. [electronic Resource].*, 514.

³¹⁷ Colls, *The Pitmen of the Northern Coalfield*, 133.

Northeast. Indeed, this practise had died out long before the period of this study, regardless of its existence in other mining regions until 1842.³¹⁸ Our results provide nothing to contradict this evidence. Our sample yielded no overtly female names, and women were not mentioned in the Bonds. More than this would simply be speculation, as we currently have no direct evidence on the lives of women in Wylam.

This section has considered a broad range of factors related to ‘the family’. We first considered family labour in the mines, and used surnames of underground employees in conjunction with their working years and occupations to suggest familial links. We then considered the Rowntree poverty-cycle, and the implications this would have had for the family and their standard-of-living. Colliery housing was then discussed, along with its allocation and value. Family budgets from labourers in the same and similar industries were then evaluated and compared by constructing a hypothetical mining family based on these family’s structures. Mining families were seen to be dependent on the utilisation of child labour in order to gain additional income, in comparison to an agricultural family in 1838. The incomes of adult hewers alone were comparable to that of agricultural workers without children who were able to work. Additionally, our miners fall short of the basket-of-goods which the 1842 report assigns to them in the Northeast, but this does not necessarily mean that our figures are too low, as this basket may well be unrepresentative of mining families in general. Finally, we noted the lack of women’s labour in our data, and acknowledge the need to account for it in future investigations.

Other Factors Relating to Earnings

Recent studies have used ‘hewers’ and ‘putter-hewers’ as a criterion for selection of workers.³¹⁹ It has been the intention of this study to demonstrate that many workers took shifts in different occupations, although at this stage it is not possible to numerically demonstrate how regular these shifts were. We have already established that on average 39 percent of hewers took a shift in another capacity per year. Contemporary accounts claim that men might partake in this

³¹⁸ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 333.

³¹⁹ Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 966.

practise of equally splitting their time between putting and hewing for a year before moving into hewing full time.³²⁰ 39 percent is higher than the number of hewers who would be in their first year hewing full-time. The practise of taking shifts in other occupations must therefore have permeated beyond those designated as ‘putter-hewers’. Additionally, further investigation has been undertaken through analysis of the Pitmen’s Bond. It is accepted that the social status of hewers was higher than other underground workers. However, the role of a ‘putter-hewer’ was never specifically established in Wylam’s Bonds, and therefore we suggest the extent to which historians have seen this as a distinct category of worker is overstated.

The Bonds for Wylam refer mainly to the terms of work for hewers. They go into a great amount of detail describing the rights and conditions attached to their employment. They also refer to putters, although this is usually only one paragraph in the entire document. This investigation has not found mention of ‘putter-hewers’. We must therefore query their inclusion in the literature as a distinction between workers. Hewers were obviously regarded as the elite- despite the similarity between hewers and putters wages- due to the weighting of clauses devoted to them, and the provisions which applied only to hewers. Only hewers received a daily rate when participating in work other than their contracted occupation and they were also the householders in the colliery. They were also subjected to fines for workmanship. These points have been mentioned elsewhere in this study, but they are worth repeating here to emphasise the status of the hewer. Whilst contemporaries may have viewed some men who were transitioning between putting and hewing as ‘putter-hewers’, they legally had no different status in the Bond. Additionally, their contemporaries were also taking shifts in other occupations, albeit likely less regularly. With so many workers taking shifts in other occupations, it seems unfair to discount these workers on such a basis.

This study has already analysed the general pattern of wages, and emphasised that fluctuations in yearly earnings and the deviation of wages should be seen as

³²⁰ Flinn, *The History of the British Coal Industry. Volume 2, 1700-1830*, 1984, 348.

important as average levels. It will now address the how the skill of individuals affected their pay. It seems obvious that in occupations paid by a piece rate, some hewers or putters would simply be better at their jobs than others- due to superior physical strength or an ability to ‘sense’ the coal. This, of course, must be true to some extent. However, the process of cavilling meant that scholars have assigned a certain amount of luck to earnings.³²¹ To investigate this, we have looked at the trends of selected workers over a long period. Hewers who worked continuously in the mine for an extended period were chosen.³²² We then evaluated their relative earning levels- did they always earn above or below average, or did this change with the year? The first simple measure of our sample of ten hewers was to consider if they consistently earned above or below the average wage. Four consistently earned above average, three consistently earned below average, and there were a further three who fluctuated. For those that fluctuated, two appear to have long runs of consistency at various points in their employment history, but this was not always at the beginning or end. This suggests that hewer skill did play a large part, with other factors (such as the part of the face to be worked) playing a minor role.

The next step was to investigate the dispersion of these earnings. A hewer could be consistently above or below average but still fluctuate wildly. The standard deviation of year-on-year earnings for each individual hewer in this sample was as much as 89 pence, and as little as 22 pence. The average was 59 pence. Compared to the variation of average wages within our data, this standard deviation seems to imply consistency within workers. Some movement would have occurred due to changes in piece rates, different numbers of working days, individual effort and cavilling. The final point should not be overstated- the “gamble of a lottery”³²³ which Colls describes does not seem as substantial as

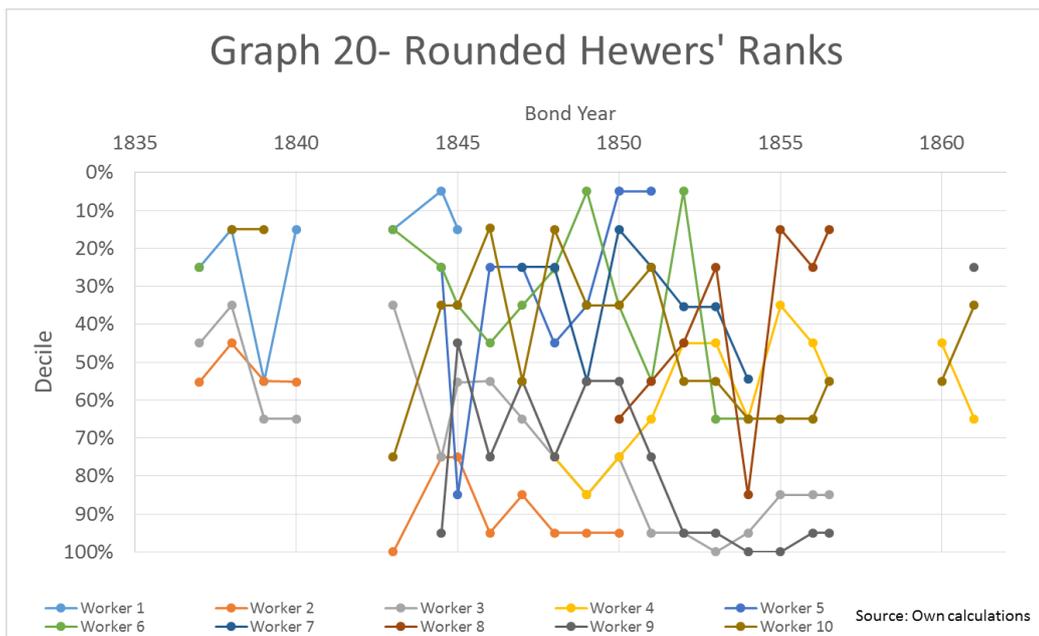
³²¹ Colls, *The Pitmen of the Northern Coalfield*, 48.

³²² A sample of ten hewers was selected. The shortest period of work for any hewer was seven years, with the most being nineteen. The average was twelve years of data per hewer. Sampling tried to ensure that those selected provided continuous employment histories, however this was not always possible and therefore there are some gaps, which are shown by graphs 15, 15.1, 15.2, and 15.3. The quality of the data were also taken into account when sampling. Whilst this varied for all hewers, those in this sample were required to have multiple years which contained more than ten fortnightly paybills. In most cases, 'multiple years' can be seen to mean over half of the total years for each hewer.

³²³ Colls, *The Pitmen of the Northern Coalfield*, 48.

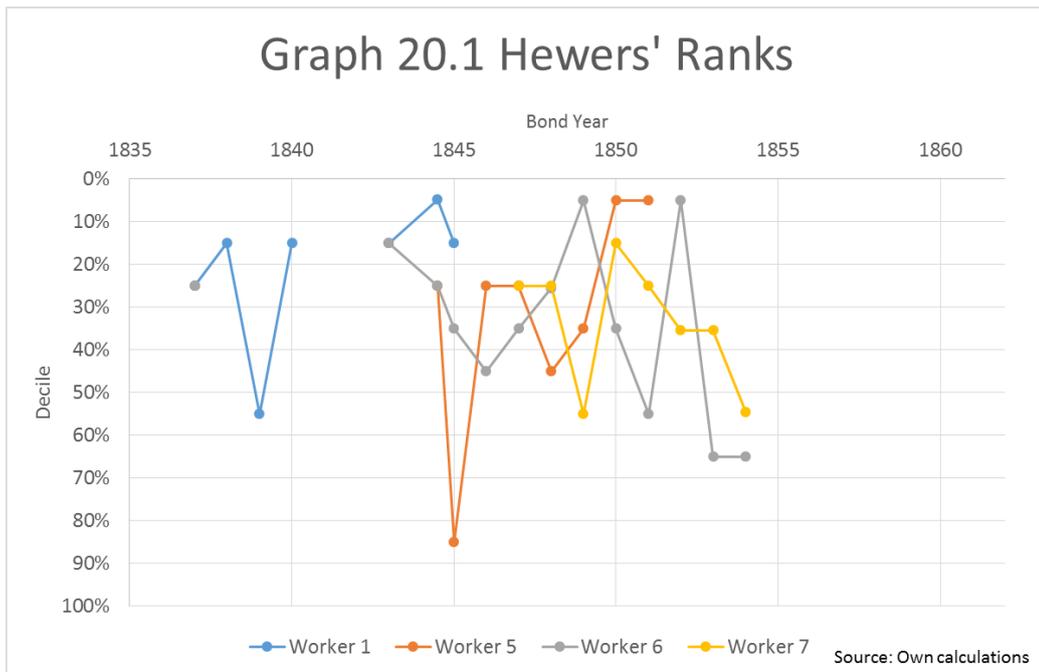
might be suspected. Hewers' age would also account for some of these changes- the output of older hewers would begin to fall off as their physical strength waned, whereas younger hewers would gain wages as they benefitted from experience.

Finally, we have ranked all hewers in each year by fortnightly earnings. We have then selected those in our sample, and recorded where they fell within hewers as a whole. These were then converted into earnings percentiles to account for the varying number of hewers in any given year. Top hewers (who earned the most) would have been classified as one percent. This pattern is far less clear than the previous two measures have suggested. To simplify these trends, *graph 20* has been constructed. Here we have converted the percentiles to deciles. This allows us to keep the majority of the fluctuations in the data, but allow the trends to be more easily identified.



There is still lots of movement in *graph 20*, so to simplify things further we have separated out those previously identified as consistently earning above average, below average, and fluctuating. *Graph 20.1* therefore contains workers 1, 5, 6 and 7, *graph 20.2* shows workers 2, 3 and 9, and *graph 20.3* shows workers 4, 8 and 10. All of *graph 20.2* seem to be decreasing over time. This means that they were likely older hewers reaching the end of their careers, or suffering from gradually worsening illness or injuries. On *graph 20.3* workers 4 and 8 both show increasing ranks, apart from the odd year probably affected by illness,

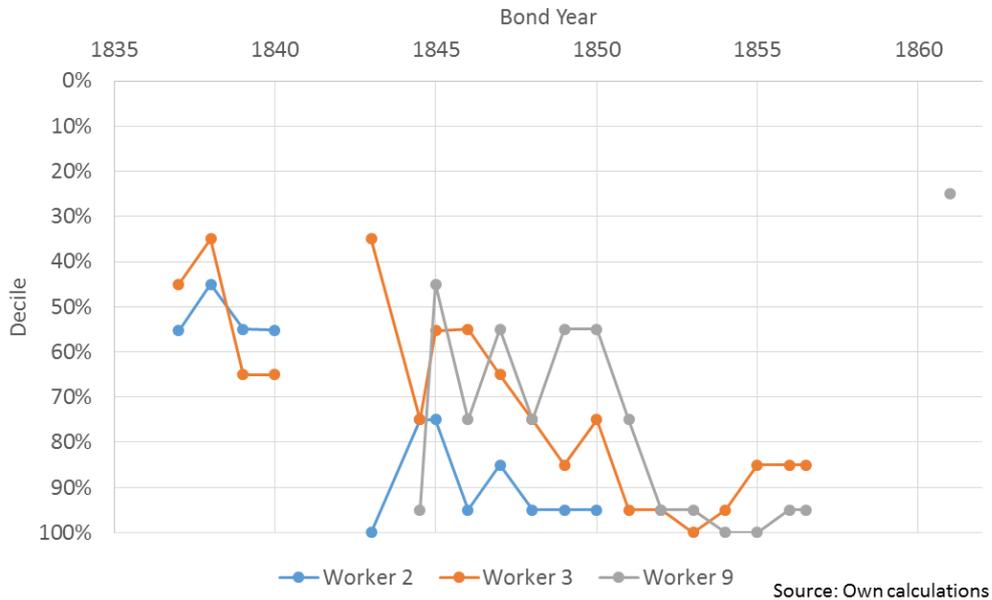
absenteeism or injury. Despite fluctuating around the average wage, this suggests they have been younger hewers making their way up in the mine. The other entry on this graph, worker 10, appears to gradually gain in rank on the whole, before declining. He then seems to undergo some form of revival in the late 1850s/early 1860s. This could be in comparison to his skill level with new labour, or he could have been disabled by some debilitating factor in the middle period from which



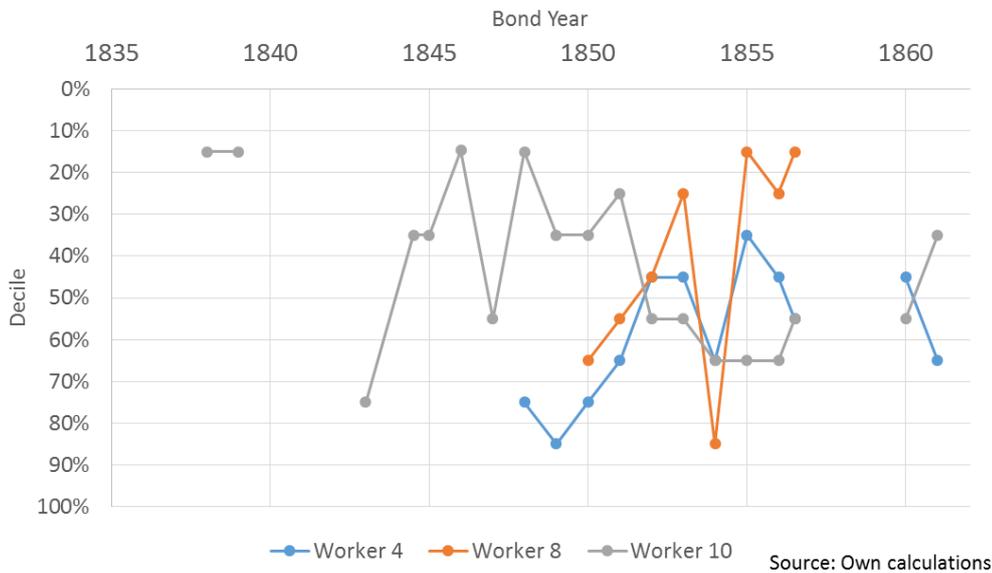
he then recovered. *Graph 20.1* is more difficult to explain. Worker 1, apart from one year, seems to rank highly as a hewer. His shorter tenure suggests he may well have joined and left Wylam in his prime. The same could be said for worker 5. Worker 7 seems to be ranking rather highly for the most part, but the general downwards trajectory of his rank from 1850 onwards suggests he may have been past his prime years. Worker 6 is all over the place, which could be a case of worker effort, or he could have been particularly badly affected by Colls' "gamble of a lottery"³²⁴.

³²⁴ Ibid.

Graph 20.2 Hewers' Ranks



Graph 20.3 Hewers' Ranks



So what can we conclude from these three related inquiries? Our analysis of hewers' wages in relation to the average suggests that there was some continuity in hewers' wages. This speaks to skill being a factor- something which the miners themselves always maintained- but also that whilst the process of cavilling could have an impact, it was not the primary determinant in wages. Our analysis of the ranks of hewers relative to others in the same year suggest that there was also continuity, but clearly showed that earnings were not static- hewers moved up and down the rankings as they gained experience, or aged and

became less physically able. Additionally, almost all of our sample had one year which didn't fit with the rest of their earnings. This embodies the varied and unpredictable nature of coal mining. Injuries and accidents occurred, which could inhibit the ability of miners to go about their work. Even if they were not completely prevented from working, there were years where this could impact on their earnings.

The final issue is that of maximum and minimum earnings. Restriction was either seen as a way of limiting competition between hewers by the Unions, or by ensuring there was more work to go around by the workers, depending on which view in the literature you subscribe to.³²⁵ It is not the aim of this study to comment on this debate, but to establish if restriction was actually a problem for many hewers. We do not know how many of Wylam's workers were members of the Union, but as productivity would have been comparable across the coalfield, this is not an issue. If earnings were lower than the restriction limit this would not have been a problem either way. If we find earnings at the limit (if there was a union presence) or above (if there was not), then we know that restriction would have had an impact. This task is made more difficult by the lack of daily wage data. However, by calculating what the 'restriction rate' would have translated into for fortnightly pay, we can see if any hewers actually got near this limit.

Colls gives the level of restriction as *4s.6d* per day.³²⁶ This converts to 54 pence per day. In a standard six day working week, this means that a hewer should not have earned over 648 pence per fortnight. Of all entries for hewers, there are ten which earn over this threshold in a year. Of these ten entries, four also worked in additional jobs which seem to have been more lucrative than hewing, and therefore we should not view them as having earned all of their wages in the restricted capacity. The other two also worked as putters, and may have bypassed restriction in that manner. Four appeared to only work as hewers, but three of these are from 1861-1862, long after the 1825 estimate, and long after hewing

³²⁵ Ibid., 29–33; Jaffe, *The Struggle for Market Power*, 118.

³²⁶ Colls, *The Pitmen of the Northern Coalfield*, 30.

was said to have been deskilled.³²⁷ The final entry is from 1854, and does contain some large fortnightly entries. The average is also based on one of the fewest number of fortnights allowed in the sample. However, these entries are all taken directly from the paybills, which lends to their validity.

There are two other possibilities- there may be a problem with the reconstruction of employment histories for these individuals (although efforts were made to ensure this was not the case), or they may have been disguised 'gang working' entries in the paybills. There were three additional entries which may be considered 'close' to this limit (averaging over 600 pence per fortnight), but all of these can be explained by the same factors.

These results were somewhat to be expected, for the reasons outlined above, but it was important to establish this was the case. The area with potential cases of hewers working at or near restriction would be on a fortnightly basis. Therefore, we have also evaluated individual fortnightly entries. Using a sample of workers- all those with a surname beginning with 'A' - fortnightly earnings were compared to the cap of restriction. This led to the discovery that instances where hewers earned over restriction, or where they were close enough to restriction that they would likely have had to reduce their output, occurred on 112 occasions of 1648 fortnightly paybills- or around 7 percent of cases. This total includes those who exceeded the limit due to earnings in secondary occupations. It therefore seems that whilst restriction could, and did, play a role in the output of some workers, it was not particularly widespread.

Perhaps more interesting is if we consider supposed minimum earnings. The Bond states that a hewer will receive "not less work than will yield to them, at the aforementioned rates, the sum of "thirty shillings" in each fortnight"³²⁸ This means that a fortnight of work should not have yielded a hewer less than 360 pence. This initially seems problematic, as twelve of our twenty-two measured Bond periods average below this value. However, the Bond specifies that the

³²⁷ Ibid., 30, 114.

³²⁸ The Pitmen's Bond, as quoted in Great Britain. Parliament. House of Commons, *Children's Employment Commission- First Report of the Commissioners- Mines, 1842. Appendix One. [electronic Resource].*, 537.

owner may lay the mine off for twelve of forty-two days, and the hewers would still only be entitled to the same minimum wages. Church has suggested that the working week for miners in this period was rarely six days, and Kirby has demonstrated that Wylam was laid off relatively frequently in his sample.³²⁹ Kirby attributes “cessations of production”³³⁰ to “a management decision based on geological or technical difficulties, or short-term demand shocks”.³³¹ Additionally, it seems that fines would have been imposed after this limit, so the hewer may well have earned this minimum wage, but have been fined down below it. Furthermore, Church contends that this feature may have been dropped from the Bonds in the 1840s,³³² although the annual Bond was later re-instated.³³³

This section has looked to address a number of issues relating to earnings in the mine. It has focussed for the most part on hewers, and finds that ‘putter-hewers’ did not feature as much as they have in the literature, due to the large number of workers with secondary employments. It also finds a large degree of continuity in year on year earnings of hewers, suggesting cavilling was not as significant as has been previously suggested. Finally, it finds that restriction was a factor for some hewers, but in most cases the limit was not an attainable level of work. Indeed, it seems that minimum earnings may well have been more of an issue. Although average earnings were below the supposed minimum set out in the Bond for several years, these do not take into account fines and days for which the pit was laid off.

Conclusion

In conclusion, despite not being a perfect measure, our findings tell us much about the living standards of these miners during the period 1836-1862. We know that average wages overall were static through this period, but that due to

³²⁹ Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 248; Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 968.

³³⁰ Kirby, “Attendance and Work Effort in the Great Northern Coalfield, 1775–1864,” 968.

³³¹ *Ibid.*

³³² Church, *The History of the British Coal Industry. Volume 3, 1830-1913*, 1986, 236.

³³³ *Ibid.*, 678.

cyclical fluctuations, this was actually a result of a large drop off between 1856 and the early-1860s, with a gradual increase in the year before 1856. This tells us that income would have changed throughout the period, and that standard-of-living would rarely have been static. The changes in wages of miners- especially hewers and putters- on a fortnightly basis meant that income was always uncertain, which may have caused periods of scarce resources for mining families.

The dispersion of wages around the mean values for each year is a factor which is ignored by most wage studies. By presenting them here, we look to emphasise how different the experiences' of workers could be, which is ignored by simply providing the mean value. This means that not all mining families shared in the gains or losses of others, again emphasising the wealth of different experiences even for those living within the same village.

In comparison to the existing literature, we estimate that wages were lower than Church has previously asserted for the North-east, but are more comparable with his national levels. Using both Church's and Clark's indices, we show that real wages followed the pattern of nominal wages closely. We highlight the mid-1850s as the peak of the mining family's prosperity in the North-east, and the early-1840s as the lowest.

The relative levels of putters' and hewers' wages has direct consequences for standard-of-living. As putters were able to earn an equivalent wage to hewers, this means that they were able to bring more income into their household earlier in their career than previously assumed. This could drastically improve the purchasing power of the family, and therefore improve standard-of-living. However, coal miners tended to have large families (in order to maximise their income) which would have put strain on the limited resources of single-male breadwinner families when there were lots of dependents and with only one wage earner. This would have exaggerated the peaks and troughs of the Rowntree Poverty cycle for mining families.

We have also seen from a comparison with an agricultural family budget that mining families were better paid, but that this came from child labour rather than the male breadwinner. Boys who could be sent down the pit were very valuable to their households, and could help to supplement the adult male's income. This was especially important for mining families, as the mining trade was so isolated and recruited from within as much as possible. The need to learn the craft meant that children were introduced to the mine as young as possible, which would have had unfortunate consequences for their long-term standard-of-living. The pit would have undoubtedly affected their health negatively, however it would also have forced them to develop well physically, in order to cope with the strains which mining jobs put upon their bodies.

So far, all of our discussion of living standards has been related to income. However, as we point out earlier in this study, income can only illustrate part of the picture. We have made efforts to use our wage data as fully as possible, by considering the different ways in which wages could affect standard-of-living, but there are some aspects which it is not possible to address using these alone.

We know that miners had certain benefits from the Pitmen's Bonds, such as access to medical care. This generally signifies a better standard-of-living, but as we have no data on how effective this care was, it is difficult to quantify. Additionally, we know that some mining families were provided with housing. We also know that these houses lacked sufficient sanitation, and access to water was a big problem. This signifies a lower standard-of-living, which is supported by the conditions in which a miner was working. The pits were not healthy places to be, with risks of injury and long term illness.

We therefore see that miners were compensated for poor sanitary conditions with monetary benefits, much like Voth's urban workers mentioned previously. How we judge a miners' standard-of-living therefore rest heavily on how we weight these different components. Including non-income related standard-of-living is yet to be approached in any quantitative manner, but may be a fruitful avenue of future research. Additionally, whilst we can be aware of environmental factors detrimental to health, we are unable to assess to what extent they had an effect.

We have also discussed cross-occupational working as being key to progressing within the mining trade. Thinking about this within the context of standard-of-living, it likely meant that young boys were forced into jobs which they were not physically ready to take on. This could have been done by a parent, in order to increase their earnings, or by an overman, or in order to fill a vacant spot. It also meant that those working double shifts may have driven themselves to the point of exhaustion, detrimentally affecting their health.

Within the context of this investigation, migration has also been discussed. Again, migration does not have an obvious effect on standard-of-living, until we consider the relatively traumatic experience of a family being uprooted and moved on a yearly basis. This is not something that can be easily included in quantitative investigations of living standards, but it must undoubtedly have impacted on the social interactions of the family, being forced to re-establish themselves in new environments on a regular basis.

There are also aspects of standard-of-living which we have been unable to address in this study. We have very little information on education (apart from the presence of a colliery school) and even less on religion at Wylam. This means that assessing access to learning is not possible at this time. Additionally, whilst there are general statistics for life expectancy for miners in the Northern coalfield, our data fail to include anything which might give us an indication of this for those born (or working) in Wylam.

Overall, wages do explain a lot about standard-of-living in Wylam. The ability to purchase goods and services was directly related to income, and the quantities and qualities of these goods would have had a direct effect on the living standards of mining families. Throughout the study we have tried to use wages in a manner to give a more complete view of earnings, rather than simply presenting the average trend over the period. We can conclude that whilst miners were likely better off than those employed in some other industries in terms of income, their environmental conditions left much to be desired. There are aspects of standard-of-living which are not able to be quantitatively measured, such as health

and education, but future research will hopefully allow us to include these factors in a more wide ranging standard-of-living measure. Using wages as a proxy may have its weaknesses, but it can aid us in our understanding of the living standards of mining families in the Great Northern Coalfield between 1836 and 1862.

Appendix One: Wylam Colliery Pitmen's Bonds

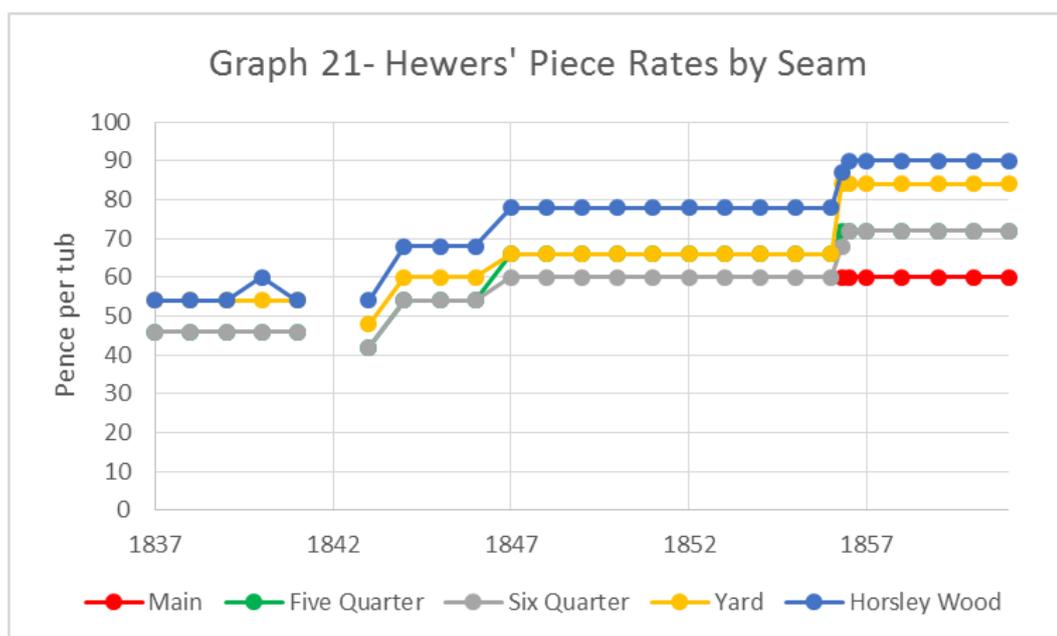
Table 3- Wylam Pitmen's Bonds

Pitmen's Bond³³⁴	Type of Bond	Start Date	End Date	Signing Date (if different)
1794-1795	Annual	23rd October	23rd October	
1798-1799	Annual	22nd September	21st November	
1804-1805	Annual	20th October	20th November	
1806-1807	Annual	20th October	20th October	
1811	Semi-Annual	19th January	5th April	
1813-1814	Annual	20th March	5th April	
1814-1815	Annual	19th March	5th April	
1815-1816	Annual	18th March	5th April	
1821-1822	Annual	5th April	5th April	23rd March
1822-1823	Annual	23rd March	5th April	
1823-1824	Annual	22nd March	5th April	
1827-1828	Annual	5th April	5th April	24th March
1829-1830	Annual	5th April	5th April	23rd March
1834-1835	Annual	5th April	5th April	22nd March
1837-1838	Annual	5th April	5th April	18th March
1838-1839	Annual	5th April	5th April	17th March
1839-1840	Annual	5th April	5th April	16th March
1840-1841	Annual	5th April	5th April	21st March
1841-1842	Annual	5th April	5th April	20th March
1843-1844	Annual	5th April	5th April	18th March
1844	Monthly	5th April		
1847	Monthly	3rd February		
1856	Semi-Annual	5th April	5th October	
1856-1857	Semi-Annual	5th October	5th April	20th September
1857-1858	Annual	5th April	5th April	21st March
1858-1859	Annual	5th April	5th April	17th March
1859-1860	Annual	5th April	5th April	19th March
1860-1861	Annual	5th April	5th April	17th March
1861-1862	Annual	5th April	5th April	16th March

³³⁴ "Wylam Colliery Pitmen's Bonds, 1787-1867," 1787 1867, Blakett Colliery Records, Northumberland Collections Service, Woodhorn Museum, Ashington.

Appendix Two: Piece and Daily Rates

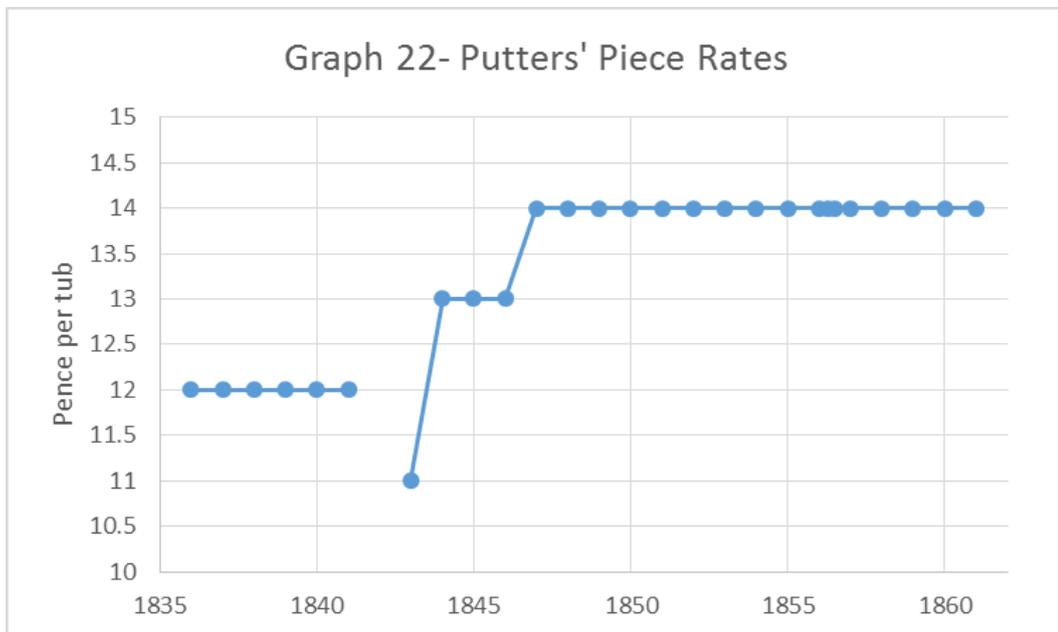
Piece rates varied by the seam in which the hewer was working. Wet work and working in the broken yielded different rates, but these were more of the exception than the rule, and therefore are not discussed in great detail here. It was the general rate which was the subject of negotiations, and tells us more about the relative power of owners and workers in the coal field. *Graph 21* shows the general level of piece rates over the period. The 'Five Quarter' seam is mainly hidden from view in the graph, as it was paid at the same rate as the 'Six Quarter' for all years between 1837-1838 and the first monthly bond in 1844. It is then paid at the same rate as the 'Yard' seam until 1856, and witnesses its own pay rate for the semi-annual Bond in 1856, before returning to the same level as the 'Five Quarter' for the rest of the period. The 'Main' seam only joins the data in 1856, as this is the first time it is mentioned; hence the lack of data beforehand.



There is a little uncertainty regarding piece rates during the years of the Monthly Bond. If a Monthly Bond changed the rate after 1847 but did not survive, then we would have no record of it. But there is no evidence to suggest that this was the case, so the rate has been applied for all years between Bonds. As we can see, the 'Horsley Wood' seam was the best paid at Wylam, likely because it yielded the best and most desirable coal. This reached the rate of 90 pence per tub

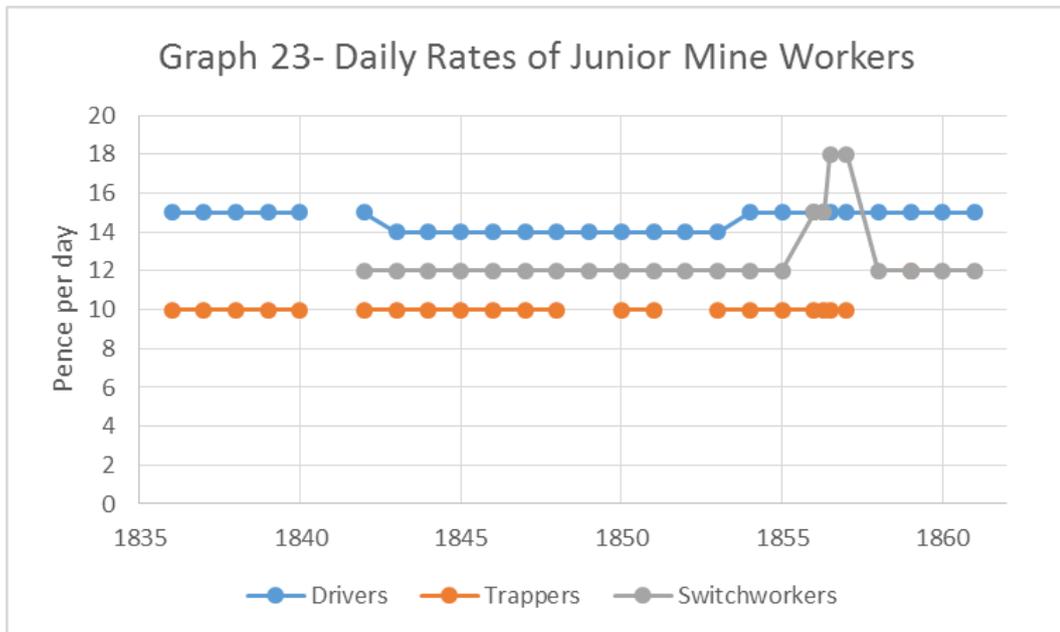
(7s.6d.) at its peak. The 'Five Quarter' and 'Six Quarter' were generally the lowest paid for the earlier part of the period, but they achieved better rates than the 'Main' seam from 1856. The lowest point of all was in the Bond year of 1843-44, at 42 pence per tub (3s.6d.). These rates could differ rather drastically, and therefore make a large difference to the income of an individual hewer. The process of cavilling also meant that hewers could move between seams during a Bond year, which could cause a sharp rise or fall in his earnings.

Piece rates for putters were largely stationary over the period. Whilst the size of the corf changed from 16 peck to 20 peck between 1843-1844 and the 1844 Monthly Bond, the putters' wage was determined by the number of tubs he could



transport a particular distance. This distance changed at the very beginning of our period, between 1837-1838 and 1838-1839, from 60 to 80 yards. Throughout the period, an additional pence was paid for every additional 20 yards a putter was required to transport a tub over this threshold. As we can see from *graph 22* the low point of the series (like that of hewers) was 1843-1844, when a putter was paid only 11 pence per tub. From 1847 onwards, he was consistently paid 14 pence (*1s.2d.*) per tub, which was also the maximum for this period. The scale of the graph may seem a little misleading here, as these were relatively minor changes overall.

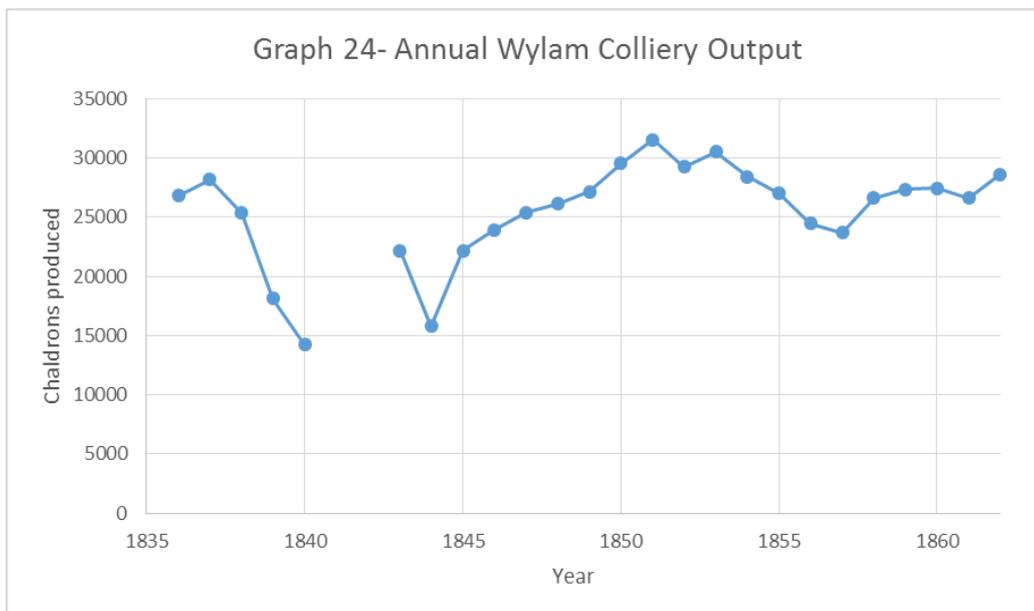
Daily rates for trappers, switchworkers and drivers took a different pattern during this period, showing far less variation. This said, it appears that rates for these jobs were more negotiable throughout the year than piece rates were. The paybills provide examples of different individuals being paid different rates for the same job. However, these were usually exceptions, likely due to the age of the boy involved, and the standing of his father within the mine (those on better terms with the overmen or viewers were probably sometimes able to obtain better rates for their children). The standard rates for drivers, trappers and switchmen are presented in *graph 23*, in order to aid comparison. As we can see, trappers are consistently paid less than drivers, at 10 pence per day in comparison to 15 pence (*1s.3d.*) or 14 pence (*1s.2d.*) for the majority of the period. This reflected the status of younger boys working a less physical job. Switchworkers, who for our



purposes have been grouped with trappers, for the most part occupy the middle ground (apart from a brief period in the mid-1850s where they suddenly receive a pay increase). It is anticipated that this may cause the reader to query why trappers and switchmen have been grouped together. The reason for this is that there was significant cross-over between those working in each occupation. Over one third of those primarily working as a trapper or switchmen worked as the other, when counting cumulative Bond years. When counting those who had no other occupation, this covers 60 percent of entries. The remainder spend some time driving, or helping with odd jobs.

Daily rates were largely static over the period of our study, and therefore it was probably the amount of work available which governed the earnings of junior mine workers. This could be a consequence of days of inactivity due to reduced demand. It should also be recalled that many drivers would also have participated in some putting, and vice versa, which would also have affected their final earnings.

Appendix Three: Colliery Output



Output statistics (presented in *graph 24* have been taken from the Produce Books of Wylam Colliery³³⁵, available in the Blackett collection at Woodhorn Museum. These records account for the total amount of coal produced by the colliery by each seam. The coal produced was recorded on a fortnightly basis, and tabulated at the end of each calendar year. Given in chaldrons, the total output for the colliery was transcribed for each relevant year.

³³⁵ "Wylam Colliery Produce Books," 1868-1879, Blackett Colliery Records, Northumberland Collections Service, Woodhorn Museum, Ashington.

Appendix Four: Agricultural Hiring in the Northeast

The Hind system of agricultural hiring in the Northeast provides an interesting comparison to that of the Pitmen's Bond. Hinds (who differed from regular agricultural day labourers) were hired on an annual basis³³⁶, and provided with housing, goods, and facilities for keeping animals.³³⁷ Wages were mainly paid in kind, which made the relative profitability for both the worker and the farmer dependent on market prices.³³⁸ A Hind was required to provide female labour (either that of his wife, or a hired female servant known as a Bondager) when required by the farmer; usually this was at busy times of the year such as the harvest.³³⁹ Other members of the family were also often employed during these periods.³⁴⁰ These usually yielded cash wages.³⁴¹ The Hind generally had responsibility for livestock, a sign of prestige among agricultural labourers in the Northeast during this period. They also typically owned some of their own livestock (usually a cow), and were provided with space and materials to maintain it as part of their contract.³⁴²

Some scholars have suggested that this system was a reaction to the draw of the mining industry on labour³⁴³, but the collective identity and protective nature of the mining community limited the inter-industry movement.³⁴⁴ It therefore seems more likely that the system was employed due to the constant need of a labourer on the farm to tend to livestock.³⁴⁵

³³⁶ Alun Howkins, "Types of Rural Communities," in *The Agrarian History of England and Wales*, vol. 7 part 2, n.d., 1314.

³³⁷ W. H. Charlton, "A Statistical Report from the Parish of Bellingham in the County of Northumberland," *Journal of the Statistical Society of London* 1, no. 7 (November 1, 1838): 424; Hindmarsh, "On the State of Agriculture and Condition of the Agricultural Labourers of the Northern Division of Northumberland," 404.

³³⁸ Hindmarsh, "On the State of Agriculture and Condition of the Agricultural Labourers of the Northern Division of Northumberland," 410.

³³⁹ Howkins, "Types of Rural Communities," 1314.

³⁴⁰ *Ibid.*

³⁴¹ A. Howkins, *Reshaping Rural England 1850-1925: A Social History* (London: Unwin Hyman, 1990), 51.

³⁴² John Bailey and George Cully, *General View of the Agriculture of the County of Northumberland; with Observations on the Means of Its Improvement* (London, 1800), 175–176.

³⁴³ Michael C. Kelly, "Collieries and Agricultural Labour in Nineteenth-Century Northumberland," *International Journal of Social Science and Humanity* 4, no. 4 (2014): 321.

³⁴⁴ *Ibid.*, 323.

³⁴⁵ *Ibid.*, 322.

Hind agreements were often made verbally, but written documents do survive in limited numbers.³⁴⁶ These range from documents a couple of sentences in length, to long, detailed contracts which rival the Pitmen's Bond in length. Unlike the Bonds however, there was little attempt to standardise Hind contracts, and the content of these contracts varied dramatically.³⁴⁷

It should be evident that there were many similarities between the hiring system of coal miners and Hinds. Whilst there was a family wage at work in both systems, this was more formal in that of the Hind. In practise, this was also the case for mining families, but it was not a part of the Pitmen's Bond. Both types of hiring often involved accommodation, but again this was more frequent for Hinds. Hinds also received a greater proportion of wages in goods, whereas miners were paid in cash. Both also received benefits, and the facility to keep animals was particularly important to agricultural families.

³⁴⁶ J Campbell, "The Northumbrian Agricultural Labourer," *North East History* 7 (1973): 30.

³⁴⁷ see, for example, NRO.2114, NRO.660/4/1, NRO.2380, n.d. available at Northumberland Collections Service, Woodhorn Museum, Ashington.

Appendix Five: Mortality and Life Expectancy

These data have kindly been supplied by Bowden. A full set with detailed occupational breakdown is available, but only industries relevant to the present discussion are listed here.

Table 4- Occupational Mortality. These data are estimated by Bowden and Mills, using data from the Supplement to the Registrar General's 55th Annual Report, PP1893-4, Vol. XXIV, Part II, pp. 124-130, PP 1905, Vol.XVIII, 6th Annual Report: Part 2: Cd. 2619, Table 2, pp cxxxiv-cxl.

1890/02 Template	Mean age of death	% die under 34
Coal miner: Durham and Northumbs	53	25.69
Coal miner: Lancs	49	26.70
Coal miner: Staffs	56	19.72
Coal miner: West Riding	50	26.55
Coal miner: Derbys and Notts	51	25.80
Coal miner: Monmouthsire and South Wales	47	34.99
General labourer (London)	53	18.67
General labourer (Industrial districts)	53	17.71
All males	59	17.24
Occupied Males: London	52	20.57
Occupied males : agricultural districts	63	14.08
Occupied males: England and Wales	56	18.52
Occupied males: industrial districts	52	20.08
Unoccupied males	69	12.35

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