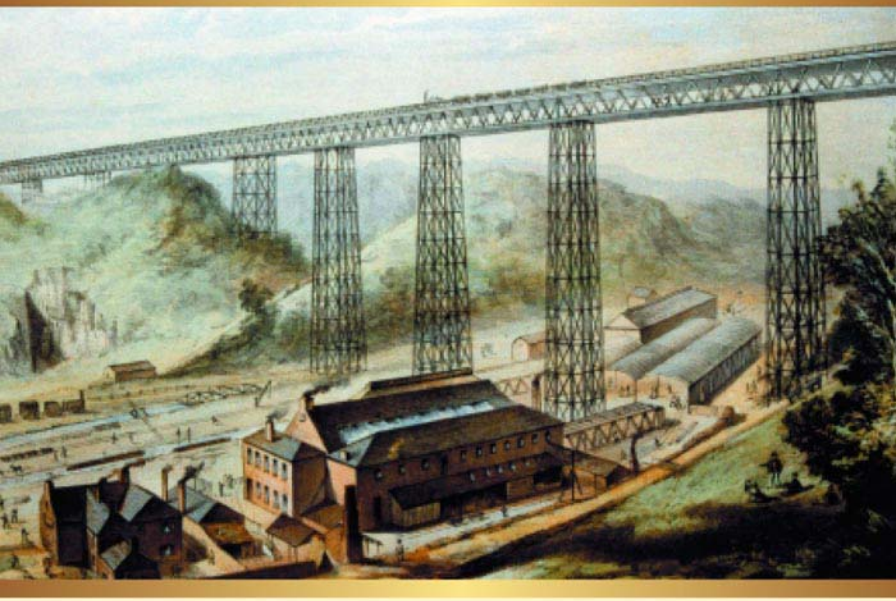
THE INDUSTRIAL DEVELOPMENT OF THE EBBW VALLEYS 1780–1914



JOHN ELLIOTT

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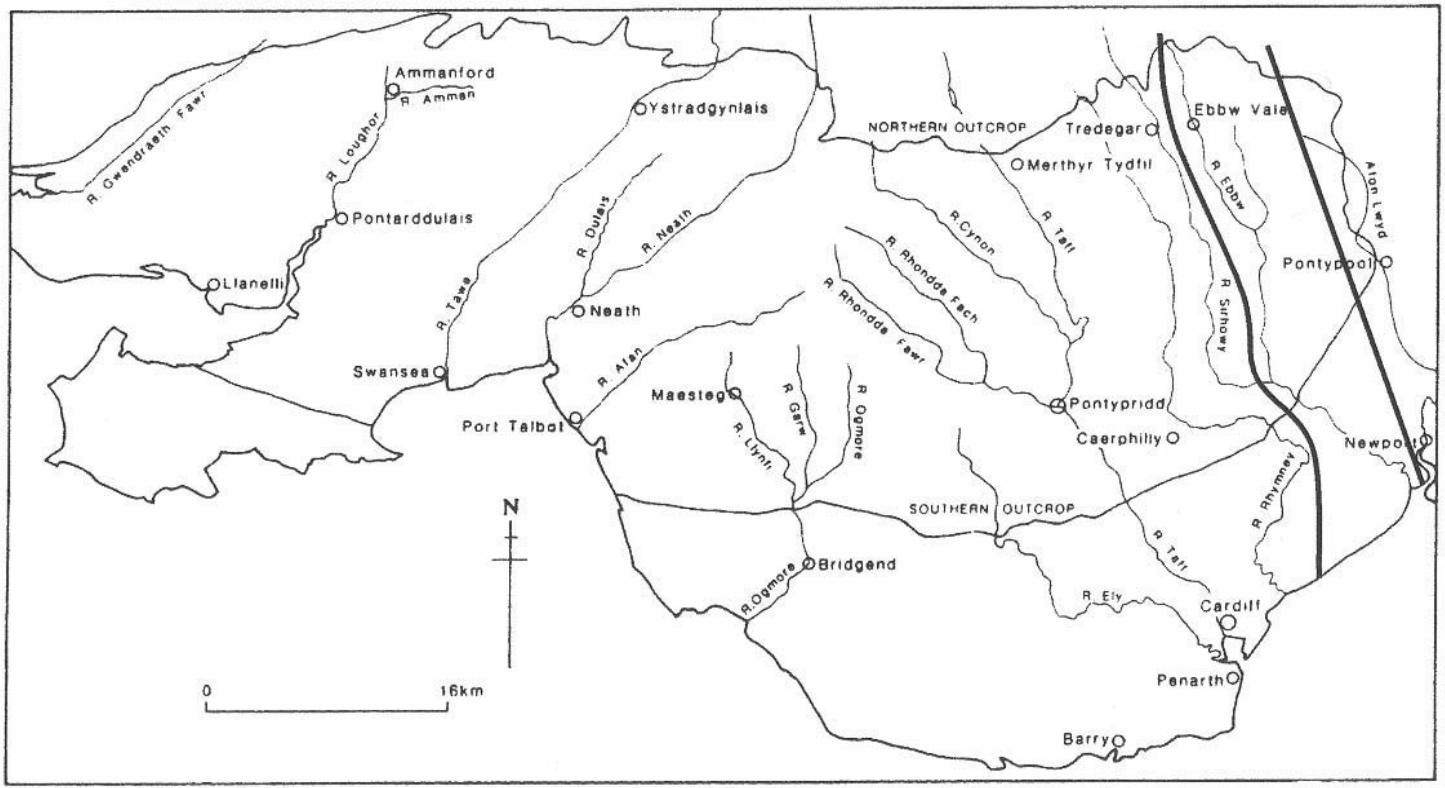

Map 1. The location of the Ebbw valleys in the south Wales coalfield (Ebbw valleys – area between heavy black lines).

The Industrial Development of the Ebbw Valleys 1780–1914

By

JOHN ELLIOTT

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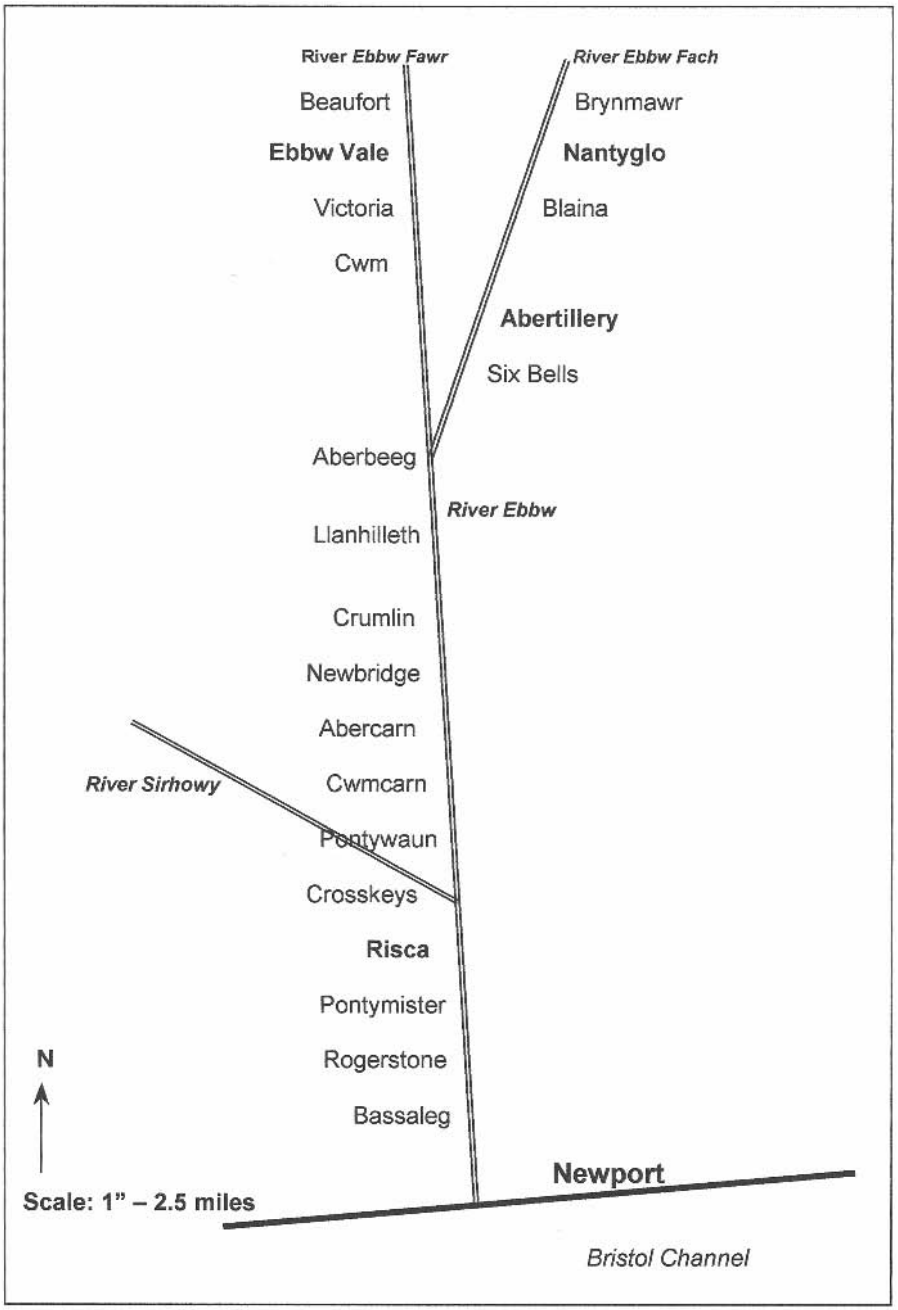

Map 2. Diagrammatic map of the towns and villages of the Ebbw valleys.

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Foreword

The mining valleys of western Monmouthshire have not received quite the same intense degree of attention as have those of Glamorgan. Historians have not apparently found their industrial history as compelling as that of the Rhondda or Merthyr, or perhaps the anthracite valleys of eastern Carmarthenshire, even though Gwent's social and political history has attracted powerful writing from the Chartists' march on Newport down to the socialist crusading of Nye Bevan and Michael Foot. This may perhaps reflect a wider relative neglect of Welsh economic history compared with political or social themes, yet the mighty coal and iron and steel industries of western Monmouthshire, especially the geographically integrated and socially distinctive Ebbw valleys, are central to the evolution of modern Wales. Their legacy has continued to haunt us down to the Corus closures of 2001 and beyond.

The industrial growth of the Ebbw valleys has now been admirably recorded by John Elliott, formerly both an industrial manager and a university professor of business studies who turned to the different discipline of economic history on his retirement. His account of the development of his native valleys, enriched by revealing statistical evidence, is fascinating on many counts. His main focus, naturally, is on the trading accounts and working practices of the coal industry, labour-intensive and with low productivity, but also marked by relentless growth down to the First World War. More distinctive to the area was iron and steel production, particularly at Ebbw Vale, with the associated tinplate industry. All were past their peak by 1914 but were to find new vitality, partly through government assistance after the new strip mill was located there in 1938. A particularly original part of Elliott's work is his analysis of the successful marketing of local coal despite its high price, and of iron and steel products by companies of varying degrees of profitability. The results were extraordinary, nationally and internationally. The downside of this marketing success was the failure to develop effective secondary industries, for reasons that include the

conservatism and lack of entrepreneurial skills of the employers, shortage of local finance and especially the inadequacies of an educational system geared to an inappropriate English model and failing to develop a new base for technological education or industrial training. The book also discusses transport provision – the early canals, the growth of the docks at Cardiff and Newport and the emergence of a railway service for the Monmouthshire valleys, haphazard to a degree which still presents problems today. Water and its role in public health is another topic covered in detail. Nor is the human dimension neglected: we read of demographic change, the role of local government, the labour market and the extent of the Welsh language. In all the aspects on which it chooses to focus, this is a book that is informative and original. It sheds new light on a host of issues only partly explored before, such as the structure of work at the coalface and the implications of this for the workforce. There are vignettes such as the building of the Crumlin viaduct and the doings of the Morgans of Tredegar. Themes examined long ago by distinguished Welsh historians are presented in a new light: thus the Chartist march to Newport in 1839, powerfully explored in its social and political aspects by Gwyn A. Williams and David J. V. Jones, is linked to the violent dislocation of the local labour market during the upsurge in the iron industry in the early and mid-1830s.

The recent history of the Ebbw valleys has often made gloomy news: an initiative like the 1992 garden festival, which two million people visited, had only limited long-term impact. Yet these valleys have a fascinating past, unusual even within the intensely diverse south Wales industrial community. With the powerful interaction between coal and steel and a different pattern of in-migration, the Ebbw valleys have a history that is economically distinctive as well as politically inspirational – witness the existence of a major engineering works there in the 1850s, almost uniquely in the mining valleys. By 1914, the Ebbw valleys had grown into one of the most dynamic industrial regions in the western world. They did so because of the sacrifices and courage of their workers: in 1905 hewers in Monmouthshire worked 9.9 hours a day back to back, compared with a UK average of just 8.5 hours. They gave the Ebbw valleys a strong productive industrial base. John Elliott in his retirement is now an industrial activist as well as a scholar, aiming at a more vibrant and hopeful future for his native valleys. He is certainly an important remembrancer of their glorious high-noon. Anyone with a serious interest in south Wales, past and present, will welcome his book.

Kenneth O. Morgan
The Queen's College, Oxford
August 2004

Acknowledgements

My first thanks must go to my wife for her support through the development of this book as it progressed on its uneven path through doctorate and journal articles. A historical education is not a socially inclusive way of spending a goodly part of retirement, but Mollie, friends and relatives bore with me when I only wanted to talk about the Ebbw valleys. One of the delights of the research was the renewing of contact with helpful childhood friends. Colin Deneen, with a distinguished career at the Ebbw Vale works to draw upon, was a splendid source of information, both technical and historical, as was John Gaydon and his other colleagues. Terry Powell saved me much time with his splendid collection of photographs and local knowledge and I learned much from my contact with the local historical societies of Brynmawr and Newbridge and the library and officers of the Abertillery Historical Society.

Professor Chris Williams patiently taught me not only the craft of the historian but much about Wales and I count it as one of the good fortunes of life to have been his student. Friends were similarly indulgent as I traded remorselessly on my status as an elderly noviciate to the craft of the historian. Professors Emrys Jones, emeritus of LSE, Martin Daunton of Cambridge and Ken Simmonds of the London Business School read chapters and gave me new ideas and clarified old ones, whilst John Williams gave excellent guidance from far off Aberystwyth. Professor the Lord Ken Morgan both wisely advised and most kindly wrote the foreword to this book, and there were many who generously gave me their time such as Professors Angela John and Gordon Roderick, the officers of the Llanover estate, and Drs Trevor Boyns and Bill Jones, Robert Prothero-Jones and Maurice Davies, Frank Bowater and Irene Burchell. I am particularly grateful to Dr Ed Moorby and David and Val Elliott for reading the complete draft and giving much helpful comment and to Neil

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Ceinwen Jones, Elin Lewis and their colleagues at the University of Wales Press managed the publication of this book with meticulous editing despite the relocation of their offices and managed me with both skill and patience.

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Introduction

This book is a study of the development of the industry of some small, historically neglected, yet in some unexpected ways, remarkable valleys. It is a history written from a particular point of view – that of the industrial manager, as this author worked primarily in manufacturing industry before retraining as a historian in his early sixties. The interest is then industrial history as distinct from business and economic history with their rather opaque boundaries. The focus is on the Ebbw valleys in Wales, a country whose industrial history has experienced a tendency, albeit diminishing, to be somewhat squeezed into that of England.[1] Whilst the concentration is restricted to one small area, the research method is rather widespread and attempts a degree of innovation, particularly in the selective use of models from accountancy, marketing and labour markets for interrogating and ordering data. An objective is to add depth to history, as the local element tends to be discarded rather than neglected by historians – an inevitable and irrevocable disposal when its usefulness and interest as a professional springboard falls away. Cardiff, St Helens, the West Riding and so on cannot provide enough sustenance for a career.

A primary endeavour is to unwrap those key decisions which were to make the history of the Ebbw valleys sometimes different from even closely related places. One purpose is to illuminate concepts of interest to economic historians such as the use of the trading or profit and loss account as a method of designing the history of the coal industry, and concepts of interest to everyone interested in the past, particularly change and the integration of industrial activities. This includes that never-ending and inexorable problem of survival through successful adaptation to change by adding value to products as old trading advantages disappear and new competitors enter the learning race. For the comparative failure continually to add value through innovation, by whatever strategy, from development agencies to the development of technology, lies at the core of the industrial history of south Wales. Highly localized social and political phenomena, resulting from sometimes eccentric industrial change processes, are also noted when they reverberate with industrial development.

The geography is plainly stated. The River Ebbw rises in Mynydd Llangynidyr a few miles north of the town of Ebbw Vale, is joined by its tributaries

the Ebbw Fach at Aberbeeg and the Sirhowy at Crosskeys, and empties into the Bristol Channel just west of Newport. It is situated in south-east Wales between the River Usk and its tributary the Afon Llwyd to the east and the River Rhymney to its west. The valley lies within the eastern section of the south Wales coalfield, in what was until the 1974 local government reorganization, the county of Monmouthshire, and this is the locality name referred to throughout this book. Map 1 shows the location of the Ebbw valleys in the south Wales coalfield and map 2 shows the river in its course of about twenty-five miles through the towns and villages of the valley.

As if to mirror the vast changes between 1780 and 1914, the name of the main valley also changed. Before 1860 there were references to 'the hills' and 'the wilds' for the valleys north of Risca, but the name 'Ebbw' was scarcely used. After that date 'Western Valleys' became almost the valleys' authorized name, following the lead of the Ordnance Survey map which appears to have taken the name from the railway line. Thus, unlike most of the other valleys of south Wales, the Ebbw valleys followed for much of the period from 1780 the name of their railway and not that of their main river. However, since the closure of the passenger line over thirty years ago, this name has been increasingly less used and could eventually disappear completely from common usage.

Western Monmouthshire would have been a more entire historical study, thereby including its neighbours – the valleys of the Afon Llwyd to its east, the Sirhowy and a part of the Rhymney to its west and Newport its major town. This is because the history of these valleys and its port is, over parts of this period and particularly during the dominance of the iron industry, as well integrated as that of the Ebbw valleys themselves. Indeed, the Sirhowy in strict geographical terms is a tributary of the Ebbw, joining that river for the last ten miles of its progress to the Bristol Channel. In considerable measure, they belong together, though the variations can be almost tribal in the perceptions of those who live in these three valleys. Thus some would see the Sirhowy shading more comfortably into the Rhymney or the Afon Llwyd standing distinctly on its own.

Yet the valley was of a piece in that it was naturally integrated by both its geography and geology. The river obliged the transport and communication systems of canal, railway, road and, just as fundamentally, sewage to follow its course, pulling together Newport, the northern towns and everything in between. Geology added its natural pressure, with the coal measures running in a basin from north to south and pushing the development of deep mining ever towards the centre of the valley. These forces were naturally followed by the longitudinal structure of local government from the Act of 1894, which copied the structure of the valley and replaced the old parish boundaries which had tended to spread across the hills as well as up and down the valleys.

Thus though people, work, culture and sport flowed reasonably easily across valley boundaries and between Newport and the valley towns, the Ebbw valleys were, to a considerable degree, one place contained within its hills. The Sirhowy and Afon Llwyd are often, and necessarily, referred to, but are not the central purpose of this work. Similarly Newport, which is not geographically part of the valley, is a constant reference point which at times both dominates and unifies the study, but written of within the context of the Ebbw valleys. Furthermore, the content of this book often overlaps into western Monmouthshire, particularly when it is difficult or fruitless to disaggregate statistics of output or population, and when the study of the valleys gains from a consideration of the county.

Two factors enhanced both the historical importance and singularity of the industrial development of the Ebbw valleys and more than balanced their diminutiveness. First, the valleys made a significant contribution to the industrial history of Wales and Great Britain. Their coal was to win a specialist niche in the national and international railway industry and support the survival of the iron and steel industry in the valley, while iron and steel were to make a massive contribution to the development and survival of the ferrous industries of south Wales. Civil engineering was to achieve an exotic, if rather short-lived, international success which began with the construction of the Crumlin viaduct, and a splendid achievement in a reservoir initiated by a small district council. Furthermore, the early industrial development of the valleys resulted in a savage dislocation in the local labour market, an issue fundamental to an understanding of the industrial story of the 1830s. This may well have been the primary cause and touch paper for a seminal incident in the labour history of the UK – the Chartist insurrection of 1839.

Secondly, some regions are particularly important in examining the causes and the dynamics of change, which sometimes varied considerably from region to region over the same period, and from village to village within regions.[2] Indeed some historians would assert that the understanding of change is best understood from the history of such places. The Ebbw valleys are a classic representative of this highly differentiated form of industrial transformation for there were considerable differences in the processes of change experienced by locations in the valleys, sometimes only a few miles apart. These transformations were spread over the period, moved in differing directions and were based on a variety of industries. Thus the mining of iron ore and the manufacture of iron prospered at Ebbw Vale and Nantyglo one hundred years before deep mining began near Crosskeys; sale coal was extensively mined by level in the area between Risca and Crumlin a century before the construction of the reservoir, the largest civil engineering project of the period was initiated by Abertillery District Council; and canals pre-dated the Crumlin viaduct by fifty years.

The transformation of industry in the Ebbw valleys was also distinctly differentiated from other nearby industrial locations, not only in the detail of

its growth, but in some of its primary developments. The sale coal trade of western Monmouthshire began earlier, and much more strongly, than the competing trade in the hinterland of Cardiff, yet its transport system including its port, lagged behind that of east Glamorgan. The development of the valley was based on coal and iron. In this characteristic it was similar to the Merthyr area, but quite different from the Rhondda valley where the processes of change were much more concentrated in time and on the single mineral of coal. The Ebbw valleys were dominated by an iron company for much of the period, even if this company was also one of the largest coal companies in south Wales, whereas the Rhondda and Cynon valleys were dominated by coal companies. A powerful engineering company with an international market was established in the Ebbw in the 1850s: a most curious development in the middle of a mining valley in the south Wales coalfield, though the Neath Abbey Ironworks was perhaps comparable in terms of innovation if not in the notability of its product. The patterns of migration, feeding the industrial development, were different from those of the Glamorgan valleys, even pulling in the opposite direction from Glamorgan for a few decades. The history of the tinplate industry was both intensely competitive with and different from that of Swansea and Llanelli. The water industry, which is now the largest Welsh industry, and certain to be the only survivor of this period, was strangled in its early development in the Ebbw valleys by singular political circumstances, whilst most other valleys were more fortunate. The importance of these changes is even more apparent if they are examined outside the industries of coal and iron and dovetailed with the problems of the growth of the secondary industries and utilities sector of industry of the nineteenth and most of the twentieth centuries. The very slow progress in civil engineering projects for the provision of water and sewerage resulted in a disaster in health care for the people who lived in the Ebbw valleys which was not replicated in most of the other valleys.

But in two fundamental aspects, particularly in the consequences for national and social development, there was a strong similarity and cohesion with the other valleys. First, geology was stronger than the pull of neighbouring England with its blurred border. For the culture of the Ebbw valleys was determined more by being a part of the south Wales coalfield than by the richer and markedly more English part of the county of Monmouthshire to its east. Geologically the Ebbw valleys were as much a part of the south Wales coalfield as the anthracite valleys of Carmarthen. Secondly, this vast industrial change over all of the south Wales valleys and indeed their ports, was marked for much of the period by its vulnerability. The system was easy to duplicate and overtake technologically, was unable to sustain any multiplier effect into manufacturing industries, had no particular geographical advantage, was weak in creating services in education, was dependent largely on external finance and, apart most notably from Swansea, had limited traditions of civic development.

These valleys also share in the disregard of historical scholarship for the key elements of their industrial development, though those of western Monmouthshire have a comfortable lead at the head of the league table of neglect. The reasons are reasonably clear. Possibly the Ebbw valleys (and eastern or Afon Llwyd valley) lack a competitive sense of drama for Welsh historians. The very words 'Rhondda' and 'Merthyr' have a resonance lacking in 'Ebbw', perhaps because, as noted earlier, until the ending of railway passenger traffic in the mid-1960s, the term in common use for the Ebbw valleys was 'Western valley'. In addition, there has been relatively little attention paid to the industrial history of Wales by Welsh historians, despite the fact that the history of south Wales and Monmouthshire in the modern period has been overwhelmingly industrial. Instead the concentration has been on social, political and general histories and this does seem to be a strong and continuing trend. As Williams and Baber noted almost twenty years ago:

> Much of the story of south Wales's economic past is to be found implicitly in studies and research that are essentially social or political history. Economic explanations of the implications of social and political change have found their way into the scholarship as accepted economic pronouncements, when they have in fact, been marginal to the main emphasis of the work be it social or political.[3]

This is not to discount the importance of politics, gender, sport, labour, language, religion and other fundamental issues. Nevertheless, there may be a danger of developing an edifice of social and political history without the foundation of economic and particularly industrial history. This could have curious effects on the collective memory of not only a valley but a nation. It is not the purpose of this book to speculate on what that might be, but certainly a result of this neglect has been a serious lack of congruence between the historical scholarship of Wales and the industrial past. This assertion can be quantified. Of just over 1,000 theses on Welsh history between 1970 and 1995 only sixty-three (or 6 per cent) were industrial and only seven (or 0.7 per cent) concerned the industry of Monmouthshire.[4] A consensus amongst historians as to the right balance would be difficult to attain, but it is worth noting that by the census of 1911 Monmouthshire comprised about 16 per cent of the population of Wales.

So as to redress this imbalance and ensure that the fundamental factors are ushered into their proper place, the concentration of this history is on the economic and business elements of industrial development. Supply and demand, mining and production, markets and the trading account give this study its shape and much of its content, though the derivation of finance, because of a paucity of research sources, is much less fully described than financial performance. However, whilst the industry of the Ebbw valleys may have danced its often clumsy survival jig to the tune of the profit and loss

account, both the politics of the state and locality and societal factors continually intrude. Indeed, they sometimes even determine its development and survival. The resulting complex structure of layer upon layer of social, political and economic interaction results in the familiar dilemma of historical boundaries. The place of business, technology and economics is reasonably clear in an industrial history, but how much societal and political history should be included? Too much and too general a history results; too little and the industrial study is cut adrift from some of its fundamental causes and widely differing reasons and perceptions of historical change. Furthermore, historiographic fashions change and often in response to their contemporary environment. The first histories of the industrial revolution were primarily social histories reflecting the concern of historians like Toynbee. Until recently the study of industrial relations dominated the personnel management (now human resource) departments of universities, both reflecting contemporary concerns and interests, and giving a measure of pre-eminence to trade union studies in the industrial story. Nowadays, training, appraisal or succession planning may be perceived as more important, and this is beginning to be reflected in the interests of economic and particularly business historians. The case for including water is mixed but on balance its inclusion was considered to be appropriate. Possibly because the governance was that of the public authority, water has not consistently been thought of as an industry to be likened with mining or engineering. However, the provision of water like coal is part of an industrial activity concerned with the processing of a raw material and such was their importance to the industrial development of primary, secondary products and transport that there is a need to include one example of the utilities. With and since privatization it rightly and firmly takes its place alongside these industries, though from an industrial perception its omission was always odd. Furthermore, in the case of the Ebbw valley, these services fit effectively into this local history where the civil engineering decisions, despite their considerable cost, were highly localized. Water brings with it sewerage, as the histories of the development of these two provisions are intricately interwoven, and certainly this is how the Victorians perceived the matter. The one is not intelligible without an analysis of the other.

This study attempts to deal with this problem of definition by introducing a selection of those issues of primary social and political importance which seem fundamental in deciding the direction and shape of the particular industrial development of the Ebbw valleys. The choice of political issues is reasonably straightforward as the boundaries of political history are long established. Social history is very different and, rather than become involved in a maze of definition, the criteria for selection are based on an identification of those issues which crucially intrude into industrial development.

Thus social history contributes a description of the collier's work, for most of the men, for most of the time, worked in coalmines and the organization of

work is at the foundations of industrial development. The politics of Westminster significantly influenced the iron and steel industry, for Ebbw Vale was witness to one of the most significant examples of the direct intrusion of the state into the industrial development of the UK. In this example some licence is taken with the restrictions of dates and the history is continued to 1939, for in this industry the local and national divide is 1936 rather than 1914. Local politics, which were the implementation engine of the increasingly collective Victorian state, finds its platform in the disastrous case of the development of water and sewerage. This example illustrates how local government, forced by very high levels of disease and motivated by despair rather than profit, was pushed into the most ambitious civil engineering project of the period. The discussion of secondary industry illustrates how the comparative poverty of education and the lack of interest of the ironmasters, as well as very low levels of savings, influenced the stilted growth of this sector. Transport is the integrating industry, the industry that connects mining and manufacture with the customer, though its effectiveness was to limit seriously the industrial development of the valley. Then, reversing the flow of cause and effect, and to illustrate and emphasize the reciprocity of change, the people of the valley are given their own chapter and fittingly conclude this history. A significant example of the social and political results of industrial development is given its platform with an analysis of the labour market between 1830 and 1839 and the differing patterns of migration and settlement in the valley dictated by changes in industrial development between 1780 and 1914. This analysis is followed by a glance at the characteristics of the society before a fuller discussion of the trade unions. Finally, the primary decisions influencing industrial development between 1780 and 1914 are discussed.

The overarching themes, then, are of integration and change. These are the constancies binding the people and the industry of this small place together, with their strategies ranging from the continual search for ways of adding value to their products to migration, as they continually adjusted to circumstances in their struggle for a reasonable survival. The integrative theme is intended to more than balance the compartmentalization of this history resulting from a structure of separate chapters, describing the histories of coal, iron and steel and other products and services, rather than a chronology, which describes the totality of events in order of their appearance. This theme is strengthened by two strands. First, industrial development intrinsically binds both the trends and events of social, political, business and economic history and the histories of the products and services of the Ebbw valleys. Secondly, a history which has the history of a small place at its centre is fundamentally integrative.

A design which separates its parts does have advantages. It does confer clarity, on at least the part, by dovetailing into the current building blocks of Welsh industrial history. These tend to be highly specialized, with separate

historians concentrating on coal, iron and steel, transport, slate and so on, with as yet a very limited specialization in water and secondary industries, the marketing of coal, and the iron and steel industry since 1880. The attempt is to ensure that what little scholarship we have should at least be tidy, so a more harmonious and sturdy pattern will eventually replace the existing embryonic and rather ramshackle assemblage.

This is not to criticize the direction of Welsh industrial historical scholarship, which is an unsuitable activity for corralling, being laden with mission statements and prodded purposefully in one direction or another like some errant business searching for profitability. Rather, it is to make the point that, notwithstanding the good fortune of Wales in the excellence of the few historians who have worked on the industrial development of this country, there has never been that critical mass of scholars working at the same time that is necessary for an effective launch of the study of the industrial history of Wales. The pioneers, including this historian, are still out there in the wilderness, hacking their way through the forest, clearing and tending their small plots, slowly and hopefully preparing the way for a chronological industrial history of Wales.

1

The Ebbw valleys in 1780

INTRODUCTION

This chapter describes the Ebbw valleys at the beginning of the massive changes that were to revolutionize the lives of its few inhabitants and transform its position in Wales and the world. It outlines the geological and topographical characteristics of the valley, which were the preconditions of this transformation, along with more secondary influences. These foundations of the great changes that were to occur up to and beyond 1914 demonstrate the duality of change and continuity and so connect this chapter with what follows.

Geology begins this history. Everything that followed was dependent on that considerable and highly compacted coil of energy awaiting its release from the coal seams lying anything from a few inches to hundreds of yards beneath the surface. Juxtaposed with these seams of coal were sufficient deposits of iron ore to develop one of the first and largest iron industries in the nation. These two minerals differed markedly in their ability to maintain the growth they had initiated. The quantity and quality of coal were easily enough to sustain an almost continual development throughout the period, but with only a weak multiplier effect into manufacturing industries. Iron ore, though a prerequisite for the founding of the iron and steel industry, was far too limited a deposit to sustain its development. But, unlike the mining of coal, the iron and steel industry was dependent on the development of engineering skills and knowledge which, if they could have been transferred, would have presented a strong potential basis for the establishment of an engineering industry.

The chapter continues with an analysis of the supporting agents of change, including the people and their society, some of which are sometimes located outside the boundaries of economic history. The rationale is to place these changes in the context of their genesis and to establish the inclusiveness of change. The industrial revolution transformed everything in the life of the valley from the size of the chapels to the origins of the people, from the temper of the politics to the spread and intensity of disease. These transitions had their own repercussion on the very industrial changes that had

transformed them. For this great transformation was an iterative process, feeding on its own dynamic and having no regard for the occasional intellectual bureaucracy of historians in its haphazard crossing of their borders.

GEOLOGY

The type of coal and iron and the nature of their extraction decided the chronology of mining and the industries that were to develop from these minerals. They were to make the valley both a classic south Wales mining valley and different from its neighbours. Thus, though the Rhondda and the Ebbw were both coal-mining valleys, their histories were different. Geology determined that there would be no iron industry in the Rhondda and outcropped the coalfield in the Ebbw valleys much nearer the coast. Even the Ebbw valleys which, compared with most of the coalfield, was rich in iron ore is best observed as a section of the coalfield rather than as a coal and ironfield. By 1830 the iron ore was almost worked out and being replaced by imported ore. Though found throughout the valley, the ore was only mined in large quantities on the northern outcrop. The geological and commercial importance of iron ore was its juxtaposition to coal in the genesis of the iron industry, rather than its quantity and quality.

The Ebbw valleys is part of the south Wales coalfield. This coalfield is a mass of carboniferous rocks resting on a basin-shaped depression. Cutting through this basin is a series of parallel valleys of which the Ebbw is the second furthest east. The southern boundary of the coalfield is at Risca and the northern approximately marked by the towns of Ebbw Vale, Tredegar and Brynmawr. The plate of the fifteen seams of the Llanhilleth colliery in the middle of the valley clarifies the geology. The 6-foot Black Vein seam at 311 yards lies much deeper than the first mined Tillery seam at 80 yards and was not won until forty years later (see picture section).

The coal seams are elongated from north to south and are approximately and appropriately rather more like the deformed half of a rugby ball than a symmetrical basin. As would be expected from this shape the seams nearest the rim are generally the most shallow, and those below the river at its centre the deepest. The coal in the north was found in conjunction with considerable quantities of iron ore. These seams also dipped very gradually and made them easier to mine than the more steeply dipping measures of the southern outcrop. North estimated that south of Caerphilly the dip is about 60 degrees, while in the north it is only about 9 or 10 degrees.[1] The coal in the south was nearest the coast and this factor, despite its relative inaccessibility, made for profitable mining very early in the history of the valley. The coal on the western and eastern rims was also near the surface, easy to mine and could be

transported north to the large ironworks, south to Newport or be used in smaller works all over the area as well as for domestic use. The development of each coal seam was, in its turn, dependent on the configuration of the coal measures in terms of their distance from the surface, the height of each seam, their angle, their degree of faulting, the problems of ventilation and drainage and the stability of the roof and floor. These differences, which were often localized, gave each mine and level a uniqueness in their working conditions, their profitability and their tragedies.

The Victorian view on this is worth quoting at length:

> There is found a class of phenomena which affects materially the winning of coal. This is the very deep and extensive valley system by which the measures are intersected. There is none of these broad plains which elsewhere have rendered for the winning of coal, shafts often of very great depth. Much of the coal has been obtained by levels driven upon the crop; and although this method necessarily becomes less and less applicable, the shafts are less deep and less costly than would be the case were the valleys less numerous.
>
> These advantages great in themselves, have been materially aided by the extensive seaboard and the facilities for shipping afforded by its ports; and when this came to be added to the rare quality of the coal itself, fitting it in highest degree to the purpose of manufacture, of commerce, of war then the question of its duration became of the highest importance indeed to the British Empire.[2]

Although iron ore occurred mainly in the northern outcrop, the mineral was probably first mined extensively at Abercarn. Bradney confirms that, at the end of the seventeenth century, 'A great portion of the mountain and wasteland of the lordship of Abercarn was let to the Hanburys who raised iron ore which they carried to their furnace at Abercarn.'[3] The ore was found in approximately horizontal seams with the coal, so that they would often be mined together and in the earliest period be extracted on the surface. The primary difference between the two minerals was that, whilst coal was profitably mined at ever-increasing depths, this was not the case with iron ore. It was too expensive and too scarce.

Limestone, as in all iron-producing regions of Britain, was in plentiful supply. It outcropped a few miles to the north of the ironworks at Trefil near Tredegar and Darren Clau which supplied the Nantyglo works. Limestone may yet leave the most evidence of its history because of the many swallow holes formed by the collapse of limestone caves. The basic types of coal found in western Monmouthshire will be discussed fully in Chapter 2. It is enough to note at this juncture that the area was rich in steam and bituminous coal.

Like coal, iron ore is not a homogeneous material and the categories of ore as with coal determine its use. They differ considerably in their richness of iron and the ores of the valley were at a disadvantage in this basic competitive regard. Brown haematite, which was the most common, contains 30–40 per

cent iron as compared to the magnetite of south-west England which contains about 65 per cent, or the red haematite of Cumbria with 55–60 per cent iron. As in all coalfields there was also some blackband, which contains 17–30 per cent iron.

One of the earliest descriptions of the local ore is that written by Octavius Morgan MP around 1780:

> The oar [sic] was generally found in poor wet ground, often near the coal; it is generally not found deeper than eighteen feet; and that the miners are of the opinion that there is no quantity deeper under the earth. In our country there are two sorts of oar called vein oar and pin oar. The former lies like a pavement of bricks about two inches to seven inches in thickness, and is of a pale yellow colour; the pin oar in lumps about the same depth, but in very uncertain quantities and is sometimes bluish or deep brown.[4]

As late as 1865 iron ore continued to be mined near the surface. A. J. Munby, that prurient voyeur of nineteenth-century working girls, describes the ore being broken into manageable pieces by some two hundred young women using sledge hammers at Blaenavon and Brynmawr.[5] Deeper workings were described by the *Morning Chronicle* reporter on his visit to Abercarn in the 1850s:

> The workings I visited were in what is called the 'Blue Vein' which is about four to six inches thick. We next proceeded to the 'Black and Spotted Vein' considered the richest in the district – The veins of iron have been snapped through and on one side lifted a height of two feet six inches. When the displacement is more extensive it becomes a fault of which there are instances in this pit extending to thirty three feet.[6]

The seams of coal are those of the eastern section of the south Wales coalfield and correlate across the region, with localized names given to each seam. The Mynyddislwyn seam, which contained three principal minor seams from 2 to 6 feet in thickness, was called the Llantwit Number Three seam in the Rhondda and the Wernffraith in the Neath valley. Similarly, the Black Vein of the Ebbw valleys is called the Nine Foot seam in the Rhondda.

This geology gave the valley its constancy and predictability. Over the next two hundred years, the Crumlin Viaduct Works were to be only major deviation from its dependence on coal and iron ore. Despite the eventual unprofitability of the industries founded upon them, nothing matched the power of this generous geological presence and the industrial society which resulted. For coal mining and the manufacture of iron and steel continued even after reasonable commercial margins of profitability had been eroded.

The geology provided the basis for a massive dislocation with the past after about 1780 but not a complete break. For the life of the valley created strong threads of continuity to be woven into the warp of industrial revolution. The valley was not an inert partner in its transformation. There were intrinsic elements in its topography, people, their society and rudimentary industry, which influenced and sometimes channelled the rapidity, strength, extent and duration of change.

TOPOGRAPHY

A picture of the valley in 1780 may be obtained from the few books published about that date. One was written by Edmund Jones, an independent Congregationalist minister who wrote an account of the northern parish of Aberystruth. He describes life on the eastern side of the Ebbw Fawr bordering the parish of Bedwellty to the west and Llanhilleth to the south. Archdeacon Coxe's second volume includes the Ebbw valleys and George Alexander Cooke describes the view in 1810 from Twmbarlwym, before its scenery had changed dramatically, as that of beautiful valleys 'deeply shaded with trees and watered by torrents, which faintly glimmer through the intervening foliage'.[7]

Coxe describes the valley between Aberbeeg and Crumlin just as graphically and was further impressed by its neatness:

> The vale is alternately expanded and contracted and forms a succession of oval plains; in some places it is wholly occupied by the torrent and by the railroad running under precipitous rocks; in others it spreads into fields of corn and pasture amidst the variety and wildness of forest scenery[8] . . . It is impossible to travel in Monmouthshire without being struck by the neatness and cheerfulness which results from the custom of whitewashing the homes. On account of the abundance of lime this operation is usually performed within and without and greatly contributes to the health of the inhabitants.[9]

The northern Ebbw valleys as described by Edmund Jones was less fertile and increasingly barren, though much softened by deciduous trees: 'The trees which are the chief glory of the earth, especially the beech trees abounding about the rivers great and small, the hedges and lanes make these places exceedingly pleasant.'[10]

There are no paintings of the area but there a few prints. One is of the northern parish of Aberystruth and of unknown provenance which Bradney dates at about 1836.[11] The ubiquitous Buck brothers, with their much better known prints of castles and ruined abbeys, inevitably skirted the valley during their journeys of 1742. Perhaps, apart from the coniferous trees, the best impression of an earlier topography is to be obtained from the present-day beautiful Cwmcarn valley which has become a centre for tourism.

This pristine place was linked with its industrial future not only through its mineral deposits but by the continual interaction of topography with geology. The length and narrowness of the valley, combined with the early and easy access to sale coal and iron ore, and the gradual development of deep mining between about 1835 and 1914, ensured that the pattern of settlement was to be piecemeal and to extend over a lengthy period. As a result the towns and villages were far more divided from each other than a glance at a map suggests. Ebbw Vale was established as an industrial town fifty years before Abertillery, which pre-dated Newbridge by a further thirty years. The early villages followed the sides of the hills, where the sale coal outcropped, rather than the bottom of the valley, particularly below Aberbeeg. Newbridge started with the settlement of Cwmdws around levels established fifty years before the sinking of the South Celynen colliery, around which the larger village developed. The governance which followed this pattern was to be urban only in the administrative sense required by local government. Even so, there was nothing like the Rhondda Urban District Council, where growth was far less sporadic, and which by 1901 had 113,000 inhabitants and most importantly some form of centralized control. By that date Abertillery UDC, the largest of nine urban districts sharing the rivers Ebbw and Sirhowy, had just under 22,000 inhabitants and Risca, the smallest, about 9,500. This pattern resulted in the Ebbw valleys having small divided communities, schools, urban district councils and sporting facilities. In its turn, as will be fully discussed later, this pattern was to influence considerably two developments. First was the comparatively poor provision of water and sewerage, which resulted in the area being one of the most diseased areas in Britain by 1880, with the consequence that thousands of people fell ill and died earlier than was normal for those times. This factor both demanded high levels of public investment to remedy it and may reasonably be assumed to have lowered the levels of productivity. Secondly, the development of the canal, because of the very steep incline from the valley into Newport, required a higher level of investment per mile than any other valley in south Wales. This factor was to have a most serious influence on the history of this area.

THE PEOPLE AND THEIR SOCIETY

Anthony Pickford, one local historian of the southern end of the valley, judged that the valley before 1780 was characterized by its quiescence.[12] It was far away from the centres of consequential matters such as Chepstow or Monmouth. Visitors travelled around the valley rather than up and down this remote place. The maps of Monmouthshire reflect the quiet and unchanging nature of the Ebbw valleys. Thomas Kitchen's map of 1764 shows a valley which is little different to Speed's of 1610. There is only one village, located at

Bassaleg at the southern end of the valley, big enough to warrant a rectory and three other settlements around small churches at Risely (Risca), Mynithisloyn (Mynyddislwyn), Llanhilleth and Blanagwent (Nantyglo, Blaina). The antiquity of these places is difficult to judge but there seems to be little of either historical or architectural interest. The major exception and most researched is St Illtyd, on top of the mountain above Aberbeeg, where a site near the church was excavated by Trevor Lewis and John Storrie, the curator of the old Cardiff Museum, in 1924.[13]

The people of the valley sometimes profited and were often crushed, sometimes literally, by its geology and topography both bountiful and terrible. A clear picture of their lives is difficult to obtain, for apart from the most important families the records are skimpy – a paucity exacerbated by the absence of both local newspapers and literature. Indeed, an obstacle to an understanding of these people in the late eighteenth century, which was to persist until about 1925, is that there was no great surge of Anglo-Welsh literature to make even the most telling of contemporary accounts less opaque. There also appears to be a paucity of Welsh literature describing the locality over this period. There were no minor novelists or poets apart from Islwyn in the 1860s and W. H. Davies, just skirting the valley, before 1914, let alone a Fielding, Dickens or Hardy.[14] Despite this screen to the reality of the life of the valley, a few strong threads of continuity are clear, notably those of the Morgan family, the Welsh language and education. The repercussions of these societal factors on industrial development were to be important, though analysis of their effects is more complex and speculative than those of geology and topography. But first an overall picture is required.

The population was small and scattered. G. H. Jenkins estimates that the population of Wales was about 489,000 in 1750 and that the density of many places was fewer than fifty persons per square mile.[15] This would place the population of the valley at about 4,000, of which probably a half lived below Risca. In the central and fairly typical parish of Llanhilleth it was noted that

> The district was very sparsely populated at the beginning of the eighteenth century for the registers show here were but two baptisms and one marriage in the Old Church in 1725. – in 1763 there were only thirty families in the whole parish and these were but small ones.[16]

The relative poverty of the area is reflected in the paucity of the tithes, the quality of the dwellings and the insubstantial character of the bourgeoisie. Between 1780 and 1783 the combined tithes of Mynyddislwyn and Bedwellty averaged £115 15s.[17] There were no large houses of note in the valley prior to 1780 and, apart from a few good Tudor farmhouses, the Ebbw valleys was bereft of any reasonable domestic architecture. Perhaps gavelkind, the Welsh practice of dividing land among all male heirs, which was not abolished until

1925, had taken its toll.[18] There were no good livings with their large and pleasant rectories, apart from Bassaleg, to attract a younger son of some lord or duke with interests in the area. The relative absence of a middle class is illustrated by the seeming scarcity of local magistrates. In the returns for 1714 there were sixty-two justices of the peace for the county but none are recognizable from their names as being domiciled in the area.[19] Jane Austen was not too far away in Bath and would have been reasonably comfortable in Monmouth or Chepstow, but the society of interlocking gentry and aristocracy which she writes about did not exist in the Ebbw valleys.

The indications of an emergent middle class are perhaps even slighter than for much of the rest of south Wales. Evidence is scanty but it is worth noting that Mynyddislwyn was only one of two parish churches in south Wales where all seats were 'Free', with no appropriated pews for the gentry and middle classes.[20] Thus, there may have been a wider gap between rulers and ruled than in much of England. This may have resulted in an instability in local government, particularly in networks of communication, which was to have very serious results between 1820 and 1840.

The precise pattern of the ownership of land is difficult to establish for 1780. However, the records of the Tithe Act of 1836 give some guidance. Changes in land ownership between these dates were mainly due to purchases for industrial use, which are fairly easy to discern, and of the manor of Abercarn by the Llanovers. In the north of the valley, in the parish of Aberystruth, of 11,049 acres the Hanburys owned almost 7,000 and the earl of Abergavenny 3,000. In the south, in the parish of Bassaleg, the Morgans owned about 3,000 of 6,500 acres and completely dominated the neighbouring parish of Bedwas with over 3,000 of about 4,000 acres. In the central parishes of Llanhilleth and Mynyddislwyn, the Hanburys were again prominent, along with Jones of Llanarth. But the land was more splintered into smaller landholdings of 100 to 300 acres, with families such as Moggridge, Blewitt, Edwards, Edmunds, George and Andrews owning the land. In Mynyddislwyn there were eighty-five independent landowners in an area of just under 17,000 acres, though these included houses and gardens.[21] The Miles family were very long established smaller landowners, with estates in Llangatock as well as the northern Ebbw valleys.[22]

Some of these families continued to influence affairs but it was the Morgan family who are instantly recognizable as occupying the local pinnacle of status and power for the 200 years before 1780. They were domiciled near the bottom of the valley and were amongst the wealthiest and best connected families of Wales. This was particularly so after the marriage with the Devonshire family in 1724, when Rachel Cavendish married William Morgan with a dowry of £20,000. Their annual income of approximately £10,000 placed them with Watkins Williams Wynn of Wynnstay, above other prosperous landowners like the Middletons of Chirk Castle and the Mansells of Margam,

whose incomes ranged from £1,000 to £5,000 per annum. Tredegar House, built by Sir William Morgan in 1670, was the largest Renaissance house in Wales, containing opulent stately rooms adorned with tiles from Holland and marble fireplaces from Italy.[23] Even their passing was more eagerly anticipated than most peoples' lives – at least everyone stood a chance of a good meal. 'On the death of John Morgan of Tredegar in 1719 the bells of Newport and Tredegar were rung for fifteen days and the mourners were regaled with hams, tongues, macaroons, biscuits and ales.'[24] Later they were to lose heavily in lawsuits between Rachel and the rest of the Morgans, but they emerged at the start of this period well able to take a key leadership role in the valley through their crucial role in the development of the canal. As will be seen, following their early and successful steering of transportation and support of the northern iron industry, the Morgans were less adventurous over the development of Newport docks and never approached the role of the Bute family in Glamorgan.

Amongst the most significant failures of these families, and particularly of the Morgans, was that they took no steps to endow a grammar school. This was a reasonably common practice and there were about thirty such schools in Yorkshire. Education was thus absent at the secondary level until the intermediate schools of the last few years of the nineteenth century. In 1780 the nearest schools of substance were at Monmouth and Cowbridge, with a weak grammar school at Abergavenny. This was to prove a key deficiency in the rapid change from an agricultural to a mineral and iron manufacturing economy. The relationship between education, training and industrial innovation and success remains imprecise but the absence of education inevitably limits the choices which people are able to make, both in their own lives and their influence on local affairs. At the primary stage, industrial schools were not yet founded and all education was based on the church and chapel. A circulating school was established at St Illtyd in 1748–9 which attracted forty-three people.[25] There were smaller schools at Aberystruth, Mynyddislwyn and Henllys.[26] But, apart from one endowed non-classical school at Bassaleg, that was the extent of the provision.

This educational deficiency combined with the Welsh language of the valleys of western Monmouthshire, the predominantly Nonconformist religion and the nature of their industries to form a frontier with England in a long, changing and intensely complex process of cultural differentiation. The detail of these differences is outside the scope of this history but undoubtedly influenced the economic development of the valley over the succeeding 200 years and beyond.

At the beginning of this period the valleys of western Monmouthshire, together with pockets in the eastern part of the county, were Welsh in language and culture. The valley pronounced itself as Welsh by its place names. With the possible exception of Bassaleg, they came from the early

Celtic period. 'The Ebbwy and its neighbours were each named after its guardian spirit or goddess-dduwes, Ebbwydd the gushing copious stream, Tillery-Telorwydd the musical babbling stream, Sirhowy-sor sullen or siriol – cheerful stream.'[27]

This was to be buttressed by the first movement of population into the valley which came from west Wales to build the canal in the 1790s.[28] Such patriotic as distinct from nationalistic instinct for Wales was not confined to the 'gwerin' with its Welsh-language base in the chapel, but was to be considerably influenced at different stages in the nineteenth century by the powerful landowning families of Hall, through their ownership of much of Abercarn, and Morgan. Both of these families were in place in 1780, though about to transform themselves by marriage. They were to have a considerable influence in Wales on what has been termed 'The Invention of Tradition'.[29]

Travellers around 1780 who pronounced on the language, such as Coxe, Williams and Byng, discerned the county as divided. The latter placed Chepstow in England and Newport as a border town differentiated from Chepstow by the speaking of Welsh.[30] Certainly Welsh was the language in common use in the valley and the few remaining eighteenth-century Bibles are in that language.

Support for Welsh was strong throughout the valley, particularly helped by a combination of the Tredegars and the bishops of Llandaff. On being appointed vicar of Bassaleg in 1781 Leyson wrote to Bishop Barrington noting, 'your Lordships desire that I should qualify myself for that purpose by learning the Welsh language'.[31] The St Mellons area was to remain one of the principal Welsh-speaking areas in the county, with 25 per cent of the parish Welsh speaking in 1901, a figure almost as high as that of Tredegar. At that census date just over 20 per cent of the adult population of the valley spoke Welsh.[32] This proportion needs to be viewed in the context of the decline of Welsh as one of the two languages of this area which was to continue until the 1960s.

The industrial influence of this language divide was of early concern. David Williams notes in his *History of Monmouthshire*, published in 1796, referring particularly to Pontypool:

> The people seldom acquire a knowledge of English which enables them to proceed beyond literal translation. The perpetual business of translation occupies their minds and their time; and the errors occasioned by annexing wrong ideas to terms founded on unknown customs, gives them appearances of folly, stupidity and inferiority which excludes them in great measure from all the speculation of industry.[33]

Whether the damage to industrial opportunity for indigenous people matched the concern is quite another matter. However, a deficiency in the

language of industrial power which was English, combined with a complete absence of secondary education, and the addition of religion to this provocative mix, had important consequences for the educational and economic perceptions of both the inhabitants and those observing them, particularly from the episode of the 'Blue Books' in mid-century. Interestingly, much of the support for the Welsh and their language at the level of the British establishment came from Monmouthshire and, as will be seen, was particularly influenced by Lady Llanover and Sir Thomas Phillips. The issue has had a long life and continues to inform the educational and economic strategies of Wales.

INDUSTRY

In 1780 the Ebbw valleys was an agricultural area – a rather cold, damp hilly place with thin poor soil above Risca which was reflected in subsistence farming. A. H. John describes the typical Welshman of the period as a small farmer, cultivating 30 to 50 acres by mixed farming, paying rent through the sale of his cereals and receiving other income through the sale of his livestock.[34] This description was well-fitted to the farming of the valley where climate supported topography in dictating this agricultural type. It was slightly colder and wetter than in the late twentieth century, with a high variation in rainfall between that of the coast at about 40 inches per annum and the hills above Risca where 60 inches could be recorded.

Transport was primitive and depended as much on mountain tracks between valleys as on roads from north to south. Parish boundaries and manorial boundaries went across valleys as much as longitudinally and were to be a matter of constant dissension as the development of industry cut across the old manorial boundaries.[35] Industrial associations were equally as likely to go across hills as up and down valleys. Thus, for example, Abercarn was connected industrially by the Hanburys to Pontypool from the mid-seventeenth century.[36] There was no market town of any note in the valley, the largest and nearest being Newport and Pontypool and, to the north and east, Brecon and Abergavenny. There is no record of the Ebbw being navigable in any section.

The small-scale industrial activity of the valley in 1780 was to have far less influence on future developments than its geology, topography or people. The measure of industrialization is reflected in the status of Newport and the trade figures. Newport was considered a creek of Cardiff, or as Coxe as late as 1801 noted, a 'member port' of Chepstow, whose traffic measured 42,276 tons whilst Newport's was 22,929 tons.[37]

The small iron industry was located mainly in the southern part of the valley at Abercarn, Pontymister, Tyddu and Tredegar Park. Of these Abercarn

was probably the oldest, with an association with the Hanburys certainly dating back to the 1670s. The first ironworks in the village of 1576 was owned by Edward Roberts, a London merchant.[38] In the Hanbury archive there is the oldest map of a Welsh and possibly British ironworks, dated 1670, showing the works on the Gwyddon stream at Abercarn. The Tredegar Ironworks, located mainly in Tredegar Park, was probably the most substantial, with a stock in 1737 valued at £7,250.[39] Copper was also mined in the Risca area and there are complaints to the Mines Royal concerning the copperworks taking too much water.[40] There was a small weaving industry located mainly in the parishes of Aberystruth and Risca.[41] Most ancient of all was possibly the long discontinued lead mining at Risca in AD 75 where the 'work was probably done by slaves and convicts'.[42]

Some coal would have been mined, scoured and dredged for domestic use, for the iron industry and a small amount sent by packhorse mainly from the southern valley to Newport for the coastwise trade. In 1651 the customs officer notes that a few hundred tons of coal per annum were being dredged from the River Usk.[43] Output is impossible to estimate with any accuracy but it is doubtful, with the trading figures of Newport in mind, that it was more than 20,000 tons per annum before 1780.

In some other areas of Britain agriculture existed side by side with rural manufacturing in a process of proto-industrialization which is believed by some historians to be the first stage of a more centralized factory production. It is a useful model to consider in discussing of the rapidity of the processes of change in the valley. The dynamic of this process was clear. The only method of meeting an increased demand, say of woollen cloth, was to increase the number of out-workers labouring in their hamlets and isolated cottages and farms in the hills. Eventually the distances to be travelled as the numbers increased made this a very difficult way of conducting a business. The only route to improved profits and even survival would be to centralize manufacturing, thereby bringing other advantages, particularly specialization of skills, ease of control and the development of regional and even international markets.

There is no direct evidence of this process in the valley as mineral economies lent themselves less easily than textiles to this stage of development. The sale coal levels developed as a comparatively small-scale method of mining as soon as the canal was opened in 1797 and continued in that way throughout this period. The iron industry quickly developed into large-scale manufacturing. There were in fact two industrial transformations in the valley, both with their roots in its geology and topography. The first and rapid revolution was in the iron industry and its associated collieries after 1790 from a tiny base. The second, slower and less dramatic, occurred in coal mining, more from about 1835, as deep mining increasingly dominated, but did not replace, the sale coal levels developed from about 1790. The first was

dramatic and the second much less so. They were both made possible by a revolution in transport.

Neither of these industries was developed around the process of the collecting of out-workers in a centralized ironworks, mine and level. As will be seen, up to about 1850 the manning of the three processes linking the pre- and post-1780 valley of the building of the canal, sale coal and ironworks was dominated by in-migration. A few colliers may have been experienced in the primitive dredging of coal from the river and there may have been some centralized marketing of their coal. But the sale coal industry, which remained throughout the period very small in its industrial scale compared to iron, has little resemblance to the model of proto-industrialization. This factor must have made for an industrial change more sudden and rapid in the iron industry than that of the textile industries of the north of England, and it was supported by less dramatic change in the sale coal area of the southern valley.

The absence of this stage of industrialization, which gave the opportunity for the ambitious to accumulate capital, may well have influenced the local financing of the early stages of development in coal levels. In this form of mining, entry was comparatively easy because of small capital requirements, but margins from hill farms were presumably too small to develop savings for even this level of local investment at anything but the most primitive form of enterprise. There are no figures available for Monmouthshire, but in the Bradford hill farms, which were very similar to those of the valley, 'the average value of farm goods and equipment was £49 as compared to £119 in the Yorkshire wolds'.[44] The low income of farms was probably exacerbated by the continuation of gavelkind in parts of the valley.[45] This paucity of discretionary savings may well be of more importance in the dramatic changes in the economy of Ebbw valleys as it transferred from an agricultural to a mineral base than the proto-industrialization factor influencing the growth of the textile industry.

Tiny incomes resulted in a tendency for the indigenous farmers to be excluded from the growth of their own economy, a factor rooted in the structure of the valley before 1780. Future commercial initiatives were mainly limited to the selling of small pieces of land to major industrialists. Evidence is scarce, but what there is all points in the same direction. The papers of the Andrews/Hoskins family, a family at the top end of the indigenous agricultural ladder of the valley, with its reference to the building of fifteen houses for rent in Abertillery in the 1860s, shows some ambition and some spare money. But the total proceeds of the will of a little less than £100 is also evidence of the limited potential for industrial funding.[46]

The financing of industrial development was to follow this precedent throughout its history. Entrepreneurs and industrialists came from outside the valley, either from a commercial or legal base in Newport such as the early Morgans, Powell, Blewitt and Beynon, or from England. The impact of this

phenomenon on the history of the valley, though inevitably indistinct, was probably important. Industrial development, as the histories of the Ebbw Vale company and the Crumlin Viaduct Works will illustrate, is not driven solely by economic considerations. Other issues such as an emotional vested interest in an area can also play a most significant part.

The slowly germinating seeds of an industrial revolution in the valley varied in their contribution to the massive changes that occurred between 1780 and 1914. Geology and topography were paramount, followed in an uncertain order by some local landowners, the paucity of education and a rather primitive industrial and agricultural society. Law, which was administered on the Oxford circuit, seems a marginal issue in this context. Religion was less so because of its influence on education. There was some order in the processes of change and development to 1914 but they were also characterized by being uneven and discontinuous. As noted in the Introduction, sale coal mined from levels and iron manufacture were supreme until the mid-1840s, and then deep-mined steam coal and steel began their long period of command from the 1860s after a decade of transition. Ebbw Vale was a century old when the recently sunk mines of the lower Sirhowy valley completely eclipsed the profitability of that town's industrial performance.

The historian with no prior knowledge of this valley and presented with the information contained in this chapter, particularly if interested in the history of technology and systems, would make a good guess as to its development. Much would be predictable. But there would be some decisions and developments which would be surprising and even lateral. Change would be spasmodic and lumpy and the integration of products, people and their institutions marked more by division than harmony. The mining of coal which was the primary industrial activity begins this history. The expectations of some perceptive contemporaries were deeply pessimistic. Writing in 1796, David Williams gives an accurate forecast of what was to come:

> Manufactures however they may add to the public wealth, certainly degrade and brutalise the people, and managed as they are on the principle of monopoly, a species of slavery is the constant effect. Children brought up as machines are depraved in body and mind; and mechanics substituting intemperance for domestic comforts are bad husbands and corrupt or unprincipled citizens. The pleasures of visiting these hills and contemplating the vast preparations for circulating their wealth are therefore not unmingled with sorrow.[47]

2

The coal industry: mining and productivity

This and the next chapter describe the coal industry of the Ebbw valleys and discuss the two core activities of a mining business: mining and marketing. Their performance is measured annually by the trading account, an appropriate model for the design of an industrial history. For it is this integrating concept at the core of accounting and industrial development which records the return on investment and whether the products or services have been sold for more than they cost (Model 1). Everything else in the performance of an industry in a capitalist society is dependent on this most fundamental of business processes.

The operation and integration of the components of this account, even if not formalized or completely understood, decided the business strategies of the owners and managers of the coal companies of the Ebbw valleys. They would have been continually integrating, together with much else, the level of their reserves against the cost of opening a new seam, the costs of labour against the price of coal, whether to invest by integrating forwards into by-products or pay short-term improvements in their margins as dividends. They may have known something of the theories of economics but it was the practicalities and sometimes brutal logic of the trading account that inevitably guided and monitored their efforts. This accounting model is closer to the realities of their industrial world than the models of economics but is something of a departure as a method of designing an industrial history.[1]

Furthermore, the coal and iron industries of the Ebbw valleys were dominated by dual-product companies. These industries were not perceived or managed as completely separate industries. The resultant rather low level of accounting differentiation makes it difficult to unravel the trading process, particularly as the complementary roles of coal and iron changed over the period, with iron dominating up to about 1850, and coal, once the era of deep mining became entrenched, after mid-century. Thus the history of both industries is open to serious misinterpretation unless studied together. The profits of one industry often supported the losses or cash-flow problems of the other. The trading account is a useful compass for the historian to establish a direction through this complex business situation, particularly as the extant reports were usually recorded as one set of annual accounts.

Model 1

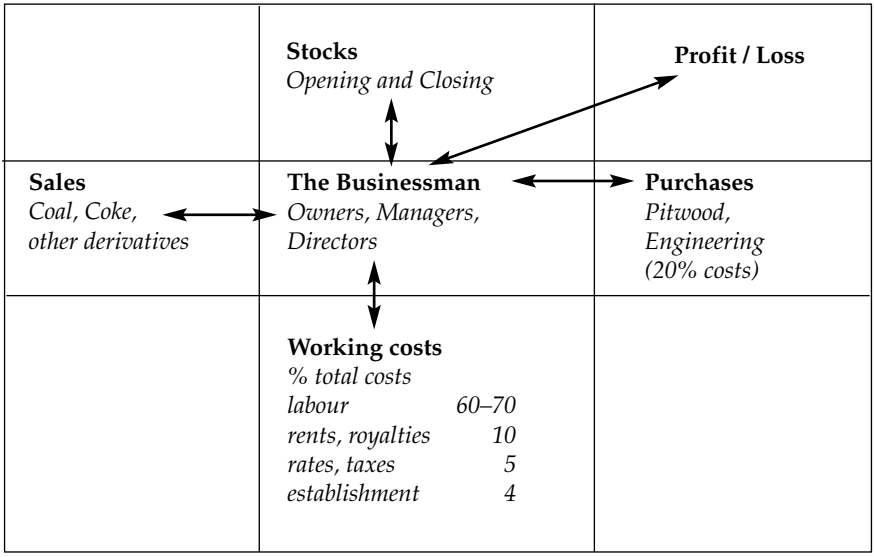
The Trading Account:
A Model Illustrating the Components and their Integration

The trading account as an accounting model is defined as:

Opening Stock + Purchases Closing Stock + Sales

The difference between the left and right sides is the gross margin. If costs of mining and sales are deducted this gives the net margin or profit or loss on trading.

The integrative model for the coal industry may be defined as:



Sources: R. Church, *History of the British Coal Industry*, vol. 3, *Victorian Pre-eminence 1830–1914* (Oxford: Clarendon Press, 1986), 497–511. *Royal Commission on Mining Royalties*, BPP XLI (1890–1), 356–7.
Note: All percentages, which are approximate, are between 1850 and 1913.

This chapter on mining is followed by a chapter on marketing, an activity which has received much less attention. The concentration on the mining or supply side is with the processes of mining and labour, as they form easily the largest cost. Purchases and stock are not discussed. Chapter 3 concludes with an analysis of costs as reflected in productivity and that of marketing with the results of the operation of the trading account as reflected in dividends.

The chapters on coal mining and marketing are followed by Chapter 4, which discusses the iron and steel industry. To emphasize the point made

earlier, this metalliferous industry and coal were often operated in the same business by the same companies. This was particularly so in some locations of the south Wales coalfield such as north Glamorgan and north Monmouthshire. This conjunction of iron, steel and coal goes some way towards balancing the marked tendency for these products to be discussed separately by separate historians.

COAL MINING

The processes of coal mining which were an overwhelming feature of the history of the Ebbw valleys were based on manual work. Men for much of this period worked with hand tools a 50- to 60-hour week spread over six days. As late as 1905, hewers in Monmouthshire worked the longest hours bank to bank of all hewers in the UK at 9.9 hours per day compared with a national average of just over 8.5 hours.[2] The influence of the colliery in the mining valleys was ubiquitous. The toil and grime of coal mining permeated everywhere, forming a bridge of work between miners and their families with the daily bath of the miner being given by his wife, with his children often fetching and heating the water. In a primary sense, then, the history of a coal-mining valley is a chronicle of its work.

This chapter begins with a summary of the development of the industry over the period as measured in output and employment, size and density of mining units. This survey is followed by a description of the mining of coal in terms of methods of access, technology, the manual tasks of hewing and hauling, their structure and the differentiation of change as it influenced these processes. Of the prime costs, rent, purchases such as pit props and transport are omitted, though the latter will be discussed later. The resultant cost is reflected in productivity. Apart from an excursion into the Sirhowy valley and the section on productivity, the study of mining is based completely on sources relating to the Ebbw valleys.

Output, employment and the size and density of mining units

There were two basic characteristics of coal mining in the Ebbw valley: first, the massive increase in output and employment between 1780 and 1914, and secondly, the dramatic change in the way in which work was organized, as deep mines began to replace levels from about 1835. Output was to increase almost continually from 1780 to 1914. It was inevitably broken by the ups and downs of the trade cycle, strikes and lockouts, but that of Monmouthshire increased from perhaps 20,000 tons in 1780 to 15,016,000 tons in 1914 (Tables 2.4 and 2.5). Numbers employed increased from about 150 to over 63,000. The

contribution of the Ebbw valleys varied considerably over time. It was affected by factors such as the opening of the lower Sirhowy valley in the 1900s and the influence of the ironworks in their stages of growth and decline. In 1915 the Ebbw valleys produced about 41 per cent of all Monmouthshire production (Table 2.6). Before 1860, output was probably above this figure, at around 50 per cent of all Monmouthshire production, as the Sirhowy deep pits were not yet being worked and the Nantyglo ironworks was in production.

Between 1800 and 1835 this increase in output came almost completely from levels. Dr Griffiths, in the parliamentary inquiry of 1810, stated that production came almost solely from this source.[3] Output to feed the coastal trade alone increased from 64,000 tons in 1804 to 618,000 tons in 1844 (Table 2.4), mainly from the construction of more levels. Output per level probably increased very slightly. In 1810 the average weekly output of various levels on the Tredegar Estate ranged between 80 and 500 tons.[4] In 1835 one level at Llanhilleth produced about 600 tons per week. Another at Mynyddislwyn produced about 250 tons.[5] Employment per level was also small. Apart from a myriad of tiny unrecorded operations employing under five people, a typical level seems to have been Cwmdws near Newbridge in mid-valley employing about sixty colliers.[6] The level continued to dominate until the mid-1840s, R. H. Franks in 1842 noting 'That the mines in South Wales are for the most part entered by level or adit as it is called'.[7]

The number of levels is necessarily an approximation. The numbers employed in mining in Monmouthshire may be estimated with caution from the *Monmouthshire Merlin* of January 1835 at about 7,000, which results in about 70 to 120 levels including a few balance pits.[8] This is supported by Prujean's mineral map of 1836 which shows sixty units in Monmouthshire, excluding units directly associated with iron production, of which there probably another thirty to forty. Of these, twenty-five units were in the Ebbw. This was small-scale production, particularly compared with the north-east of England where the number employed in some collieries exceeded 1,000.[9] The pit began its long period of ascendancy over the level between 1835 and 1845. In the northern part of the valley this was probably given its most dramatic boost when Thomas Brown discovered a rich coal seam at Cwmtillery in September 1842.[10]

By 1914 the size of mining unit had increased dramatically. The largest single unit was Nine Mile Point employing 2,450 people. The largest single company was the Ebbw Vale Steel, Iron and Coal Company employing, in nine units, 6,987 people. There were forty-three units employing more than 300 and twenty-two employing more than 1,000. There were 61,692 employees in deep mines and only 1,680 in levels.[11] Western Monmouthshire by 1914 was dominated by large baronies, including the old established Ebbw Vale and Tredegar and Blaenavon companies and newer arrivals such as Burnyeat Brown and John Lancaster.

Just as marked as the increasing size was the growth in density. In 1840 there were probably no more than three deep pits. By 1913 this had increased to sixteen deep pits (Table 2.6). As early as 1875 the landscape of the Ebbw valleys had been transformed to one of deep pits, on or near the valley bottom, each with its distinctive winding gear, a landscape which was to be retained for one hundred years.

This growth of the mining industry of the valley was achieved by thousands of miners spending most of their lives in the winning of coal by digging, boring, sinking, hauling and hewing. These processes are now described, starting with methods of access to the coal seams. There was no simple cumulative progression in the access to coal, from the easy winning of surface deposits to the more difficult and costly exploitation of deep seams. The advancing methods of access did succeed each other but continued to exist often side by side throughout the history of the coal-mining industry. There were three distinct types of access: primitive, intermediate and advanced. Each was characterized by both its own specific work processes, the continuity of manual hewing and, to a marked extent, the same organization of work at the face.

THE WINNING OF COAL: ACCESS AND TECHNOLOGY

Primitive access – dredging, scouring and patching

The most primitive method of obtaining coal was by dredging from the Usk and presumably the Ebbw where it flowed into the Bristol Channel. Bassett notes that, 'Previous to 1791 the total quantity sent coastwise was 7,000 tons, a large portion being collected in the bed of the river Usk.'[12] David Williams gave the harvesting of this coal a mystical and protective connection for the poor of the district:

> As marvellous circumstances are blended with all British blessings, depositions of coal, by the tide, in the mud and sands of the shore, are here ascribed to a faculty bestowed on the river by providence; and the people generally testify, whilst the Lord of the Manor imposed a duty, the river ceased to deposit coal and when the duty was withdrawn it exercised its usual bounty. – the poor collect the coal and apply it to their use; and the probable opinion is that a vein of it has been laid open by the river.[13]

Scouring was slightly more complex. By this process the seams where they outcropped were first undercut and then a dam of water released over them so as to wash the soil from the coal or coal and iron ore. The Rassau district of Beaufort is named after these scourings or races.[14] A small development seems to have been established around these scourings which was connected

with the Brecon ironworks. Thus, north of Ebbw Vale, 'the surface of the mountain was excavated and the mine was found, then washed in water, by which process much of it was carried away – then conveyed on mules to Brecon blast furnace'.[15] The process was clearly common throughout the valley, as Bassett describes the same procedure, quoting from a paper by Octavius Morgan who wrote about the extraction of iron ore in the south of the valley:

> On the wash or the enclosed ground on the sides of the hills, where we find oar [sic], we dig a trench about four or five feet wide till we come to the lowest vein about fourteen feet deep, and in that depth is usually four veins or layers of oar. Then we make small ponds to hold the rain water, or any that is come out of the springs above the trench that is cut; and as fast as the ponds fill we let them down through a floodgate into the trench, which carries away all the loose earth, and leaves the myne behind and the lowest vein bare.[16]

In the middle of the valley there were complaints about scouring as early as 1659 when the workers of Capel Hanbury destroyed half an acre of land.[17] Pollution seems to have been an early issue in the Ebbw Fawr, as the river was 'being often troubled by the pond waters scouring the coal works which is also unfriendly to the fishes and makes them more scarce'.[18]

A complementary method was patching, where manual labour rather than water was used to dig away the covering of soil, and dig vertically into the coal and iron seams. At their crudest, these bell pits, so-called from their shape, could either be abandoned once the coal lying vertically had been extracted, or continued by supporting the soil with pillars of coal. This method was to continue for many years and was used to mine coal by miners during the 1926 strike in the Newbridge area. Commercially, however, it probably ceased around 1870.[19] More importantly, it was in the bell pit that pillar and stall experienced an early development, though this method of access was to be quickly superseded by the level.

Intermediate access – the level

Coal seams were reached by levels through the construction of a tunnel from the side of a hill rather than a vertical pit. This method continued because it was comparatively undemanding in terms of technology, capital and labour and because the geology of Monmouthshire was highly conducive to this technique. Cash flow, especially important in the early days because of the primitive banking system, was much more rapid and certain than with a deep pit, which could have lengthy lead times of over a year before coming into production. New levels could be started and old ones abandoned when water

or ventilation became too difficult. This method of reaching the coal seams was also well suited to the intermittent market for sale coal. If demand for house coal fell in the summer or transport was difficult in the winter, levels were easily shut down. Above all, the level was a comparatively cheap method of mining coal. Construction at Llanhilleth by Blewitt in 1844 showed an expense of £33 during the month of May for making five explorations.[20]

However, as noted earlier, the level was limited in output and even the larger ones produced between only 60 and 100 tons a day. They were also limited technically. If ventilation or drainage became a problem they were usually abandoned, as they could not afford a technical support, particularly if they operated as stand-alone units. Levels often existed on the same site as a pit. They financed at the beginning of the period the more expensive development of a longer-term vertical shaft. This was the case of the Risca unit, where Edward Jones developed the largest colliery in the valley. It consisted of four coal shafts of 40 to 70 yards in depth, three levels each of half a mile and three miles of railroad.[21] This colliery was stated in the 1810 inquiry to have cost £60,000. The part financing of the very expensive sinking of a deep pit by the level was to be common practice to the end of this period. When the Tredegar Company began the development of their Oakdale site in 1907 – an operation which was not completed until 1910 – they immediately began working some of the coal by level.[22]

As the century progressed, levels were both worked independently by small owners, often farmers, and were useful additions to a large works. In 1907 J. F. Tallis noted of the Victoria location:

> In addition to the steam coal collieries a large area of Bituminous coal overlying the Steam coal measures is worked by means of levels driven in from the mountain sides and yields an excellent House and Gas coal, the small of which, is in great demand at high prices for the use of smiths, brickburning and other purposes.[23]

The level method of accessing coal seams was to be amongst the most tenacious of industrial processes, but its period of dominance was coming to an end by 1850, to be replaced by the much more complex and costly deep pit.

Complex access – the deep pit

The first mention of a local pit is in Harfords' Memorandum Book, which refers on 17 March 1796 to an *airpit* – a ventilating shaft 45 yards deep, at the Ebbw Vale colliery.[24] This would have been sunk at about the same time as those at Risca. But it was not until 1836 that the deep-mining era really commenced. Then the first deep pit was sunk in a location approaching mid-

valley at Abercarn by the Abercarn Colliery Company, to be followed by Thomas Brown in 1841 sinking the Ebbw Vale pits, and then again at Abercarn in 1846 by the Alfrey brothers.[25] These winnings were consolidated by the successful sinking at Abertillery of 1850, which was to develop by 1900 into one of the largest concentrations of coal mining in Monmouthshire:

> Messrs T P and D Price have reached their steam coal at Abertillery. The worthy proprietors distributed Bibles among the families and all the deserving poor were provided with beef for the enjoyment of a cheering dinner on Sunday – The Elled vein is five feet thick and the Big Vein eight feet. We are glad to find that Messrs Price after an enormous capital outlay can now be congratulated on having one of the finest steam coal collieries in S Wales and will in a short period be producing five hundred tons a day.[26]

These pits heralded the final stage of development: access by deep shaft in mid-valley on the valley floor, sunk to hundreds of yards, the last being the sinking of a shaft in the North Celynen colliery near Newbridge at a depth of 1,550 feet to the 5-foot Gellideg seam in 1921.[27]

Deep mining brought with it a much more complex method of access based on the technologies of prospecting, boring and sinking. All of these technologies flowed across the coalfields of the UK following the processes of development. The coal companies of the Ebbw valleys learned from those of the north-east, and the Rhondda and Cynon valleys learned from the Ebbw valleys. Up to about 1860 the technology was developed by viewers who both managed and advised and these were mainly from the North-East Coalfield.

The initiating technologies – prospecting, boring and sinking

Prospecting appears to have been of small importance from the decision to build the canal in 1792 until the development of the deep mine after 1836. It is inconceivable that these canal entrepreneurs would have risked such a very large capital outlay unless they were certain that there were available very large deposits of easily accessible coal. The issue was one of timing and money. Landowners, agents and local farmers knew where the coal was to be found, and before about 1840 even postponed its working because of the monopoly arrangement of the Monmouthshire sale coal owners, or sold one piece of coal-rich land to buy another. Justice, the agent of Sir Charles Morgan, writing to him in 1837 notes: 'I was convinced it was to your advantage to wait – having joined in the monopoly arrangements they were obliged to postpone working his coal.'[28] The prospected areas by the 1900s were considerable. The Newport Abercarn Black Vein Steam Coal Company owned or leased 2,500 acres.[29] The area of the Tredegar Company reached almost twice that figure with 4,600 acres.[30]

There was an early certainty or at least optimism as to the extent of the seams: 'In the vein of coal we are at present opening we have unworked 22,000,000 tons which will provide for the remainder of our output for the length of our lease.'[31] The smaller indigenous families also profited. The related Hoskins and Andrews families who farmed and owned land in the Aberbeeg area sold mineral rights to Thomas Brown in 1835 for the considerable sum of £500 and bought land which was later proved to contain one of the richest surface deposits in south Wales. They were, however, not to realize their fortune, as the problem was not in locating the coal, but in its transportation down a mile of very steep hillside. The deposit was in any case placed under compulsory purchase in 1940.[32]

Boring and sinking became of importance after the mid-1830s and were in the hands of the consultant viewers like Jenkins and, later, Rogers of Abercarn, as well as those from the North-East Coalfield. In the construction of shafts the valley coal owners seem to have been innovative. Thus at Abercarn in 1854:

> The depth of the pit is 420 feet. I must not omit to mention a plan here adopted for steadying the descent of the cage which I believe is peculiar to these works and which may be adopted in other collieries to best effect. Instead of the hempen or wire rope usually employed, they use here a line of railway irons laid vertically and pinned securely to the bratticing and side of the shaft; a proper shaped groove in the cage which is kept well greased traverses the rail, and the effect is to impart a greater smoothness and steadiness than are obtainable by the old fashioned method.[33]

The processes of boring and sinking were not cheap, and, until the 1860s, were not very predictable. This decade saw the beginning of hydraulic lubrication techniques, and core recovery accompanied by diamond core drilling which revealed the position and extent of the seams and water.[34] These were the two most important geological considerations affecting the development of a new coalfield. The sinking process could be protracted and expensive, with many men engaged. In 1904, after two years of sinking, Burnyeat Brown succeeded in striking the Black Vein at Cwmfelinfach and 280 men were employed in the process.[35] In 1864 it took three years of preparation at a cost of £36,000 before the 9-foot seam was hit at a depth of 300 yards in Abercarn.[36] Once the coal had been accessed, the winning of coal by manual hewing and its service activities could begin.

Manual hewing and the organization of work

Common to these very different methods of access was manual hewing and its organization at the face by the structures of pillar and stall and/or

longwall. The technique of manual hewing did not change fundamentally between 1780 and 1914 and its organization only very slowly. From 1780 to 1914 the faceworker predominated in the mining of coal in the Ebbw valleys in terms of costs, numbers employed and the flow of work.

Underground costs dominated total mining costs and after 1860 were probably 60–70 per cent of total working costs.[37] In their turn hewing costs were the major category of underground costs. The extent of this dominance over the period is difficult to judge accurately. Precise divisions of total costs into wage costs and hewing costs over the period are probably impossible. The most ambitious attempt is that of Church, though he is concerned about the difficulty of generalization. In addition, his main series does not begin until 1868.[38] Approximately, however, there were about 58,000 men employed in Monmouthshire coal mining in 1913.[39] Of these about, 15,000 were hewers and their butties, and they were paid about 33 per cent of total wage costs.[40]

Hewing also determined the flow and rhythm of work in a colliery. Hewing is of such importance that it merits far more than a passing mention here. Hopefully, the following two distinct but short insights convey some of its richness. The first is given orally by Cliff Smith, a miner and local historian working at the Markham pit in the Sirhowy valley who was apprenticed about 1916. He describes the task of the hewer and his butty. The basic tools were a cutting mandrel, a holing mandrel, a heavy breaking-up mandrel and a heavier bottom mandrel, together with clamps, sledge, wedges, shovel and hatchet.

> I would stand back of father when cutting and for eighteen months a butty would just shovel coal into a tram until level and then place large lumps around the rim so as to make more weight per tram – racing as it was called.[41]

The butty was taught to use the various cutting tools, the sledge, the clamps and later how to timber roofs and use sprags to keep up the overhanging coal. He was also taught how to cut the roof and the floor to enable the horses to come near the face. Very early in his apprenticeship he was instructed at home how to fashion helves or handles for his tools. The apprenticeship usually lasted five to seven years but was not indentured.

The second insight, which is probably the clearest description of a miner's day and has not been previously quoted in any history, is written by William Jones, the manager of the Ocean colliery in the Rhondda, who learned his trade in the Monmouthshire collieries:

> The underground workmen are expected to have descended the pit by 7 in the morning and not to commence ascending until 4 in the afternoon – After a workman has reached the bottom of the shaft, it may be safely assumed if he is a collier, that he is on average about three quarters of a mile from his working place

> – and it is necessary for him to be a little time between the bottom of the shaft and the lamp locking station, where he has his lamp examined and locked by an official, who is also in charge of the district where he works, and who gives him any necessary directions before he proceeds to his work – The working place reached, work will then go on until 10 o'clock when as a rule he will take twenty minutes for his lunch, then will work on again until 1 o'clock, when at least twenty minutes will be taken for his dinner – Again work will be resumed until about a quarter to four, when if everything is all right at the face, work will cease and the collier will be wending his way out. On the other hand if anything calls for his attention, as frequently happens – a piece of top requires wedging, a pair of timber or some post requires standing – and this frequently necessitates his staying in the work place a quarter or half an hour, sometimes an hour after the regular time for ceasing work in his working place.[42]

The methods of the manual mining of coal changed very little over the period. However, this work was organized in two quite different ways which have interested students of organization and influenced structures of production and management, such as currently the concept of empowerment in activities as diverse as high-technology engineering and financial services, to the present day.

The structure of work at the coal face

The two fundamental types of organization supporting the basic task of hewing were pillar and stall and longwall. In the north-east the dominant method was longwall and in the Ebbw valleys and the rest of south Wales until about 1870 pillar and stall was much more common. T. Dyne Steele, a colliery manager in Abertillery in 1866, summarized the position with some irritation:

> Collieries were opened on the seam near Abertillery many years ago and Pillar and Stall was of course the system of working adopted; no other was known in the district. From the nature of the roof and the tenderness of the coal much waste and loss of coal was the result.[43]

This debate involved the two basic and often opposing prerequisites of safety and profit, so a very short description of these processes may be useful. They lay at the foundations of the management and labour relations of the mining industry. There were variations, but with pillar and stall, as the coal was cut and the face advanced, pillars of coal were left intact to support the roof. The area of the pillars depended on the fragility of the roof and floor but could be as large as the stalls which were cut to obtain the coal. The longwall system removed all the coal at the same time; as the colliers moved forward they filled in behind them with the waste – 'the gob' as it was called. There

were two economic disadvantages to pillar and stall. The first was the waste of the pillars, which could amount to 40 per cent of extractable coal.[44] When the pillars were left to be extracted later, squeeze would often reduce valuable large coal to a much less valuable small coal. This disadvantage could be stark. In a paper given by Bassett to his fellow mining engineers in 1863, a comparison between seams of just over 3 feet in the Mynyddislwyn seam worked by pillar and stall and a comparative seam in Somerset worked by longwall showed a loss in Somerset of 2.14–6.4 per cent and in Mynyddislwyn of between 30.4 and 34.09 per cent.[45] This was a massive competitive disadvantage which would drop immediately to the bottom of the trading account and chop savagely at the margins. The second difficulty was thought by some to be safety, because of the more ready accumulation of gas in the recesses of the pillars and stalls. Opposing this perception it was sometimes judged that the pillars were the best method of holding up the roof. Nasmyth lecturing his peers in 1863 was adamant in his defence of pillar and stall: 'none (other system) has yet come under my observation that I would conscientiously recommend for the safety of workmen'.[46] There were frequent, almost nostalgic, references to the safer levels where pillar and stall had been, and remained, the monopoly structure and the costs of timber were far smaller:

> In the shallow pits that were worked up to thirty years ago there was not the amount of 'squeeze' not the amount of 'creep' and 'crush'. Stalls were worked on the Pillar and Stall method; the roof was very much better – I would say there was not one tenth the timber necessary as compared with today.[47]

By the 1880s the debate had lost its edge: the issue increasingly was to decide when pillar and stall should be used as a subsidiary method. Increasingly, longwall was seen as safer, easier to supervise and more productive.

But whilst pillar and stall became less used, one aspect of its structure remained. This was the enlarged and enriched job of the hewer and his butty in south Wales and their comparative independence from supervision, compared with the north-east of England. Jevons noted that, in south Wales, 'Hewers had to repair the roads and cut bottom and stand timber and keep the whole of their place in safe working order and their working place could extend back for fifty yards'.[48] The opinion as to the effectiveness of this amount of autonomy was, however, divided. William Thomas, a mining engineer in the Ebbw valley, noted that the north country method of timbering would be impossible to implement in Monmouthshire as a man 'must always be ready with his post to defend himself' because of the fragility of the roof.[49] In south Wales, it seemed, the collier was in a personal war with coal. George Elliot saw the matter quite differently:

> For every 500,000 tons of coal worked in Northumberland and Durham there are by the falling of the roofs and coal which have to be propped up to 1.3 lives lost –

> in south Wales there are 3.2 lives lost – In Durham we have persons of skill and character selected for a duty which requires judgement and experience, namely to ascertain the condition of the roof, and they are appointed to go round and have charge of the places and they put in the timber and really are responsible for the safety of the men. Now in Wales the men do it all for themselves.[50]

This autonomy was reflected in the pace of work, safety, the shift system recruitment of family and separation, as far as job succession was concerned, from the closely associated job of hauling. The single shift remained in operation after its general abandonment by miners in the rest of the UK and this was partly due to the objection of sharing of work places as well as the dislike of night work. As late as 1907 it was thought impossible to get the men to work three shifts because of their strong objection to double shifts.[51] This situation was designed for conflict within the pit and perhaps partly explains the slow growth of unionism in south Wales and the splintered nature of the strike weapon.

The manual method of hewing coal intrinsically gave little opportunity for improvement. The coal was undercut and then brought down. In the Ebbw it would often fall down because of its friability. It was a skilled, unchanging and intensely arduous task at the apex of mining life. However, the supporting tasks, even those which were manual, changed in two primary ways. Hauling evolved from a task often performed by children and women who dragged skips without wheels to a much more horse-drawn, and, from about 1900, mechanically aided activity. It was a change forced by legislation and scale. As pits became larger and larger they had to be made much more accessible to the horse and the conveyor. At the time of the Abercarn explosion of 1878 there were fifteen miles of workings in the pit. It would have required an army of children to haul coal from the face to the shaft bottom. The operating technologies of pumping and ventilating changed from gravity drainage and the furnace, at the beginning of the deep pit era, to extremely powerful pumps and fans. It was again a change forced by a massive increase in scale and made accessible by improvements in technology.

Hauling

In 1842 hauling was by unassisted child labour whose occupation was to drag the skips of coal from the working place to the main road. Some of these seams did not exceed 18 inches. The evidence from the Risca colliery was explicit, describing children of eleven drawing weights of up to one hundredweight 300 yards.[52] The children were very young and very cheap, compensating in part for the waste of pillar and stall. Typically, in response to

questions, William Skidmore, a collier of Mynyddislwyn, replied, 'I do not know how old I am; father thinks I am 8 years. Do not know when I first went to work, it is a long time since.'[53] In Monmouthshire in the early 1840s there were 154 under-thirteen year olds, and 302 between the ages of thirteen to eighteen employed for every 1,000 adults – just over 45 per cent.[54] Up to 1842 coal and particularly hauling was an industry dominated by children and adolescents. By 1914 this situation had changed in that no women were employed underground and no children were employed until they were fourteen years of age.

As noted earlier, scale must have influenced the decline of child labour as well as increasing distaste. Once prospecting, boring and sinking had been completed, the laying out of roadways and the haulage of coal to the pit bottom was an enormous task in a deep mine and very expensive in its use of timber. The fifteen miles of workings in the Ebbw Vale collieries were supported by thousands of pit props and by 1907 were using 1,000 tons a week of pit prop timber.[55] In the South Celynen colliery working places could be almost 2 miles from the pit bottom, increasing the use of mechanical haulage in tandem with horses.[56] At the Victoria colliery there were thirty miles of ropes driven by steam and electricity supplementing the work of 400 horses.[57] These horses were not always well treated: at the Lancaster pits at Abertillery, the ostler, F. L. Davis, stated in his evidence to the 1907 inquiry, 'Now I have only touched one place of cruelty, namely overworking them.'[58]

Pumping and ventilating

Water and gas were to prove expensive problems and there was never certainty as to their extent. Methods of preventing water entering the shaft were already in use in the 1830s and cast iron had been substituted for wooden planking for the purpose of lining the shaft. By the 1900s the problem was of massive proportions. When the North Celynen was sunk in 1913:

> A feeder was encountered at a depth of 53 yards yielding 7,000 gallons of water per hour. Another was met a depth of 59 yards yielding 9,000 gallons per hour; a third at a depth of 110 yards producing 20,000 gallons per hour and a fourth at a distance of 287 yards yielding 1,000 gallons per hour.[59]

The problem seems to have been endemic in the valley for in the north the Ebbw Vale collieries pumped a total of 1,072,000,000 gallons annually.[60] Only an advanced hydraulic technology could cope with such a scale. The underground pumps at the South Celynen colliery were able to pump 20,000 gallons per hour.[61] Pumping was usually done from the surface until the late

nineteenth century, when it was transferred underground so as to make a direct connection to the pumps.

The danger of explosion was both economic and human and much of the technical progress of these years was devoted to the improvement of ventilation. There was probably no artificial ventilation in any level in 1780. Furnaces, the most primitive and long-lasting method, were not much use in shallow workings. The effectiveness of ventilation depended partly on the method of working and mainly the system of coursing air through a pit. There were three basic methods: natural, the furnace and the ventilating fan. The problem was choke and/or firedamp. The former deprives air of oxygen and therefore suffocates; the latter is a methane-based gas which is highly volatile above a certain concentration, particularly if mixed with coal dust. Firedamp was the primary problem in the Ebbw. In 1842 the inspectors reported very pessimistically on the Mynyddislwyn levels.[62] Matters did not seem to improve, as Kenyon Blackwell, one of the inspectors, reported in 1850.[63] But there was hope, until the early 1850s, that ventilation by natural means would prove sufficient. Thus at the Red Ash pit at Abercarn:

> So clear and direct is the driftway for the passage of air through the workings from the downcast to the up shaft that all necessity for artificial working is unnecessary. The heat of the mine by rarifying the air, causes a smart current of dense and cold air to enter the pit by the downward shaft – and is abundantly sufficient.[64]

Before the development of the fan in the 1850s the furnace was certainly the favoured method for circulating air. However, by that date, the Ebbw valleys seems to have become a location for innovation in the development of mechanical fans. One of the first was introduced at Abercarn by Nasmyth in 1853–4 with a diameter of 13fi feet and a width of 3 feet.[65] The progress of ventilation did not, however, catch up with the increasing problem of firedamp as pits became deeper and more extensive, until after the dreadful Abercarn explosion of 1878 when 258 people lost their lives. This disaster was preceded by the Risca explosion of 1861 when 142 were killed. Ebbw Vale also seems to have suffered badly with 53 fatalities in 1856. It is not surprising that, by 1900, the Ebbw Vale company had invested considerably in colliery fans, which, by that date, were capable of blowing 300,000 cubic feet of air per minute.[66]

The range of skills and technologies in mining in the valley was considerable: from the washing away of a few feet of soil taking a couple of hours to the sinking of a deep pit with a lead time of two years. Common to ancient and modern techniques, from the naked candle to sophisticated electrical lighting, was the central and hardly changing task of the manual hewing of coal. Influencing productivity were the increasingly complex methods of

pumping and ventilating, with capital costs impossible for a level, and the sharply differing methods of the organization of work at the coal face of longwall and pillar and stall. The pace of change of these methods and activities of coal mining differed between pits and levels, companies and periods, and it is to this differentiated nature of change that this history now turns.

THE DIFFERENTIATED NATURE OF CHANGE

The growth in output and size of the mining unit was characterized by one of the most singular, even curious, changes in the processes of work in industrial history. It was distinguished by both the very lengthy continuity of some work and the dramatic change of others within the same place: the coalmine. For a short period the medieval and the modern coexisted. For good economic reasons the basic production task of hewing changed little for almost 150 years, with antecedents which were far older. In stark contrast, the supporting infrastructure of access to coal, ventilating, winding, pumping and so on, particularly from the 1840s, were revolutionized through the influence of first steam and then electricity.

A miner at the coal face of a level or even a patch of 1780 in the Ebbw and certainly one of the deep mines of the north-east of England would have been immediately at home in the level of 1914 and would have quickly adjusted to the deep mine of 1914. Very little had changed in the techniques of hewing and loading coal. His basic tools were the same – shovel, mandrel and sledge – though they were now made of steel, or tipped with steel, rather than iron. They were used in the same way. Horses were much more commonly used to transport coal from the face to the pit bottom rather than small boys, girls or women. Older boys than previously, thirteen rather than five or six years old, opened and closed the ventilation doors. A miner working in Ebbw Vale in 1900 would certainly have been familiar with water balance pits which differed little from those of 1800.[67] Ventilation by furnace was still common in the 1880s. Unlike the miners of the north of England, the Ebbw valleys miner would be more likely to be working by pillar and stall rather than longwall, though increasingly less after about 1880, and be on one shift rather than two. If in a pit, rather than a level, his work would probably be illuminated by electricity and he would certainly have a miner's lamp, which was an enormous advance on the candle and much safer. However, as late as 1883, at the Abertillery colliery of Rose Heyworth, a deputation of miners supported the board of the South Wales Colliery Company in their defence of naked lights in an area notorious for its fiery seams.[68] In nearby Cwmtillery twelve had been killed in 1857, because, as the *Monmouthshire Merlin* reported in its edition of 13 July, they were testing for gas with naked light.

In 1914 the supervisors of the coalminer could read and write, though in some cases their nomenclature had changed. The *viewers*, those technical consultants of the early coal industry, had disappeared to be replaced by a variety of experts and managers. But there were still *butties,* though now they were friends, or at least work mates, rather than gang bosses. The use of gunpowder would probably be familiar, as it was well established before 1830.[69] The early miner would, however, have been astonished at the legal requirements placed on the management of his successors. Thus, if he happened to work at the South Celynen colliery in 1905, permission had to be sought from the Home Office for blasting, though this was unusual. The reply to their request for permission from the Under Secretary, no less, stated:

> It must however be clearly understood that this letter in no way removes or lessens the several responsibilities of the Owners and Officials of the Mine under the Coal Mines Regulation Acts, the Explosives in Coal Mines Order and the special rules established for Celynen colliery.[70]

These comparatively small changes at the face over these 150 years or so, concealed the differentiated impact of technology upon coal mining. The technology supporting manual work advanced quite rapidly once the period of deep mining had commenced. Indeed, the cost disadvantages forced upon the industry of south Wales by a geology of friable coal, wet, gassy and fractured seams and the remnants of traditional working methods pressed for a compensating advantage which would reduce costs. This was obtained in the technically advanced engineering infrastructure of mining. The price advantage of high-quality coal was not enough. The industry required a high performance in methods of access to coal, ventilation and pumping, which could only be improved by the rapid implementation of new technologies, particularly electricity. It is what would be expected from sensibly alert businessmen with a long-term, reasonably profitable, but comparatively disadvantaged industry to manage. For the trading account to remain in reasonable health on the cost side of mining, there was a need for investment in those activities which would react positively to financial sustenance.

The figures illustrate this scenario. In 1912 only about 1 per cent of coal in south Wales was cut by machine, as compared with 8.6 per cent nationally. In that year there were 114 coal-cutting machines and conveyors in south Wales servicing 592,529 tons, compared to Scotland with 771 machines cutting and conveying 7,742,470 tons.[71] In Monmouthshire it was proportionally probably less than 1 per cent because of the very soft nature of much of the coal which clogged the early cutting machinery. In his evidence to the 1907 inquiry, J. F. Tallis, the manager of Ebbw Vale, noted that there was scarcely any coal-cutting machinery in Monmouthshire, 'as there was no scope for it'.[72]

But, in the total use of electricity, that prime criterion of technical advance, south Wales showed the greatest average power per mine of 3,200 hp per million tons in the 1907 census of production. The next highest was Scotland with 2,800 hp, but taking a much higher proportion of this figure for cutting machinery than south Wales.[73] The production statistics for 1912 strongly support this fundamental factor. The South Wales Coalfield was a UK leader in those production activities where it was economically sensible, to compensate for the disadvantage of having to cut coal by hand. Interestingly, by this date, the horse power per mine was much higher in Monmouthshire than Glamorgan (see Table 2.1).

Table 2.1. Summary of electricity in mines: aggregate horse power

Location	No. of mines	Surface hp	Undergrd hp	Total hp	Hp per mine
Glamorgan	200	40,212	47,510	87,722	439
Monmouth	49	28,250	25,988	54,238	1106
Scotland	290	19,014	79,343	98,357	339

Source: *Dr Atkinson's Report*, BPP XXXV (1913), 23, table 15, and 45, table 20.

However, there is a need to be wary in taking too simplistic a view of change as being deeply conservative at the face and very rapid, even adventurous, in the implementation of new technology. The following statement by Tallis, the colliery manager of the Ebbw Vale company, must rank amongst the most hidebound in the history of coal mining. When questioned on the employment of specialist electricians rather than retrained mechanics to service electrical machinery he replied: 'With all due respect to electricians we find they are better electricians than they are workmen – they know too much.'[74]

In the Ebbw valleys mining was comparatively primitive up to about 1840 because, on the supply side, coal was nearer the surface and could be extracted by level into the side of a hill rather than sinking a deep pit. On the demand side, there was not yet enough pressure to tempt change. As noted earlier, mining technology was slow in its development because there was no economic need for it to be otherwise. Productivity was high enough to generate sufficient margins for the industry to survive and often prosper, though, as will be discussed next, it suffered in comparison with many competitors. This disadvantage forced the Monmouthshire industry to be dependent on high-quality coal in order to provide enough sales to trade profitably.

PRODUCTIVITY

The objective of mining was to obtain the highest possible productivity as this factor was the most important determinant of profitability and survival. All the elements of mining so far discussed were directed to that end. The productivity of labour was the managerial imperative because wages were between 60 and 70 per cent of total working costs.[75] They were probably nearer 80 per cent before 1850 in the valley and decreased as size of unit and capital investment per miner increased to 1914. The labour costs of four Monmouthshire collieries whose managers gave evidence to the 1890 Royal Commission on Mining Royalties were between 65 and 68 per cent of total costs.[76]

Over the period 1780 to 1914 total factor productivity is impossible to calculate. Labour productivity is difficult to isolate and highly dependent on investment as well as geology. Calculations of revenue productivity are similarly problematic because of very limited data and the impossibility of separating the financial results of the iron companies which dominated the west Monmouthshire coal industry. Econometrics may give useful guidance, for national figures with large samples, but can result in an edifice of estimates.

Approximate trends, as distinct from precise statistics, for labour productivity are however reasonably authentic from 1874. This is the first date for L. J. Williams's figures and more contemporary sources based on the mineral statistics such as those of Finlay Gibson in 1922.[77] From 1831 to 1871 the estimates by Church are much less accurate but do illustrate trends.

Even so, it needs to be noted that, over the total period, productivity varied considerably between companies and pits. It was not only dependent on geology, but on less fixed factors, such as the attitude of managers and directors to safety, capital investment and changes in the market such as the rise in small coal prices relative to other prices after the 1880s. Thus the Newport Abercarn Black Vein colliery at South Celynen continually suffered from geological faults. The insistence on rigorous safety standards by Green the manager between 1878 and 1893, was also perceived as an additional hindrance, for which he was eventually dismissed by his board.[78] Conversely, the Nine Mile Point colliery, only five miles away, enjoyed superb seams and the resultant exceptional productivity when it was opened in the early 1900s. Finally, output per man shift makes for further difficulties of comparison as it was estimated that the percentage of colliers on double shift was three times higher in the other coalfields of the UK than in south Wales.[79]

With all these caveats in mind, the most accessible and appropriate measure of productivity is that of comparisons with the output per man year of the North-East Coalfield, which was its major competitor, and for a general indication the UK. The comparison between 1831 and 1871 is as shown in Table 2.2.

Table 2.2. Output per head in tons per man year: south Wales, north-east England, UK, 1831–1871

Year	S. Wales	NE	UK	Index of s. Wales production (NE = 100)	Index of s. Wales production (UK= 100)
1831	277	327	285	85	97
1841	283	323	284	72	100
1851	310	376	298	82	104
1861	326	382	301	85	108
1871	291	397	314	73	93

Source: R. Church, *History of Coal Industry*, vol. 3, *1830–1913*, 472, table 6.1.

This table indicates that, between 1831 and 1871, the productivity of the South Wales Coalfield is about average for the UK but compares poorly with the North-East Coalfield, which it lags behind by between 28 and 15 per cent. Between 1874 and 1914 a different series of figures is accessible (Table 2.3). This shows a comparison of Monmouthshire with the UK and Glamorgan and continues the low comparative output of the first table. The output of Monmouthshire per head is marginally above that of Glamorgan, except for 1914, when the positions are reversed. It continues to be well below that of the UK at the beginning and end, and marginally below in the middle of the period.

Table 2.3. Output per head in tons per man year: Monmouth, Glamorgan, UK, 1874–1914

Year	Monmouth	Glamorgan	UK	Index of Mon. production (Glam. = 100)	Index of Mon. production (UK = 100)
1874	229	223	275	103	83
1884	316	303	340	104	92
1894	276	268	285	103	97
1904	277	268	290	103	95
1914	230	243	270	95	85

Source: For Monmouthshire and Glamorgan, J. Williams, *Digest*, Coal 10; for UK, Church, *History of Coal Industry*, vol. 3, *1830–1913* 473, fig. 6.1.

These trends show that the coalfields of south Wales, including those of Monmouthshire, found it difficult to compete on productivity. The combination of work processes with the geology and topography of the valley

placed the majority of the collieries of the valley at a continual disadvantage on the mining side of the trading account. It is there that almost all the costs were concentrated. However, not all the factors of production were negative. Access to the coal seams seems to have been effective and technology was comparatively advanced. Some companies, as the dividend performance of Burnyeat and Brown will illustrate, were fortunate in having a long run of high-quality and thick-seamed coal. But work practices, from shift working to the move from pillar and stall to longwall, were difficult to change. For this product to prosper in the market place it would need to be of a very high quality in markets where there was a high and continual demand, so as to balance the high costs of production. In particular, the coal of Monmouthshire, including that of the Ebbw valley, would need to be of higher quality than coal mined elsewhere in the UK and of a comparable quality, or else marketed more effectively than that of Glamorgan as productivity was about the same. Only then would Monmouthshire be able to enjoy a reasonable trading parity with its neighbour and its national competitors. It is to this matter of marketing that we now turn.

APPENDIX

Table 2.4. Coal shipments from Newport and Cardiff, 1794–1914 (000 tons)

Year	Newport	Cardiff	Index of Newport shipments (Cardiff = 100)
1794	10*		
1804	64		
1814			
1824	375	20	1,875
1834			
1844	618	352	175
1854	641	1,047	61
1864	892	2,316	38
1874	1,056	3,770	28
1884	2,764	7,975	35
1894	3,721	12,903	29
1904	4,699	20,380	23
1914	5,459	20,244	27

*Estimate. All other figures from J. Williams, *Digest,* Coal 10. Coke and patent fuel are not included.

Table 2.5. Coal output, Monmouthshire and Glamorgan, 1874–1914 (000 tons)

Year	Monmouthshire	Glamorgan	Index of Mon. output (Glam = 100)
1874	4,227	12,264	34
1884	6,480	18,218	35
1894	8,213	23,994	34
1904	11,210	30,340	37
1914	15,016	35,847	42

Source: J. Williams, *Digest*, Coal 10.

Table 2.6. Major collieries, levels and numbers employed, Ebbw valleys, 1913

Owner	Agent and location	Name of colliery/level	Type of coal	No. employed
Banks, R. C.	R. C. Banks, Newport	W. Blaina Red Ash	House	96
Budd and Co.	R. C. Banks, Newport and Cardiff	Aberbeeg	House	265
Burnyeat Brown Co.	Watts and Co., Cardiff	Nine Mile Point	Steam and manufacturing	2,105
Coalbrookvale Coal Co.	D. L. Flack, Cardiff	Coalbrookvale Deep Pit and Drift	Coking, manufacturing steam	35
Ebbw Vale Steel, Iron and Coal Co.	T Beynon, Newport, Cardiff and London	Abercarn Prince of Wales and No. 5 Pit	Steam	1,197
		Cwmcarn	Steam	148
		Graig Fawr	House	184
		Marine No. 1	Coking and Steam	923
		Marine No. 2	Coking and steam	1,484
		Victoria	Coking and steam	436
		Waunlwydd 1	Coking and steam	1,059
		Waunlwydd 2	Coking and steam	1,450
James and Emmanuel	A. E. Jones, Newport	Llandavel	House	66
Jones and Co.	S. Jones, Nantyglo	California	House	120
Lancaster and Co.	Wolstenhom, Newport	Arial Griffin	Steam	
		S Aberbeeg		1,884
		Griffin 2 and 3 Blaina	Coking, house manufacturing, steam	1,832
		Henwain Blaina	Steam	1,368
Lancaster Steam Coal Collieries	F. W. Brice, Cardiff, and G. W. Lancaster, London	Cwmtillery 1 and 2 Rose Heyworth	Coking, house manufacturing steam	2,986
Millbrook Colliery Co.	A. E. Jones, Newport	Millbrook Crumlin	House	35
Mon and Cwm Colliery Co.	R. Stanfield, Newport	Cwm N and S Levels	House	59
Morris David	D. Morris, Ebbw Vale	Ganister	House	26
Newport, Abercarn Black Vein Steam Coal Co.	T. Beynon and Co., London, Newport, Cardiff	Celynen	Coking and steam	1,670

Table 2.6 (continued)

Owner	Agent and location	Name of colliery/level	Type of coal	No. employed
Partridge Jones and Co.	F. A. Smith, Newport	Llanhilleth	Steam	1,899
Powells Tillery Steam Coal Co.	F. J. Dawson, Cardiff	Tillery, Gray and Vivian Abertillery	Coking, manufacturing, steam	2,777
Salt Thomas	T. Salt, Abertillery	Arral and Rhiw	House	28
Twyn Gwyn Colliery Co.	Harry Griffiths, Pontypool	Cwmdows and Twyn Gwyn Newbridge	House	63
United National Collieries	Watts, Watts and Co. Cardiff	Risca Old Black Vein	Steam	1,717
Waen Nantyglo	J. L. Smith, Cardiff	Waen Nantyglo	House	103
Lewis, Rees	Brynmawr	Yard Level	House	12
Total employed				**26,007**

Note on output: In addition to these 26,007 employees there were another 500, say, employed in small levels. Estimating an output per miner of 230 (Table 2.3) and multiplying by 26,507 gives a total of 6,096,610 tons. This figure is approximately 41 per cent of the 1914 output for Monmouthshire of 15,016,000 tons.
Source: *South Wales Coal Annual* (1913).

3

The coal industry: marketing and financial performance

INTRODUCTION

The sale of the coal of the valley for a comparatively high price was vital to ensure profitable trading. This was the only way of compensating for the disadvantage of low productivity concentrated on the mining side of the trading account. Indeed, not only the prosperity but the survival of the coal companies depended on the price for their product being high enough to meet the considerable costs and risks of deep mining compared with those of the early level-based industry, the development of sufficient margins to pay dividends, and, when possible, to build reserves to guard against the problems of faulting in the coal seams and of disasters. This high price was achieved throughout almost all of this period by effective marketing which supported the natural advantage of high-quality coal.

There are two difficulties with the subject of this chapter. The first are the conceptual problems involved with marketing, as distinct from other industrial functions such as mining, finance or industrial relations and related subjects such as demography and education. The second is the comparative paucity of information on the marketing of coal.

The conceptual issue makes it difficult to build upon previous studies. The academic study of marketing in business schools and faculties of economic history has changed markedly over the past fifty years, with a branching into two different conventions. The treatment of marketing by historians is far less standard than that of business schools. Indeed, it is difficult to discern any stated conventions in their studies of this subject. Conversely, the study of marketing by business school academics has adopted, for over thirty years, the stated and increasingly standard components of product, price, place and promotion. The definition of these components includes many issues which are as fundamental to the marketing of coal as to any other commodity or service. The product includes features and quality; that of price includes discounts; promotion includes public relations; while place includes type of transportation. Much of the research and teaching of marketing academics is based on this concept (see Model 2).

This study attempts to resolve this conceptual inconsistency in the history of the coal industry by interrogating the research data of this chapter with the marketing concept of the business academic, using their model as a map to plot the course of this study.

Model 2

Marketing Concepts

There are several core concepts which are standardized almost completely in the academic marketing literature. The key and appropriate concept for the purposes of this history is the 'Marketing Mix'. This consists of Product, Price, Promotion and Place. Service is sometimes discussed separately. Selling is included within marketing. The management of marketing is defined as:

> The process of planning and executing the concept, pricing, and distribution of ideas, goods, and services, to create exchanges that satisfy individual and organizational needs.

The Marketing Mix

Product	*Price*
Product variety *(Steam, Bituminous)*	List price *(High)*
Quality *(High)*	Discounts *(Transfer Price)*
Design	Allowances
Features *(Hard, clean)*	Payment period *(variable)*
Brand name *(Best Mon, Welsh)*	Credit terms *(competitive)*
Packaging	
Sizes *(Large, Beans, Nuts, Duff)*	
Services	
Warranties	
Returns.	
Promotion	*Place*
Sales promotion *(Admiralty List)*	Channels *(Mixed)*
Advertising *(Trade Journals*)	Coverage *(Broad)*
Sales force *(Director level)*	Assortments *(with Anthracite)*
Public relations *(Include Parliament*)	Location *(Domestic, abroad*)
Direct marketing *(Railways*)	Inventory *(Low)*
	Transport *(GWR, sea, coast)*

Source: Philip Kotler, *Marketing Management* (New York: Prentice Hall, 1997).
Note: Ebbw valley examples developed in this study are in brackets.

The three elements of this concept to be discussed in this chapter are the product, the price and a combination of some of the components of promotion and place, particularly the issue of market segmentation.

The second issue of the paucity of primary information is a bigger problem. There are national and local statistics of output but very few sale contracts. There is a richness of primary material dealing with the organization of a colliery and the roles of its workers, but very little information dealing with the sales offices and no information on the Monmouthshire sales offices. The most important family involved in the marketing of Ebbw valleys coal was that of Beynon, based at Newport, of which there are no extant records. The firm was established in Newport in the early 1840s and developed its base through marriage with the Corys and directorships of the Abercarn and Black Vein and the Ebbw Vale Iron Steel and Coal Company. Further, apart from the South Wales Institute of Engineers, there seems to have been no social relationship based upon business curiosity and invention like the Lunar Society of the Midlands, whose records would perhaps tangentially inform the historian on the seeking and sustaining of markets. The activities of Powell, the founder of the great coal company Powell Duffryn, are the best known, but after an early start at Aberbeeg he spent little time in the valley.

The differentiation of the product and competition between regions is fairly well documented. However, apart from the evidence to the Royal Commission on Coal Supplies of 1905, there is little information which describes the comparative marketing of local companies.[1] Prices are more readily available but often, at least in Monmouthshire, from about 1860 onwards, for the purpose of industrial relations as distinct from sales and thus not fully engaging competitive pricing. In Monmouthshire these obstacles to understanding are made even more difficult, compared with single primary-product valleys, particularly the Rhondda, because of the integrated nature of most of the largest companies until about 1890. These included the iron and steel companies at Ebbw Vale and Blaenavon to the end of the period, the companies at Blaina and Nantyglo to the early 1870s, and at Tredegar and Rhymney until about 1890. In these businesses, strategic decisions about coal were involved with strategic decisions about iron. This almost complete absence of primary material on the organization of marketing is such a difficulty that I have decided not to discuss this topic, as this would only duplicate the work by Walters on the marketing of the steam coal of south Wales, particularly Glamorgan.[2] As will be seen, Monmouthshire was quite different from Glamorgan in the distribution of its coal to its customers, and, less so, but still markedly, in the segmentation of its market.

This is not to infer that marketing was unimportant to the industrialist or economic and social theorist of this period. It was, indeed, central. Adam Smith's representation of consumption as the sole end and purpose of production was a description of what has become known, in recent years, as

'the marketing concept'. Industrialists were only too aware that their short-term profitability and long-term survival depended upon the matching of their firm's capabilities with their customer wants in an environment over which they usually had little control.

The question of financial performance has similar difficulties, for to engage the slippery concept of nineteenth-century profitability for the western Monmouthshire coalfield is impossible from available data. There are only two reasonable guides and both are engaged in this chapter. First, there are dividends as a direct measurement of financial health, but these only from the early 1870s with the publication of the *Stock Exchange Year Book*. Secondly, there is the very occasional newspaper report on the annual results. With these caveats in mind, this study begins with a discussion of the product: coal.

THE PRODUCT: THE COAL OF THE EBBW VALLEY

Coal was in the business of energy. Indeed, in terms of the market, the product for sale is best perceived not as coal, but as a form of energy. This was the driving force of the industrial revolution in its diverse forms, from steam power to new and radical forms of chemical reaction. The commercial history of coal is that of each coal-mining region and company optimizing its specific product advantages in the market for energy. For coal was a complex product categorized by geological type, the characteristics of its use and its bulk.

Of the three basic types of coal, the Ebbw valleys was rich in both steam and bituminous but was too far east for anthracite. In their properties as well as their location, steam and bituminous, in the valley as elsewhere, pass by almost imperceptible gradations one into another. But, in general, the bituminous variety, particularly prior to 1840, was more commonly mined in the south of the valley below Aberbeeg and nearer the surface, while the steam coal was more prevalent in the northern area at the surface and deeper. Sometimes both types of coal named by some contemporaries as Red and White Ash coal would be mined adjacently, as at Abercarn in 1850. Thus, on his visit to Abercarn, in that year, the *Morning Chronicle* reporter wrote of a Rock Vein pit where Red Ash coal was raised at a depth of 210 feet and a White Ash steam coal pit at 420 feet.[3]

The government geologists described this differentiation caused by the depth of the seams and their location to the east or west of the coalfield as a law:

> They (the coals), contain more of that ingredient (Bituminous), in this county than in Glamorgan, and are regarded as intermediate between house coals and smokeless steam coals. The loss of the bituminous constituent both in a downward and horizontally in a westward direction, is in accordance with a law which holds good throughout the south Wales coalfield.[4]

Bituminous coal is particularly suited to domestic use because it is the most easily ignited and burns well in open grates. This was a great advantage in the burgeoning domestic market of the early nineteenth century. Steam coal, whilst being only slightly less suitable for domestic use, has a higher carbon content than other coals and thus gives off more heat. This gave it an advantage in the smelting of iron before the invention of hot blast in 1828.

The consistency of the product characteristics of coal may be seen from the official reports and mining textbooks such as those of Joshua Richardson in 1865 and the *Regional Survey Report* of 1946. They confirm the uniformity of the product over the history of the coalfield.[5] By the 1900s the trade journals classed coal as to its broad use – coking, gas, household, manufacturing and steam and small coal – and the grades – nuts, peas, beans and duff – obtained by screening. The duff was increasingly used for the making of patent fuel. The Ebbw valleys coals divided by use, colliery and company are shown in Table 2.6. The major factors influencing the operation of the market were seam and location, and these established increasingly tighter product criteria.

SEAM AND LOCATION

An example of different coals from 1924 are shown in Table 3.1. The three Monmouthshire coals, Powell's Tillery, Powell's Navigation and Abercarn Black Vein, differ little, but all show a considerable difference in the percentage of fixed carbon to Crawshay's Cyfarthfa Merthyr, a premier coal on the Admiralty List. This seeming detail would have been vital in the operation of the market on which the very survival of collieries would have depended. The 'Best Admiralty Smokeless Steam Coal' of Crawshay's of Merthyr was clearly differentiated from the Ebbw valleys coal by its very high percentage of fixed carbon and smokeless characteristic. These were two intrinsic product advantages of considerable benefit in denying entry to competitors to the top end of the coal market.

There seems to have been an increasing differentiation of south Wales coal from about 1900. By 1909 Monmouthshire coals were categorized in the trade journals by both company and county.[6] By this date they were also mixing coal. If coals were apt to be smoky, as were the Monmouthshire coals, then they could be mixed with other coals which were smokeless, but did not ignite as well. The mixing was increasingly scientific:

> Keen competition on the part of enterprising middlemen, aided by the natural desires of foreign coal importers to secure their supplies on the most advantageous terms, has brought about at all south Wales ports, the daily practice of mixing, at the time of shipment (This), is not an easy matter, and cannot be done satisfactorily by the kindergarten methods of the average coal exporter. In this matter the consumer would derive considerable benefit if the expert

Table 3.1. Chemical analysis of Ebbw valleys coals compared with Crawshay's Admiralty

Coal type	Class	% fixed carbon	% volatile matter	% moisture	% ash	% sulphur
Powell's Tillery	S, H, M, G	67.35	27.5	0.7	4.45	0.81
Powell's Navigation	S, H, M, G	63.6	30.2	1.06	5.15	0.82
Abercarn Black Vein	S, H, M, G	67.51	26.84	0.80	4.85	0.83
Crawshay's Best Cyfarthfa Admiralty Merthyr Smokeless Steam		81.09	13.22	0.77	4.92	0.81

S = steam, H = house, M = manufacturing, G = gas.
Source: J. V. Elsden and J. Griffith, *Analysis of British Coal and Coking* (London: Colliery Guardian Company, 1924).

analytical chemist was consulted regarding the composition and blending of his supplies.[7]

By 1918 *The Newport Trade Directory* was more precise and classed the Monmouthshire coals as 'Best Monmouthshire Black Veins, Western Valleys, Eastern Valleys – best classes Eastern Valleys – other sorts' and clearly graded Ebbw valleys coals as superior to those from the Afon Llwyd.[8]

The agents advertised their coals by colliery company. Beynon's, the premier Newport agent, advertised in *The Newport Year Book* of 1917: steam coals from Ebbw Vale, Newport Abercarn Black Vein, Abercarn, Griffin Nantyglo, Powell's Tillery and Powell's Navigation. The Tredegar Iron and Coal Company responded with eight steam coals from Tredegar alone, including Tredegar Large Steam and Tredegar Foundry Coke.[9]

Much of the household coal was mined by drift. Small companies such as the Twyn Gwyn Colliery Company in Newbridge employing thirty-seven people and the Rhiw Colbren Colliery Company in Abertillery with thirty-one employees continued the coastwise trade established for over 100 years as well as supplying local domestic needs.[10] Thus, in the 1913 list, almost all the household coal came from levels employing less than 100 people. Much of this came from the old Mynyddislwyn seam top coal, which was classed as second in quality to the Maesteg coal for this purpose.[11]

However, in order to establish a continuity of both large contracts and advantageous prices, it was useful for a coal to possess a physical

characteristic which gave it supremacy in at least one sector of the vast and increasingly differentiated, international and national market. As noted earlier, a high percentage of carbon was an advantage in the coals of the northern valley, in the smelting of iron ore particularly before 1830. The ability of Ebbw valleys coke to carry a heavy burden of iron ore during smelting was another asset. But the unique competitive advantage of the coals of the valley seems to have been their facility for storage. In this regard they were stated by the shippers of south Wales to be the supreme coals in the United Kingdom:

> The Monmouthshire coals, especially the true Black Veins are very large, hard and clean, and are specially suitable for shipment to either very hot or very cold climates, as they have a greater power than any other coals of resisting climatic influences without disintegration or deterioration.[12]

The coal of the Ebbw valleys was, then, a multi-purpose coal of high general quality, selling into a well informed and increasingly discerning market. It gave superb storage quality, was first class for domestic purposes and very good for the smelting of iron ore and the manufacture of ferrous products. It was not as good as those of the Rhondda and Merthyr for steam raising, but better than those of its national competitor in the north-east and its local competitor in the eastern valley.

PLACE AND PROMOTION: THE MARKET AND ITS SEGMENTATION

The coal market of the Ebbw valleys and, indeed, every other coal-producing location, was based on one international factor which was as fundamental as the influence of geology on the mining side of the trading account. From 1780 to 1914 there was very little primary energy competition from alternatives. Oil did not begin to be used until about 1880 and did not finally overtake coal until about 1960, whilst coal overtook wood about 1870 and in the industrial markets of the world long before that date.

Within this astonishing ascendancy between 1780 and 1914 the high quality of Ebbw valleys coal was continually balanced against other factors such as location, changing uses and advances in technology. Throughout the period, as one use or advantage declined, another was ready to take its place. When the development of hot blast in the late 1820s considerably reduced the amount of coal required for the smelting of iron ore, the use of steam power was accelerating. When the market became much more international, national and competitive, expansion in these markets far outweighed any potential loss in competitiveness. The fairly constant factor in this dynamic mix was the product. But even this changed, as different seams with different chemical and physical characteristics were brought into production, particularly when

deep mining started to increase its hold from about 1835, thus increasing the proportion of steam to house coal mined in the valley.

The coal of the Ebbw valleys competed effectively in these markets because of two advantages. First, until 1830, Cardiff, its major competitor, suffered from a swingeing duty on coal exported to the Severn and Bristol Channel ports from which Newport was exempt. Secondly, the Ebbw valleys was a premier iron and steel centre. This local and very large customer for coal increased proportionally in importance to 1914 and did not follow the general pattern of the south Wales industry. The major disadvantage was their closeness to the Glamorgan coal valleys. This resulted in Monmouthshire shadowing Glamorgan in the dramatic increase of its export trade, with the coal managers and owners often perceiving their product to be less ably marketed than that of their neighbour. These advantages and disadvantages were played out in four reasonably distinct markets: local, regional, national and international.

The local and regional market

For about the first forty years of the nineteenth century, the growth of the United Kingdom coal trade was restricted to a mainly local and regional market. Both widespread supply and, in south Wales, a highly confining canal system imposed such a market. Coal rarely travelled more than sixty miles from its source, though there were important exceptions such as the ancient Newcastle trade with London and the Welsh trade with Ireland.

Principal competitors for use as domestic fuel were peat and wood, but it is unlikely that these would have been used much in the larger urban areas, though Morris and Williams write that they were common in north Brecon up to 1850.[13] Charcoal and water, those ancient industrial competitors, were more tenacious. Charcoal continued to be used in the manufacture of tinplate until the end of the century. As late as 1840, 300 tons of charcoal bloom was auctioned at Crumlin.[14] Its demise was hastened by the successful application of steel to tinplate making in 1876.[15] Water power was possibly even more successful. By 1886, of the 386 tinplate mills operating in the trade, 46 continued to rely on water for their motive power.[16]

But these energy sources were unable to compete seriously with the ubiquity and efficiency of coal and were overwhelmed in most markets as early as 1800, with the local and regional market dividing into three main segments. These were the local manufacture of iron and iron products, the local and Severn valley market for domestic fuel and some secondary industrial use.

Local coal for the smelting of iron ore and manufacture of iron and steel products retained its monopoly throughout the period. Both proximity and

excellent suitability for use kept competitors out of these markets. This advantage continued throughout the period. In 1903 John Eeles, the commercial agent for John Lancaster, stated that the majority of Monmouthshire coal, including house coal, was very suitable for converting into coke for blast furnace purposes.[17] As the local iron ore became depleted, this proximity to smelting became crucial in the location of works producing iron and steel. This industry used 43 per cent of the total coal produced in south Wales, falling to about 10 per cent after 1870 and continuing at this level to 1914.[18] In the Ebbw valleys the percentage was certainly higher, particularly from the late 1860s. From that date the Ebbw Vale company started to dominate the Welsh industry, culminating in 1913 with about one-third of the Welsh production of pig iron.[19] Around this company clustered one of the heaviest concentrations of tinplate manufacture in south Wales, with works stretching from Ebbw Vale to Rogerstone. There was some diminution of this trend over the period, for between 1817 and 1881 improved furnace efficiency reduced the amount of coal needed to make 1 ton of pig iron from 5.8 to 1.1 tons.[20]

The second market segment was regional and was dependent on the monopoly of sale coal shipped east of the Holms, two islands in the Bristol Channel from 1780 to 1830. This advantage was based on a highly advantageous exemption from duty. Until the development of the railways, whoever controlled water transport held the regional markets. The problem of defining when a river becomes the coast rather than an estuary, on which the legality partly rested, does not seem to have applied very much to this trade. Anything shipped east of the Holms was free from duty, though there was some uncertainty about the Bridgwater trade. A major sector of the regional market was domestic and this was probably the prime use for the high-quality bituminous level mined coal sent to the ports of the West Country. It was of a much higher quality than the competitive supplies of Somerset and the Forest of Dean. There is some evidence that sales outlets in this regional market were established before the sinking of pits. The Abercarn and Gwythen Company who purchased a colliery from Alfreys in 1848, 'Already possess coalyards in Crediton, Cullompton, Wellington, Taunton and Bridgwater – immediately contiguous to the line of the Bristol and Exeter Railway'.[21]

The segmentation of the Ebbw coal before the development of the export trade and railways is difficult to estimate as evidence is scant. At the beginning of the period in 1809, the distribution was approximately as shown in Table 3.2. The receiving ports of the coastwise trade were mainly Bristol, Bridgwater, Gloucester and Chepstow. Bassett estimated the proportional division in the late 1820s: 'The shipments to Bridgwater were about 140,000 tons, Bristol 180,000 tons, Gloucester 80,000 tons and Chepstow 30–35,000 tons per annum'.[22]

The coastwise trade continued after 1830, increasing from 420,964 tons in 1828 to a peak of 1,144,000 tons in 1892, and then decreased to 719,000 tons in

Table 3.2. Market segmentation of Monmouthshire coal, 1809

Use	000 tons	% total use
Iron smelting	242	53
To Newport	185	41
Other uses in valley	25	6
Total	452	100

Source: calculated from *Report of Commissioners Relating to Coal*, BPP XVIII (1871), 49 (footnote), 50 (para 1).

1914. At Newport the coastwise trade was a higher proportion of total shipping than foreign trade as late as 1879, though by the end of the period it had declined to 15 per cent of total shipping (Table 3.7).

This market seems to have been more divided than the industrial. This factor encouraged easier entry and explains the large number of small producers and shippers. In one week in June 1839 eight shippers were recorded. They varied in size, from Anne Rees with 140 tons to the Newport Coal Company, which marketed the coal of numerous companies with 4,122 tons.[23] By 1848, twenty shippers were transporting their coal down the valley to Newport, of which about a third were sending under 50 tons a week.[24]

The local market of the valley and Newport would have fuelled nearby works like brick, gas and brewing, particularly after the start of municipal gas lighting in the 1820s. As late as 1850, such enterprises were small in the valley, though growing in scale in Newport. The largest brewery in the valley at Aberbeeg only employed five at the 1851 census.[25] Brickworks, despite the rapid increase in housing, competed with locally quarried stone which used no fuel. Steam power was into its stride by 1800, consuming about one-tenth of the country's total demand, but it was not of much utility in drift mines, though increasingly it was in ironworks.

Up to 1850, the fastest growing market at the national level came from accelerating industrial demand. There is no record, apart from a small development at Risca and the iron and steel industry, that Monmouthshire shared much in this trade. Copper and tin were Swansea markets. There were no local consumers like the great Scottish salt industry which lasted until the removal of duty in 1825, or pottery which was the monopoly of the Staffordshire coalfield.

Newport, as long as its three markets of regional sale coal, iron ore imports and finished iron products were expanding, had little need to export coal. This must have delayed the development of the docks when the international market for steam coal began about 1850. Even with the extension of 1858, they provided only about 12 acres of water, compared almost 20 acres at Cardiff. In 1850 coal exports as a proportion of production in south Wales were 4 per cent, twenty years later they were 23 per cent, rising to 46 per cent in 1890 and

57 per cent by 1913. However, though care must be taken not to confuse exports from Newport with exports of Monmouthshire, the export performance of Newport was quite different from that of Cardiff. This issue will be discussed in some detail later but it is enough to note, at this juncture, that from about 1880 to 1914 the GWR carried more coal away from the mining valleys of Monmouthshire than that processed by Newport in its export and coastwise trade combined (Table 3.7).

The national and international market

The national and international advantage was to be found in the comparative efficiency of the coal of south Wales in the raising of steam for transport by sea and rail. In these two markets Monmouthshire coals shadowed those of Glamorgan in the export market, established a stronger trade in the proportion of coal carried from the county by rail and developed a specific niche in the rail locomotion trade.

But, first, coal finally established its role as the leader in the energy business by disposing of the remnants of some antique competitors. In shipping, coal was in competition with wind and sail, which were slow to relinquish their hold. As late as 1828, the Admiralty was suspicious of steam, though this was soon to change.[26] By 1865 the gross tonnage of United Kingdom steam shipping exceeded sail and the dominance of coal was established to 1914 and beyond. The warnings of impending change at the end of the period were sounded locally in the *South Wales Times* of 10 January 1902, following the oil trials of the Royal Navy. But it was thought that 'there was very little likelihood that oil will ever supersede coal altogether'. There was some justification for their optimism as by 1913 coal still supplied over 96 per cent of the fuel for shipping.

The most powerful signal of approval for reform came from that one-time laggard in the energy market, the Royal Navy. This marine was agreed by others, both at home and abroad, as the undisputed market leader of the nineteenth-century international energy trade. Their trials of 1845, in which Welsh coal was very successful, differentiated these coals qualitatively from their competitors.

The triumph of Welsh coal, and it was nothing less, was based on the criterion of distinctive capability as defined by the Admiralty. Their List, which may be seen as an archetype of the Victorian fascination with tabulation, established a dramatic change in the definition of coal, transforming it into a much more sophisticated product.

Coal became a product for specific use when it was scientifically analysed and categorized according to its efficiency in the raising of steam. Marketing, not only of coal, had made its first step into the independently and

prestigiously assessed league table of suppliers of products and services. There is no more powerful marketing method for the determination of winners and losers. The British Merchant Marine and navies of other countries found no necessity to hold their own trials.

From these tests it emerged that the best Welsh coal was at the top of the table and these included the coals of the Ebbw valleys. True, of the top five, the coal of Ebbw Vale was more smoky than that of Merthyr, but its evaporative power was about 10 per cent higher than that of the nearest competitor from Newcastle.[27] It gave off less smoke than others, which was a considerable advantage, if creeping up on, say, an unwary Chinese junk; it had the highest evaporative power, which was vital for speed and storage space, and both lit and blew up steam rapidly, which was basic for acceleration.

These coals now possessed a powerful advantage: an agreed formalized quality and resulting price premium which compensated for low levels of productivity. A more potent blessing in the history of marketing does not come readily to mind. Concurrently, coal became a nationally and internationally competitive product when railways and steamships developed to transport this bulky mineral easily from one place to another. In 1848 the Abercarn coal was placed on the Admiralty List.[28] By 1876 eleven Monmouthshire coals were listed, including those of Tredegar, Janes Tillery, Abercarn and Risca. It was not a static list and on the Admiralty List of 1903 supplied by the director of navy contracts there were no Monmouthshire coals.[29] In terms of the UK, and much more so of south Wales, the coalfield including that of the Ebbw valleys had become, in the language of marketing, a massive 'cash cow' which was to be milked for over sixty years and was to have a dramatic effect on the development of other industries.

The Ebbw valleys coals seem to have made their first considerable success in shipping rather than railways. The Risca collieries of John Russell were dealing with the West Indian Mail Royal Steam Packet Company in 1841 to supply 72,000 tons of coal annually.[30] Notably, this company was the biggest contributor by far to their disaster fund of 1846 with a donation of £100. Earlier, in 1839, the Tredegar Iron and Coal Company in the Sirhowy valley had supplied *The Great Western* for its maiden and subsequent voyages across the Atlantic. The importance of this contract was so considerable that the Tredegar firm was impelled to advertise their status as sole suppliers supported by a letter from the managing director of the Great Western: 'We have never purchased from any other company in Newport – Tredegar coal is superior to any we have ever used.'[31] Their major local competitor seems to have been Anne Rees and Company who had intimated in an earlier advert that they had supplied the coal and were certainly advertising its advantages. 'Every coal (including Nova Scotia) has been forced to yield to the vast superiority of Newport Coal – It performs more work with smaller quantity; does not burn the bars and does not clinker, and leaves little but dust to throw

overboard'.[32] This promotion of coal by jumping aboard a competitor's successful bandwagon was not confined to Anne Rees. R. J. Blewitt also tried to sell coal from Llanhilleth and Cwmbran by advertising his coal as similar to that of Tredegar in the London market.[33]

By the end of the period, the Ebbw valleys companies seem to have shifted a considerable proportion of their product from ships to railways. They were particularly prominent in supplying coal to foreign railways. In 1894, 100,000 tons were shipped for the Egyptian railways and 150,000 tons were contracted to the Italian navy.[34] In 1899 there was a Danish railways contract for 70,000 tons at a 6d a ton premium over Newcastle coals.[35] In 1908 they were the primary supplier to the GWR: 'The Great Western Railway annual contracts amount to 200,000 to 250,000 tons of which the bulk is the Western Valleys semi-bituminous.'[36]

But the highest proportion of coal output was not being shipped from Newport but transported by the GWR to England or Cardiff. From 1883 to 1913, this proportion ranged from 50 to 64 per cent, with a median of 56 per cent, and always exceeded coastwise and export shipments combined. Newport had become the coal distribution centre between the Monmouthshire valleys and England and Cardiff, as well as an export port (Table 3.7). In addition, coal was transported from the northern valley towns by the LNWR (Table 3.7) This was quite different from the situation at Cardiff where by 1913 over 65 per cent of the output of Glamorgan was shipped from the docks, as against 35 per cent of Monmouthshire's by Newport (Table 3.3).

Table 3.3. Coal output of Monmouthshire and Glamorgan and total shipments from Newport and Cardiff, 1874–1913 (000 tons)

Year	Output Mon.	Shipped Newport	% shipped	Output Glam.	Shipped Cardiff	% shipped
1874	4,227	1,056	25	12,264	3,830	31
1884	6,480	2,764	43	18,218	7,975	44
1894	8,213	3,721	45	23,994	12,903	54
1904	11,210	4,085	36	30,340	20,380	67
1913	15,374	5,398	35	38,033	24,557	65

Source; J. Williams, *Digest*, Coal 2, 10.

This substitution, was not, however, a matter of local congratulation, for it indicated the long-established and envied placing of Cardiff above Newport in the league table of the exporting ports of south Wales. The chairman's speech at the 1907 annual dinner of the Monmouthshire colliery officials summed up their irritation:

> 70 per cent of the coal raised in south Wales was shipped by south Wales ports whereas 40 per cent of coal raised in the Newport district was shipped at Newport – if it was all shipped at Newport it would do much to destroy the sentimental value of Cardiff coal attached to it by foreign buyers.[37]

The complaints centred on the great docks of Cardiff and the ability of the merchants of that town to brand their coal so much more effectively than those of Newport. As early as 1835 the *Monmouthshire Merlin* complained that: 'Cardiff will shortly possess a capacious floating harbour; and if Newport shall remain destitute of that advantage it must look to an even more mortifying contrast in terms of trade with Cardiff.'[38] In 1859, almost fifteen years later, the advantage of the harbour was seemingly supported by the more dynamic marketing of Glamorgan coal, a dominance that had been developed since the loss of Newport's competitive advantage in 1830, when the long-standing right of that port to ship coal free of duty to places east of the Holms had been repealed: 'How far have Cardiff coal merchants progressed? (compared with Newport). At great expense they have made their coals known all over the continent – they don't wait for buyers but go in quest of them.'[39]

The defence of Newport took two forms. First, Monmouthshire coal was sent from Newport to Cardiff for export, often, it seems, as Cardiff coal. As Acworth, the distinguished railway commentator, wrote in 1900: 'No inconsiderable quantity of coal accordingly which is raised in the Monmouthshire valleys passes through Newport, in order that it may be shipped under the better known title.'[40]

How far the customer acquiesced in this sleight of hand and how far the Cardiff shippers colluded is not known. It must have been fairly easy to switch traffic from one port to another, both in terms of the logistics of transport and the control of the shipping companies. Beynon, the most important of the Newport shippers, was a brother-in-law of Cory and a director of his company, as well as of the Ebbw Vale and Newport Abercarn Black Vein companies. The Rhymney valley companies were in the hinterland of both ports and Burnyeat Brown were a Cardiff and Liverpool company. Certainly the situation was very well known. Not only the foremost of the railway writers but the local press often commented, as for example, the *Monmouthshire Merlin* in 1896: 'It may be of interest for you to learn that it is a daily occurrence for the bulk of Monmouthshire colliery representatives to migrate to Cardiff, where they sell their coal or the best part of it'.[41] The major export markets, certainly by 1903, were the whole of France and the Mediterranean countries, with a 10 per cent price advantage for Monmouthshire over German coals of comparable quality at the point of delivery.[42]

Secondly, there was probably some substitution to rail from the old coast-wise market to the hinterland of the Severn and Bristol Channels. It is very

unlikely that the county would have lost any of their share of this market. The coal was better suited than those further west to domestic consumption, the trading contacts very well established and the price slightly lower. In 1830 domestic consumption was 38 per cent of the total output of the UK, and, whilst this figure had decreased to 12 per cent by 1913, consumption had almost trebled to 35 million tons.[43] A proportional increase in this region would have increased the supply from Monmouthshire from about 500,000 tons in 1830 to 1,500,000 tons in 1914. Only about half of this amount was sent coastwise by 1914. Similarly, by 1913, rail was taking 5 per cent of the total production of UK coal and this figure must have been considerably higher in the Ebbw valleys which specialized in this market.

The market for south Wales coal was, then, considerably differentiated depending on history, port facilities, type of coal, local demand and whether the mining were also iron companies. In 1891 the segmentation for Monmouthshire and south Wales was given by Dalziel (Table 3.4). The Ebbw valleys companies would have not disposed of their output in the same proportion, though a quantitative measure is not available. Certainly, more coal moved into the iron, steel and tin industries, the Severn and Bristol Channel hinterland by rail and ship, and much less was exported from Newport and Cardiff.

Table 3.4. Segmentation of the south Wales coal market, 1891

	Tons	% total
Exported as coke, coal or patent fuel	18, 540, 000	61.3
Sent to Liverpool, London and Southampton, for shipment or bunkers	1, 925, 000	6.4
Iron, steel and tin	4, 086, 000	13.5
Converted into coke	1, 607, 000	5.3
Locomotive coal shipped to railway companies	950, 000	3.1
Supply to workmen	580, 000	1.9
Supplied for house coal and manufacture of gas at Cardiff, Newport and Swansea	390, 000	1.3
Balance supplied for various purposes	1, 212, 000	4.0
Total	30, 363, 000	100

Source: W. G. Dalziel, *Records of the several Monmouthshire and South Wales Coal Owners Association 1864–1895* (London: Parliamentary Printer, 1895), 612.

PRICE

To be viable, the coal of south Wales, including that of the Ebbw valley, needed to sell for a high price, as margins were severely constrained by

comparatively low productivity. This price was determined primarily by quality. But high price is not, on its own, a good indicator of profitability. This is determined by the margin between mining costs, which is indicated by the pithead coal price, and the price at which coal was sold to the customer and the volume of output.

Before 1830, Ebbw valleys coal had considerable price advantages in its regional market, despite the comparable quality and productivity of Welsh competitors, because of the exemption from duty. This advantage is difficult to estimate precisely. Before the construction of the railways, markets were much more localized than later. National price movements are therefore not of much value, and those that exist are heavily dependent on data from the dominant North-East Coalfield. Over the period, scattered information gives a price delivered on board between 5s to 11s per ton for Newport coal, with 4s to 5s 4d duty to be added for competitors.[44] The data is far too limited other than to state that duty was a large enough advantage to establish an almost complete monopoly for the coal of western Monmouthshire in the market of the Severn from Bridgwater to Gloucester. In addition, the coal of the valley enjoyed a quality advantage and large accessible quantities compared with that of its nearby competitors in the Forest of Dean and Somerset. Despite the working of the shallow Mynyddislwyn house coal seam since the 1790s, in 1871 it was calculated that over 63,000,000 tons were workable in three principal seams ranging from 2 to 6 feet in thickness.[45]

After 1850 this quality ensured high prices in the national and international market. The differential between pit-head coal prices varied considerably between south Wales and the north-east, from 11 per cent to 60 per cent between 1882 and 1913, and was always in favour of south Wales. This variability was at its lowest between 1896 and 1900, with a mean of 18 per cent, and at its highest from 1901 to 1911, with a mean of 39 per cent (Table 3.9). The coals of Monmouthshire sold below those of Glamorgan but only at small margins. Thus, the median percentage difference in the value of coal from 1873 to 1893 between Cardiff and Newport for the eighteen years when it was in favour of Cardiff was 2.5 per cent, and for three years it was marginally in favour of Newport (Table 3.8). The key price differential is not only the selling price between competitors but the difference a company is able to obtain between the price at the pit-head, which is indicative of costs, and the price from the customer. Information on customer pricing is largely limited to shipping prices. Between 1882 and 1914 the price at the pit-head and f.o.b. (free on board: the net selling price for coal at the docks) of large coal for south Wales show a variation from 25 per cent in 1898 to 65 per cent in 1886. In terms of a five-year period, the highest differential was between 1882 and 1887, with a mean of 59 per cent, and the lowest between 1899 and 1904, with a mean of 32 per cent (Table 3.10).

These prices unfortunately do not include two pieces of key data for competitive pricing which is of considerable importance in Monmouthshire

and which would give a much clearer picture as to pricing and market strategies. These are the transfer price of coal to be used for the manufacture of iron and steel and the price paid for coal by the railway companies.

FINANCIAL PERFORMANCE

Price, specific product features, quality, productivity and location are primary factors which determine the profitability of a product and the financial performance of companies. Others, on which there is almost no information, are reliability of delivery, service, the accuracy of market information and promotion. Coal and other extractive products also have a singular characteristic. Over time, there is an inevitable and inexorable tendency towards diminishing returns which influences profits. They are also highly localized in terms of geological advantage. The Newport Abercarn Black Vein Steam Coal Company was under constant pressure to improve margins by reducing selling costs because of their fractured seams. At their AGM of 1896 some of the board voted to reduce the agent's (Beynon's) percentage from 3.5 per cent to 2.5 per cent. Other members wanted to take the sale of coal into their own hands.[46] As will be seen, this was in complete contrast to the Burnyeat Brown colliery at Nine Mile Point only a few miles down the valley.

Indicators of financial performance are difficult to determine and are not accessible before the mid-1870s. As a result, this analysis relates only to the period 1875–1914. This issue is exacerbated in the Ebbw because of the dominance of the Ebbw Vale Iron, Steel and Coal Company which did not separate its performance in iron and steel from coal. Annual reports, which are easily the most effective indicator, are very few in number, and there are almost no press reports on the medium and small companies. The only reasonable series is that of dividends which can be extracted from the *Stock Exchange Year Books* between 1874 and 1914, giving some indication of financial health and the Board of Trade records of a few companies (Table 3.11).

The companies on which information exists are in three groups. First, those companies which were located almost completely in the Ebbw valleys. These were particularly the Ebbw Vale Iron, Steel and Coal Company and the Newport Abercarn Black Vein Steam Coal Company. Some dividends are also available for the Nantyglo and Blaina Ironworks and the South Wales Colliery Company. The second group were those companies mining both in and outside the valley. These were Partridge Jones and United National. Lastly, for the purpose of comparison, Burnyeat Brown and the Tredegar Iron, Steel and Coal Company are included from the adjacent Sirhowy valley and the Blaenavon Company in the Afon Llwyd valley. Table 3.5 illustrates the very low dividend history of the Ebbw Vale Company compared with both the

Blaenavon and the Tredegar companies, with which it was the most similar, because of the continuity of all three in the manufacture of iron and steel. For example, between 1881 and 1900, the Ebbw Vale Company for nineteen of those years produced dividends below 2.5 per cent, whilst the Blaenavon Company distributed dividends at that level only twice. Secondly, the table shows that the Blaenavon company managed to distribute dividends of between 6 and 10 per cent thirteen times, while the Ebbw Vale Company never managed to reach that level. Thirdly, the rather poor performance of the Newport Abercarn Black Vein Steam Coal Company is illustrated. This company, despite being only involved in the coal industry, had results which were close to the companies at Tredegar and Blaenavon.

Table 3.5. Ordinary dividend range of four major Monmouthshire companies, 1881–1900

Dividend range %	Newport Abercarn BV	Ebbw Vale Iron and Coal	Blaenavon	Tredegar Iron and Coal
0–2.5	9	19	2	10
2.6–5	3	1	3	6
6–10	7	0	13	4
11–15	1	0	0	0
16 +	0	0	2	0

For source see Table 3.11.

Table 3.6, which continues the dividend series between 1904 and 1912, illustrates the continuation of the poor performance of the Ebbw Vale Company, the steady showing of the businesses at Blaenavon and Tredegar and the excellent performance of the companies of Burnyeat Brown, United National and Partridge Jones (all of which mined and traded only in coal), compared with the Newport Abercarn Black Vein Steam Coal Company. But, most of all, the table graphically illustrates the very large variations in profitability, at least as indicated by dividend distribution, between these companies. Partridge Jones, United National and Burnyeat Brown paid dividends of 16 per cent over seventeen times between them over the period 1904 and 1912, while the other four companies never reached that range of dividend and only twice managed to reach the range between 11 and 16 per cent.

These vast differences in financial performance are highlighted by a comparison between Burnyeat Brown and the Ebbw Vale Company for 1906 and 1907. In those years the former, on a capital of about £300,000, made net profits of £86,000 (29 per cent return on capital) and £27,000 (9 per cent), whilst the Ebbw Vale Company, on a capital of £2,383,000, made net profits of £113,000 (5 per cent) and £34,000 (1 per cent).[47]

Table 3.6. Ordinary dividend range of seven major Monmouthshire companies, 1904–1912

Dividend range %	Newport, Abercarn, Black Vein	Ebbw Vale Iron and Coal	Blaenavon	Burnyeat Brown	Tredegar Iron and Coal	United National	Partridge Jones
0–2.5	3	3	2	1	1	0	0
2.6–5	1	4	4	0	4	0	0
6–10	3	2	3	2	4	2	1
11–16	2	0	0	2	0	1	1
16 +	0	0	0	4	0	6	7

Source: See Table 3.11.

The Ebbw Vale company will be discussed in much more detail in the next chapter. It is enough to note at this juncture that its coal supported its iron for part of the period. The Abercarn company was constantly on the financial edge for the quite different reason of fractured seams. Burnyeat Brown enjoyed a marvellous geology, was not involved with the iron industry and was highly profitable to a degree far removed from its neighbours.

The coal-mining industry of the Ebbw valleys was characterized by some key issues. The application of the industrial concepts of the trading account and the marketing mix, as distinct from the more usual economic models, at this local level clarify these factors. Of the four basic trading advantages of the coal business of the Ebbw valleys, two were due to the product, whilst the others were to be found in the promotion and location sectors of the marketing mix. The premier product advantages were the high quality of its coal, and resulting high price. These more than compensated for the low level of productivity. Secondly, the coal of the valley had a facility to move from one market segment to another over the period. These markets were diverse and marked by supply continually and successfully adjusting to demand, with competitive advantage based on a high suitability for storage, domestic use and the smelting of iron ore. The promotional benefit arose from the ruthless and brilliant blocking of the development of Cardiff between 1790 and 1830 through the legal exclusion from duty on sale coal shipped from Newport east of the Holms. The location asset derived from the proximity to the iron and steel industry of the valley.

These advantages were not without cost. The almost complete monopoly of sale coal to 1830, combined with a complete monopoly of the market for the local iron and steel industry, delayed the development of Newport docks as a coal exporter. In the 1900s, because of the congestion at the docks, it was not uncommon for a vessel to wait for up to two days before loading.[48] Taking advantage of this problem from the early 1880s to 1914 the railways, and particularly the GWR carried a larger proportion of coal to Cardiff and

England than was shipped from Newport. Presumably they skimmed off some margin from the coal companies.

The combination of all trading factors enabled growth to continue throughout the period, with the last deep mine of the North Celynen being opened after the First World War, though the winning of coal by level has continued to the present day. Profitability was highly variable, both over time and between companies. The Ebbw Vale Iron, Steel and Coal Company was easily the largest coal firm in western Monmouthshire, but was the least profitable as measured by its dividends. In terms of its business behaviour it must rank amongst the oddest in south Wales. It is this industry of iron and steel and particularly this remarkable company that are the subjects of the next chapter.

APPENDIX

Table 3.7. The coal output of Monmouthshire and transport by sectors (non-local) (000 tons)

Year	Output	Coastwise from Newport	Foreign from Newport	GWR	Coal carried by GWR as % of Mon. output
1883	6,346	1,000	1,565	3,603	57
1884	6,480	1,052	1,712	3,870	60
1885	6,384	1,132	1,756	4,025	63
1886	6,368	1,138	1,914	3,776	59
1887	6,796	1,130	2,277	4,026	60
1888	6,831	991	2,260	3,953	58
1889	6,751	923	2,094	4,000	59
1890	6,895	793	1,982	3,901	57
1891	7,159	970	1,788	3,991	56
1892	7,408	1,144	1,810	4,715	64
1893	7,309	1,104	1,803	4,092	56
1894	8,213	1,132	2,589	4,698	57
1895	7,195	895	2,417	4,577	64
1896	8,841	1,059	2,524	5,328	60
1897	9,307	989	2,845	5,576	60
1898	6,060	654	1,736	3,587	59
1899	10,103	891	2,928	5,814	57
1900	9,819	770	2,774	5,592	57
1901	9,598	796	2,619	5,841	61
1902	10,175	861	2,768	6,112	60
1903	10,671	917	2,953	6,262	59
1904	11,210	940	3,145	6,222	55
1905	10,886	824	3,006	5,773	53

Table 3.7 (continued)

Year	Output	Coastwise from Newport	Foreign from Newport	GWR	Coal carried by GWR as % of Mon. output
1906	12,238	779	3,541	6,756	55
1907	13,196	781	3,803	7,620	58
1908	13,035	777	3,922	7,373	57
1909	13,204	775	3,833	7,315	55
1910	13,006	736	3,774	7,305	56
1911	13,799	688	4,325	7,776	56
1912	13,392	674	3,976	7,585	57
1913	15,374	719	4,679	8,439	55

Source: J. Williams, *Digest*, Coal 2 and 10. Figures for GWR from NLW, Muniments Coal Owners Association, 1954, HM Inspector of Mines 1882–1914, *Mineral Statistics for UK*, 92.

Notes: The figures for the GWR agree with the tonnage given in *The South Wales Coal Annual* (1917) where they are explicitly referred to as 'Carried by Great Western Railway Company from Newport District'. They do not include local traffic carried by this railway, e.g. from Abercarn to Ebbw Vale blast furnaces.

The total carried by railway from Monmouthshire would have been considerably higher as the northern valley towns serviced LNWR which in 1888 carried 1.4 million tons of coal from south Wales, increasing to over 3 million by 1913.

Newport and Monmouthshire are not congruent. Thus Cardiff exported a considerable amount of the Monmouthshire output which varied over time but particularly included Rhymney. The sum for coastwise, foreign and GWR on three years exceeds output confirming the approximation of these series.

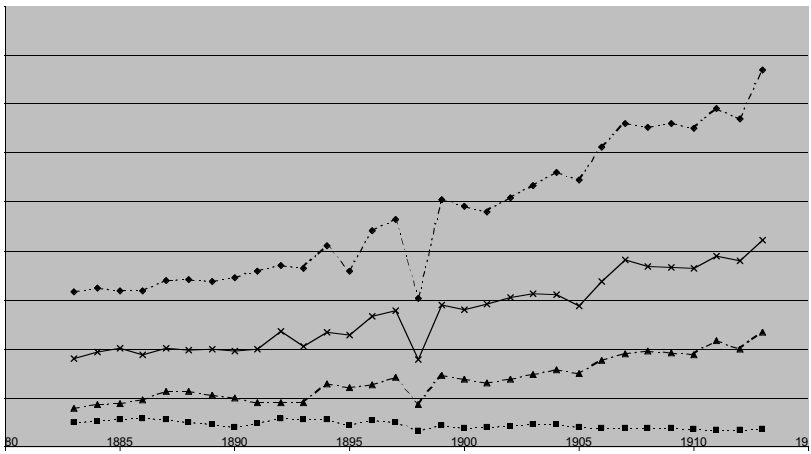


Figure 3.1. The coal output of Monmouthshire and transport by sectors, 1883–1913

Table 3.8. Comparative values of Newport and Cardiff coal, 1873–1893

Year	Value per ton of coal at Cardiff s d	Value per ton of coal at Newport s d	% difference Cardiff to Newport
1873	22 2	21 0	5.5
1874	19 0	18 4	3.6
1875	14 8	14 6	1.0
1876	11 2	10 6	6.3
1877	10 2	10 1	0.8
1878	9 10	9 8	1.7
1879	9 3	9 6	–2.5
1880	9 4	9 5	–0.9
1881	9 10	9 8	1.7
1882	10 3	9 10	4.2
1883	10 3	10 0	2.5
1884	10 6	10 0	5.0
1885	10 0	9 9	2.5
1886	9 4	9 1	2.7
1887	8 10	8 3	7.0
1888	9 2	9 11	2.8
1889	12 0	11 7	3.9
1890	13 9	13 10	0.6
1891	13 5	13 5	0
1892	11 10	11 2	6.0
1893	10 7	10 9	–1.5

Source: G. Dalziel, *Coal Owners Association*, 615.

Notes: The term 'value' is not defined by Dalziel but must be indicative of the comparative prices of coal at Cardiff and Newport. Mynyddislwyn and Tillery house coal sold at about the same price between 1875 and 1879 (ibid., chart following pp. 108–9, giving average selling prices of coal).

Table 3.9. Pithead coal prices, south Wales and north-east England, 1882–1913

Year	North-east s d	South Wales s d	Margin S. Wales to NE % +
1882	4 9	5 10	23
1883	5 0	6 3	25
1884	4 9	6 3	32
1885	4 7	5 10	27
1886	4 6	5 1	13
1887	4 6	5 4	19
1888	4 5	5 10	32

Table 3.9 (continued)

Year	North-east s	d	South Wales s	d	Margin S. Wales to NE % +
1889	5	2	7	0	36
1890	6	11	10	4	49
1891	6	5	10	3	60
1892	5	9	8	9	52
1893	5	9	7	6	30
1894	6	0	7	7	26
1895	5	4	7	2	34
1896	5	1	6	0	18
1897	5	3	6	9	29
1898	6	1	7	1	16
1899	7	6	8	10	18
1900	10	11	12	1	11
1901	8	7	11	8	37
1902	7	4	10	6	43
1903	7	1	9	5	33
1904	6	5	9	1	38
1905	6	4	8	9	38
1906	6	11	9	4	35
1907	8	9	11	10	36
1908	8	8	11	1	29
1909	7	6	10	9	49
1910	7	11	11	0	40
1911	7	5	11	2	52
1912	9	1	11	2	24
1913	9	6	10	11	15

Source: Church, *History of Coal Industry*, vol. 3, *1830–1913,* 58, 59.

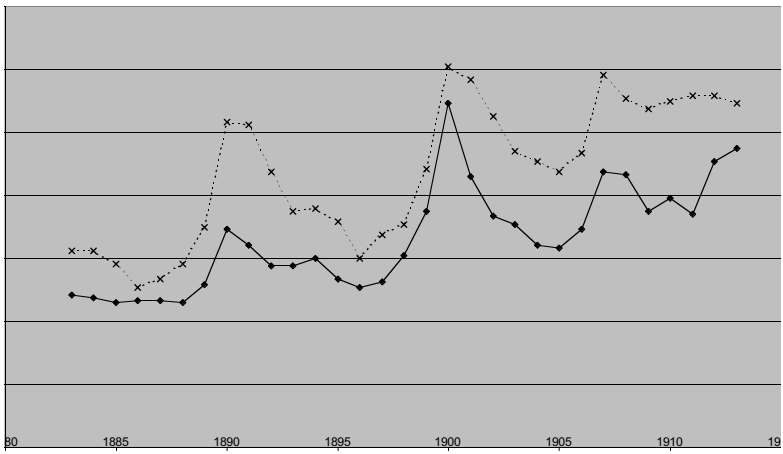


Figure 3.2. Pithead coal prices, south Wales and north-east England, 1882–1913

Table 3.10. Price and % differentials at pithead and f.o.b.; south Wales, 1880–1914

Year	Price at pithead		Price f.o.b.(large)		% Difference
	s	d	s	d	
1882	5	10	9	5	61
1883	6	3	9	8	55
1884	6	3	9	10	57
1885	5	10	9	3	59
1886	5	1	8	5	65
1887	5	4	8	0	50
1888	5	10	8	4	43
1889	8	0	10	6	32
1890	10	3	13	0	29
1891	10	3	13	5	31
1892	8	9	11	7	33
1893	7	6	9	7	28
1894	7	7	10	8	41
1895	7	2	9	7	34
1896	6	0	9	2	53
1897	6	9	9	3	37
1898	7	1	10	1	42
1899	8	10	11	1	25
1900	12	1	15	2	25
1901	11	8	16	1	38
1902	10	6	13	7	29
1903	9	5	12	10	38
1904	9	1	12	9	40
1905	8	9	12	0	37
1906	9	4	12	4	32
1907	11	7	14	9	27
1908	11	1	15	8	41
1909	10	9	13	9	28
1910	11	0	14	10	35
1911	11	2	14	9	32
1912	11	2	15	6	39
1913	11	11	16	5	38
1914	11	11	17	6	47

Source: Williams, *Digest*, Coal 14.

Table 3.11. Dividends of major Monmouthshire coal companies, 1874–1912

Year	Company	Dividend	Year	Company	Dividend
1874	SWC	5.25		TIC	10
	TIC	10.0		Bl.	1.5
	NB	0		EV, SWC, NB	0
1875	SWC	2.0	1885	EV, SWC	0
	EV	1.5		NABV	7
	NABV	0		TIC	3
				Bl.	10
1876	NB	0			
	SWC	0	1886	Bl.	10
	EV	0		NABV	2
	NABV	0		TIC	3.5
	TIC	5		EV	0
				SWC, NB	0
1877	SWC	0			
	NB	0	1887	Bl.	10
	EV	0		TIC	1.5
	TIC	4		EV	0
				NABV	0
1878	Listed 1877	0		SWC, NB	0
1879	TIC	2.5	1888	Bl.	10
	EV, NB	0		TIC	1.5
				EV	0
1880	NABV	2.5		NABV	0
	TIC	3.0		SWC, NB	0
	EV, NB	0			
			1889	Bl.	10
1881	NABV	6		NABV	5
	TIC	4		TIC	2
	Bl.	6		EV	0
	EV, SWC, NB	0		SWC, NB	0
1882	EV	1	1890	Bl.	10
	NB	2		NABV	10
	NABV	10		EV	1.5
	TIC	6		TIC	6
	Bl.	7		SWC, NB	0
1883	EV	1	1891	Bl.	10
	NABV	10		SWC	10
	TIC	4		TIC	4
	Bl.	8		EV	0
				NABV	0
1884	EV	0		NB	0

Table 3.11 (continued)

Year	Company	Dividend	Year	Company	Dividend
1892	Bl.	10	1901	PJ	20
	LS	0		NABV	15
	NABV	10		TIC	7.5
	EV	0		Bl.	0
1893	Bl.	5	1902	PJ	15
	All listed 1892	0		NABV	6
				TIC	5
1894	Bl.	5		EV	0
	EV	2.5		Bl.	0
	LS	5.0			
	NABV	3	1903	PJ	10
	TIC, NB	0		UN	15
				Bl.	5
1895	Bl.	5		EV	5
	LS	5		TIC	5
	TIC	3		NABV	6
	EV	0			
	NABV, NB	0	1904	PJ	10
				UN	10
1896	TIC	2.5		BB	10
	Bl., NABV, NB	0		EV	2
	EV	0		NABV	7.5
				TIC	5
1897	Bl.	7.5		Bl.	0
	EV	1.8			
	LS	0	1905	PJ	25
	TIC	1.25		BB	7.5
	NABV, NB	0		Bl.	5
				EV	5
1898	NABV	3		TIC	7.5
	TIC	1.25			
	EV	0.			
	Bl., LS	0	1906	PJ	30
				UN	25
1899	Bl.	25		BB	15
	EV	1.25		EV	5
	NABV	10		NABV	7.5
	TIC	0		TIC	5
				Bl.	10
1900	Bl.	20			
	EV	6	1907	PJ	30
	NABV	15		UN	30
	TIC	10		BB	30
				EV	10

Table 3.11 (continued)

Year	Company	Dividend	Year	Company	Dividend
	NABV	10	1910	PJ	20
	TIC	7.5		UN	20
	Bl.	10		BB	5
				EV	5
1908	PJ	15		NABV	0
	UN	10		Bl.	5
	BB	30			
	EV	10	1911	PJ	20
	NABV	12.5		UN	20
	TIC	5		BB	15
				EV	2.5
1909	PJ	25		NABV, Bl.	0
	UN	20			
	BB**	30	1912	PJ	20
	EV	2.5		UN	20
	NABV	12.5		EV	3
	TIC	5		TIC	6
	Bl.	5		Bl., NABV	0

Sources: All figures except the Partridge Jones and United National Companies from *The Stock Exchange Year Book* (London, 1873–1914). Partridge Jones and United National from R. H. Walters, *The Economic and Business History of the South Wales Steam Coal Industry 1880–1914* (New York: Arno Press, 1977), table 43.

*Lancaster Steam Coal Colliery Company took over the South Wales Colliery Company in 1892.

**Dividend for Burnyeat Brown for 1909 not clear but at least 30%.

All dividends are ordinary dividends, preference are not quoted.

Abbreviations:

BB Burnyeat Brown
Bl. Blaenavon Company
EV Ebbw Vale Iron, Steel and Coal Company
LS Lancaster Steam Coal Colliery Company
NB Nantyglo and Blaina Company (NABV Newport Abercarn Blach Vein)
PJ Partridge Jones Company
SWC South Wales Colliery Company
TIC Tredegar Iron and Coal Company
UN United National Company

The collieries of these companies were almost completely located in Monmouthshire but the United National Company also owned collieries in the Rhondda as well as Risca and the Lancaster Steam Coal Colliery Company in Lancashire as well as Abertillery.

4

Iron and steel

INTRODUCTION

The iron, steel and coal industries of the valley, often managed by the same company, were very different in the structure of their trading. Almost all the costs of coal mining, particularly labour, were in the processes of mining, and there was little change in this pattern between 1780 and 1914. In the iron and steel industry, apart from the crucial cost of technological change, many of its costs and many of its difficulties were not in manufacturing but on the purchasing side of the account, where a series of transformations were experienced between 1828 and 1939. These changes were driven by changes in technology and the sourcing of raw materials which forced a pattern of continual structural adjustment upon the industry. The major similarity with coal was in the strength of sales. As with coal, the demand for iron and then steel products increased throughout the period, though the type of product changed from a concentration on bar iron up to about 1830, rails until about 1870 and a variety of products after that date until 1939. The objective of this chapter is to discuss these adjustments, including the relationship with the coal industry, and with an extension of the study to 1939 so as to introduce the beginnings of what may be reasonably described as a revolution in the governance of this industry, through the intrusion of the state. This interference was just as fundamental and dramatic as the earlier revolutions in technology and the transformations in global competition and was to find one of its more sure, though commercially imprudent, first steps at Ebbw Vale. It is amongst the best and clearest examples of the integration of political intention and industrial development in the history of the UK, was a forerunner of the clash between social and economic objectives, with the former being the short-term winner and resulted in the beginnings of the major theme of the industrial development of Wales between 1936 and the end of the century. However, this intervention of the state occurred concurrently and in the same industry with a considerable and most successful example of entrepreneurial initiative.

Considerable research difficulties have contributed to the British and Welsh iron and steel industries being much less favoured by historians than the coal industry.[1]

Thus this one chapter cannot fill this historical British and Welsh chasm with a detailed description following the model of the trading account, though such an analysis is much needed. Nevertheless, the intrinsic historical importance of this chapter is amplified because the coal industry is not truly comprehensible unless there is a corresponding account of iron and steel. The reason is simply stated. Coal and iron, particularly in the Ebbw valley, were in considerable part managed by dual-product companies. The mining of coal and the manufacture of iron was often one business and they were amongst the largest coal businesses on the coalfield. Their history is open to serious misinterpretation unless both are studied, and studied together, particularly in localized pockets such as western Monmouthshire and north Glamorgan. As already noted, historians of the coal and iron industries have a marked tendency to be different historians. To add to the academic stew, the iron and steel industry of the valley was of much greater importance for the Welsh iron and steel industry than is the corresponding case with the coal industry.

This chapter then has the objective of partially filling what is probably the most considerable gap in the history of modern Wales. It does so by discussing the structural adjustment of the industry in the valley over the period, but with a concentration from 1870 to 1939 and with a focus on the Ebbw Vale companies. It was an adjustment which found its obstacle to profitability and survival within three overriding issues on the purchasing side of the trading account and one in the technology of manufacturing. These were the transport over long distances of iron ore, often of low quality, much of which was sent by ship to a port unsuited for the import of iron ore; the eventual disadvantage, as the engineering industry gathered momentum, of being at a further distance from sources of scrap than many competitors; and the decreasing advantage, after 1828, of the presence of local coal following the invention of hot blast. To these must be added the change to steel following the implementation of the Bessemer process in the mid-1850s which resulted in the demise of most of the Welsh wrought iron industry by 1880.

These processes may be summarized as follows. UK crude steel production increased almost without pause between 1866 and 1914, from about 1,000,000 to 9,500,000 tons. By 1914 pig iron from home ore had increased to about half the total output of the UK while pig iron from scrap metal, a source also not shared to much extent by the south Wales industry, contributed around 1,000,000 tons.[2] This factor placed the Ebbw valleys iron and steel industry and that of south Wales at a considerable competitive disadvantage.

Table 5.1 shows the amount of coal needed to produce a ton of pig iron, falling from about 6 tons in 1780 to just over 1 ton in 1881. The result of this trend was twofold. The first effect, compounded as will be seen by the application of hot blast to furnaces in 1828, neutralized the advantage of easily accessible local coal. In contrast, the second effect made for a business opportunity in that it was an obvious step to use this surfeit of coal, released

by the decreasing demands of the blast furnaces, for the development of a coal industry selling to external customers, though the development of this trend is rather tortuous. Homfray was building his Tredegar coal trade through Newport as early as 1817, while Crawshay Bailey paid much less attention to coal as an independent product; a trend which continued to the sale of his company in the 1860s.

These transformations were to change the very name of the premier company of western Monmouthshire. The Ebbw Vale Iron Company became the Ebbw Vale, Steel, Iron and Coal Company. The adjustment in name mirrored the adjustments in trading and its impact on the balance sheet. These changes are described in the remainder of this study and are introduced by a mainly quantitative outline of the development over the period, with a concentration on the site and companies at Ebbw Vale.

Table 4.1. The amount of coal required to produce one ton of pig iron 1766–1881

Date	Works	Tons of coal
1766	Plymouth	6
1817	Dowlais	5.8
1831	Rhymney	4
1839	Plymouth	2.5–3
1856	Dowlais	2.65
1857	Dowlais	2.05
1860	Abersychan	1.63
1863	Plymouth	2.25
1870	Abersychan	1.51
1881	Dowlais	1.10

Source: L. Ince, *The South Wales Iron Industry, 1750–1885* (Cardiff: Merton Priority Press, 1993), 5.

The iron and steel industry, with the associated businesses in tinplate, dominated manufacturing in the valley between 1780 and 1914. Despite a location with no particular economic logic since the invention of hot blast in 1828, the Ebbw valleys fastened tenaciously to its industrial offspring. Until the last few years of the 1990s it strongly retained its interest in steel making through the direct connection with Llanwern and housed the largest single-site manufacturer of tinplate in Europe at Ebbw Vale. The tinplate works at Ebbw Vale in 1996 employed about 1,500 core workers, subcontracted another 1,500 people, while 1,350 employees were transferred from the site at Ebbw Vale to Llanwern when the works were opened in 1962. The output of Llanwern in 1996 was 2.4 million tons, representing 30.8 per cent of the output of south Wales and 15.2 per cent of the output of the UK.[3]

The seeds of this tenacity are to be found in the overall pattern of development between 1780 and 1914 which contained two basic characteristics in the pattern of output. These established a dominance both for the successive companies based at Ebbw Vale and the location at the top of the Ebbw Fawr valley. The first was that the companies based at Ebbw Vale did not follow the trend of south Wales production. Indeed, for much of the period, they were to differ markedly. Thus, there was a growth in output of south Wales, including that of Ebbw Vale, from about 34,400 tons in 1796 to 979,000 tons in 1870, and then a levelling off at just below this figure until 1913, when 889,000 tons were produced. There was also a decreasing share of the total UK output, from about 27 per cent in 1796 to 16 per cent in 1870 to about 9 per cent in 1913 (see appendix to this chapter). Conversely, from about 1830 to 1914 the successive companies at Ebbw Vale held a constant share of UK production at a mean of about 2.8 per cent. They thus increased their proportion of south Wales output from 4.6 per cent in 1796, to about 14.0 per cent in 1870, to 33 per cent in 1913. Rather than levelling off after 1870, production of pig iron increased from around 137,400 tons to 296,400 tons in 1913, an increase of 116 per cent (Appendix).

Secondly, the site at Ebbw Vale was similarly stubborn in retaining the prime share of the production of iron and steel. Thus, in Monmouthshire between 1790 and about 1845, there was a diffusion of manufacture between many sites and an almost corresponding number of separate companies. However, between 1845 and 1880, while there was an increasing concentration of output on the Ebbw Vale company, this production was spread over six major sites. Finally, between 1880 and 1914, there was a concentration on both one site and one company at Ebbw Vale and Victoria.

The scale and remarkableness of this story of historical causation and tenacity over a period of two hundred years is probably unique in British industry. A considerable part of this success is due to Llanwern and its Ebbw Vale ancestor. West Wales did not achieve the scale of east Wales in the iron period to about 1860 and Port Talbot is less of a local descendant than its sister plant in Llanwern. The steel industry of the Ebbw valleys has outlasted local competitors in longevity like Dowlais (whose descendant the East Moors Works closed in 1978) and Cyfarthfa, which closed in 1919. Over the period from 1780 to 1939, Ebbw Vale has a reasonable claim to be the primary shaper of the south Wales steel industry.

The linear ancestor of this industry was the iron and steelworks of the Ebbw valleys and particularly that of Ebbw Vale. At the centre of this long-term business success story is the company established at Ebbw Vale in 1789 by Joseph Homfray, Walter Watkins and Charles Cracroft. These businesses were to pass through a series of transformations and sometimes revolutions, both economic and technical, with a continuity not to be repeated on this scale in any industry in Wales. The Ebbw Vale company was the largest employer

in the Ebbw valleys for much of this period and shaped, more than any other, its industrial history, with a massive and continuing effect on its economic and social life. At various times its branches stretched east to Pontypool, west to Sirhowy and south to Abercarn, with its own wharves at Newport.

As noted earlier, there has been a pronounced tendency amongst historians and writers generally to concentrate on the iron period from about 1780 to 1860 and particularly on the earlier years up to about 1830. This may be attributable to both the importance of Merthyr, the location there of a very high percentage of British iron output between about 1780 and 1830, and the neglect of the history of Monmouthshire. However, the iron and steel industry is of a piece, and over the longer run of two hundred years since 1780, Monmouthshire, and particularly the northern Ebbw valleys facility, seem to be more important in terms of their contribution to Welsh industry. Indeed, as early as 1812, Monmouthshire produced the largest proportion of Welsh output, at 42 per cent followed at 40 per cent by the Merthyr works.[4] This prominence was to increase with the century.

The history of the iron and steel making facility at Ebbw Vale forms, then, the centrepiece of this story of structural adjustment. From about 1840 to 1914, nearly all the other Monmouthshire companies operated either as competitors, casualties or victims of take-over by the Ebbw Vale company. From 1914 to 1939 this picture was transformed with the success of medium-sized entrepreneurial family-owned companies at the same time as the near bankruptcy of the Ebbw Vale company and its salvation by the Bank of England in 1936. The Ebbw Vale company was also one of the great coal producers of south Wales. In terms of assured tonnage, it was the largest in Wales in 1873, producing about one million tons. By 1913, the company was the third largest behind Powell Duffryn and Ocean (with GKN the other steel company to appear in the list of the top twelve), with a tonnage of just over two million tons.[5]

PERIODS OF DEVELOPMENT

There were four reasonably distinct periods between 1780 and 1939 in the history of iron and steel production in western Monmouthshire and its dominant manufacturing sites in the Ebbw valleys.

The first, from 1780 to 1830, was the period of iron manufacture in a multiplicity of works and companies. This era was based on the competitive advantage deriving from cheap and plentiful high-carbon-content coal and a sufficiency of iron ore and limestone.

The second, between 1830 and 1880, was marked by iron giving way to steel, a massive increase in the market and a loss of competitive advantage based on local raw materials. These changes forced the demise of the once

powerful Nantyglo and Blaina ironworks and the take-over of most of the remainder of the northern Monmouthshire companies by the Ebbw Vale company.

The third, between 1880 and 1914, witnessed the completion of the absorption of much of the iron industry of the county by the Ebbw Vale company and its integration on one site, the collapse or complete movement into coal of the remainder of the Monmouthshire manufacturers, with the exception of Blaenavon, and the almost total shift from wrought iron to steel.

The fourth, between 1914 and 1939, after an optimistic start with the wartime flurry of exceptional demand for steel, saw the near-bankruptcy of the Ebbw Vale works, its saving with a massive and unprecedented financial intervention by the state through the Bank of England and the growth of a few highly successful steel companies based at Newport. This period is the classic example of the intrusion of the state into an industry which was no longer able to sustain itself and more particularly its workforce in its nineteenth-century form through the trading principles of *laissez-faire* and market forces, but nevertheless witnessed the development of a few entrepreneurial companies in the same industry.

The first period has been comparatively well researched, though, in absolute terms, the work has only just begun; the second period much less so and the last two periods are almost completely neglected. This research pattern is unfortunately almost the reverse of the increasing output of the Ebbw Vale company and its pre-eminence in the Ebbw valleys between 1880 and 1914 and, as noted earlier, its fundamental importance in the history of Wales extending into the twenty-first century.

Competitive advantage, 1780–1830

This was the period of the establishment of the iron industry based on high-carbon coal and local iron ore. It was a wrought-iron industry, though some works produced cast iron for the market and pig iron for other companies. There was a long history of an earlier charcoal-based industry which was located more in the centre and southern parts of the Ebbw at Abercarn and Tydu (Rogerstone) than on the northern outcrop. Indeed, as noted earlier, the oldest map of a south Wales ironworks is of the works established at Abercarn by the Hanburys in 1670. Both of these villages were to continue in metal manufacture well into the twentieth century, though Rogerstone in aluminium rather than iron. During the 1770s the Abercarn site had been developed by the Glover family of Birmingham who sent some of their pig iron to Hirwaun by packhorse.[6] It seems probable that the southern Ebbw was more suited to charcoal production than the future northern sites because of the greater supplies of timber. In addition, water power, whilst not as

powerful as at, for example, Clydach, was sufficient in terms of power and quality, particularly on the Gwyddon stream at Abercarn. Thus Lloyd notes:

> Of their formation we have no particulars but in 1783 we find Messrs Joshua Glover and Samuel Glover of Birmingham carrying on an important business there, and entering into a contract with Anthony Bacon Senior of Cyfarthfa, for the supply to them at Abercarn of 800 tons of pig iron yearly.[7]

There was a rapid growth in the iron industry based on coal but not a sudden transformation. As early as 1788, only 34 per cent of the iron output of south Wales was credited to charcoal furnaces.[8] Just over fifty years later there was an auction of 300 tons of charcoal bloom at Crumlin wharf.[9] In the tinplate industry, charcoal was judged to produce a better quality product until well into the 1860s. Thus Ebenezer Rogers of Abercarn wrote in 1857:

> One of the great items of expense in the manufacture of bar iron is the cost of charcoal for fineries. This limits, at present, the production of iron made by these means, but the superior quality of iron made in the charcoal finery is always admitted.[10]

It was the only period when the northern valley sites enjoyed a competitive advantage. On the supply side, coal and iron were both plentiful and cheaply mined as they outcropped together with limestone at a far less steeper incline than in the south. It was thus a level-based industry without the need for large or risky capital investment in the mining of the raw materials. This was a factor of fundamental importance in a period when technology was in the early stage of the efficient reduction of raw materials. In 1800, between ten and twelve tons of coal, iron and limestone were needed to produce one ton of pig iron and accounted for 80 to 85 per cent of the total cost of its production.[11] There were also heavy indirect costs such as the building of houses for the inflow of workers which were basically company villages. Margins needed to be high to compensate for these costs. Of a complementary importance, the local coal was richer in carbon than competitors outside the south Wales coalfield. Care needs to be taken with measures of carbon percentages in coal but it does seem that Ebbw Vale coal was richer in this element than the coals to the east and south. At 87.8 per cent it was marginally lower than Dowlais at 88.46 per cent.[12] But this percentage was considerably higher than that of Yorkshire at 63 per cent and Scotland at 35–40 per cent.[13] This was of great importance before the invention of hot blast. The result of these advantages on output were considerable. Thus during the first few decades of the nineteenth century:

> The south Wales works advanced productivity per furnace well in excess of the national average of about 1,500 tons. South Wales works averaged 2,416 tons and

in 1827 the south Wales works averaged 3,022 tons compared with a national figure of about 2,600 tons.[14]

Local iron ore was far less of an advantage than coal in being much less plentiful, particularly after the early outcrops were exhausted. This led to importation into south Wales as early as the 1770s. In 1839 1,285 tons were imported into Newport in one week in sixteen separate cargoes ranging from 26 to 158 tons, which was a most uneconomic way of transporting a bulk product.[15] Even so, local supplies were used until the end of the century. In 1865 over 100 girls were working from twelve hours a day, breaking up lumps of ironstone with sledge hammers above the Nantyglo works.[16] As late as 1893, 5,315 tons were 'raised incidentally' with coal in the Ebbw Vale and Abercarn locations.[17] There is some evidence that only local ores were being used in Ebbw Vale long after the Merthyr sites: 'In 1834 Ebbw Vale the four blast furnaces were producing an average of 85 tons of pig iron each week; calcined Welsh ore being the only ore used.'[18] Compounding the problem of availability was the poorness of the local ore. It contained half the percentage of metal of Cumbrian ores on which the iron industries of the north were to be based.

However, until about 1830, this increasing disadvantage in locally available iron ore was somewhat balanced by advantageous purchases of land, mainly freehold. The auction notice for the Ebbw Vale and Sirhowy Ironworks on 18 April 1844 states that there were '2,887 acres of mineral land principally freehold'.[19] The Ebbw Vale company's holding of large freehold tracts must have been of importance in the maintenance of a strong balance sheet and the survival of the company.

Already then, by 1830, the primary factor in location was carbon-rich coal, and initially reasonably plentiful, but rapidly decreasing poor-quality iron ore. In this period the iron industry of south Wales became large-scale compared with its charcoal-based predecessor but very small-scale compared with its future development. The drama of the first fifty years of the industry and its high share of the international market is apt to cloud this issue.

Entry into the market with such an advantage was tempting for both large and small entrepreneurs. Of the smaller we know little, though Coxe, as early as 1801, writes of a lively manufacturing locality with many small works both manufacturing iron and using the iron of the larger producers.[20] But it was a difficult trade because of the fluctuations in demand. Reserves or access to short-term loans were essential because of the necessity to stockpile when times were difficult. The financial success of some industrialists like the Crawshays does not make this a period of easily acquired millions. A Mr Daniel living at Abercarn and a deacon of Beulah, Newbridge, who owned a works with an output of 1,023 tons of iron in 1826, lost his fortune in the iron industry and was unable to pay his debts in his lifetime.[21]

The markets also seem to have been based on small as well as large orders, though this was probably determined by size of hold as much as by size of order, particularly until the beginning of the rail trade. Thus, in one week as late as 1839, of forty-five cargoes of iron product for export, there was no single order above 130 tons and most were below 100 tons.[22]

The development of the Monmouthshire iron industry and its companies, based on these locational factors, is reasonably well known. In the Ebbw Fach valley it was centred on Beaufort and Ebbw Vale. This was part of a northern Monmouthshire development stretching from Rhymney in the west to Pontypool and Blaenavon in the east. Dominance was shared over much of this period with first one company and then another taking the lead. In 1796 Beaufort and Clydach were the dominant producers producing 1,660 and 1,625 tons respectively, with Ebbw Vale at 397 tons. By 1805 Blaenavon at 7,846 tons per annum was producing just over 10 per cent of Welsh output, a proportion not to be achieved by Ebbw Vale until the 1860s.[23] The works at Blaenavon were considerably larger than their nearest rival at Tredegar, with an output of 4,500 tons and were seemingly well set to establish a long-term superiority. It was, however, a typically false dawn to the chequered history of this company. Ebbw Vale waited until 1818 to begin its long ascendancy with the puchase of Sirhowy. In 1830 the combined works produced just over 26,000 tons.[24]

By the 1820s, works like the Bute, Blaina, Tredegar, Abersychan, Pontypool and Pentwyn were all well established and Rhymney was producing, first for Crawshay, and then for his son-in-law Benjamin Hall, as early as 1805. The Nantyglo works of the Baileys produced 17,750 tons of pig iron, the Tredegar works of the Homfrays 16,385 tons and the Harfords at Ebbw Vale and Sirhowy 20,425 tons.[25]

The entrepreneurs were English, with the exception of Watkin of Llangrwyne forge, often Quaker and usually with a long experience of making and selling iron. Success in this industry was always a combination of experience and capital. This common experience, supported by family relationships, gave them good access to markets, and a facility to combine and support themselves through partnerships. This facility may well, however, have been highly dangerous if there were sudden calls on cash, as they were all apt to be in the same situation with their reserves, as the Harfords perhaps found to their cost at their bankruptcy in the early 1840s. This family were English charcoal ironmasters, then moved to coke and, before the development of rail markets, exported to southern Ireland and the north of England using Quaker contacts. The Baileys were nephews of the Crawshays, with a thorough grounding in the trade at Merthyr before they purchased Nantyglo. The dynastic contribution of the Crawshays was not restricted to the Baileys, for their daughter had married Benjamin Hall who was presented with the Abercarn manor, and the Halls were also leaseholders at Victoria.

The industry was not, however, organized as a cartel and indeed the letter books are full of trading complaints against each other, particularly in the poaching of labour. They did meet regularly, usually at the Kings Head in Newport, and contracted work to each other, particularly when beginning in business. Welsh quarterly meetings were started in 1802, and apart from 1810, fixed prices each quarter until 1824.[26] To sell pig iron in large quantities nearby must have been only marginally profitable but it was safer than the much more splintered wrought-iron industry. Thus in 1802, 'The Nantyglo ironworks agrees to deliver to Pendyrren Iron Works – 30 tons long weight of Pig iron.'[27]

The industry was driven by the two forces of technology and markets, particularly once its access to the coast was assured through the construction of a network of canals and connecting tramroads. Technology, in its turn, was a combination of two issues. First, size of furnace and efficiency of blast were the prime determinants of productivity in terms of quantity. Secondly, the better chemical processing of iron ore resulted in a higher quality and more usable wrought iron which had a distinct advantage over cast iron in that it could be rolled and shaped. Coke was strong and light and almost pure carbon. It could, thus, bear a heavier weight of iron ore than charcoal and gave a more intensive heat. Steam was a much more effective and consistent method of supplying blast. Increasingly, after about 1805, most ironworks, with the notable exception of Clydach, had transferred to this method. In the late eighteenth century the blast furnace could produce 10 to 46 tons weekly. By 1830 this had increased to 85 tons.[28] The chemical processing was obtained by puddling and shingling which basically stirred and beat the impurities out of the pig iron, helped considerably by the reverberatory furnace which allowed burning coal and and melting iron to be kept separate.

Monmouthshire technologists were active. Samuel Rogers, writing from Risca in 1819 to Josiah Guest, suggested that the ironmasters become subscribers to his scientific letters: 'These letters contain the basics of iron making and show what to avoid and what to employ to make good iron – and therein it will be shown that equally as good iron may be made with coke as with charcoal.'[29] In the previous year he had made a considerable improvement in puddling by the replacement of the solid sand bottom of the furnace with cast iron plates.[30]

Then, in 1828, Neilson invented the hot blast method of reducing iron ore. The competitive advantage of high-carbon coal came to an end at the same time that there was an increasing dependence on imported foreign ore. It was not a sudden end. Thomas Bell, writing to Thomas Evans of Dowlais from Newcastle on Tyne in 1831, was not sure if they knew of this advance in Wales, let alone its implementation: 'Have you heard they are making pig iron in Scotland from raw coal by the hot blast? If you could do this in all the iron districts you would be able to spare half your colliers.'[31] Indeed, they were to

continue cold blast at Blaenavon for a further fifty years. On the same date, rails were rolled at Ebbw Vale for the Stockton and Darlington line. The period of massive increase in demand and the end of technical advantage were simultaneous and it was demand that was to prove the more powerful in terms of its effect on the output of the firms of the Ebbw and their continued location in the valley.

The decline of Nantyglo and the continuation of Ebbw Vale, 1830–1880

It was these divergent trends on the demand and supply sides which determined the history of iron and steel making in south Wales. Over this period these two trends may be summarized as follows. Between 1830 and 1882 the total production of pig iron in Great Britain increased from 678,000 tons to 8,558,000 tons: an increase of over tenfold. That of south Wales increased from 277,000 tons to 934,000 tons – a percentage increase of 237 per cent – while the Ebbw Vale Company's output increased over sevenfold from 26,200 tons to 211,000 tons in 1882 (see Appendix to this chapter). The output of Ebbw Vale was not expanding as fast as that of Great Britain but was expanding much faster than most of the rest of south Wales.

The technology was firmly against the south Wales wrought-iron industry, particularly after Bessemer's invention of the acid steel converter in 1856. This development hastened the replacement of wrought iron by steel and required the use of non-phosphoric iron ores of which there were no deposits in south Wales apart from a little in the Llantrisant area. Gilchrist Thomas's invention at Blaenavon in 1878 aggravated the problem as phosphoric ores could now be used, and these were in abundance, it seemed, in many places except Wales. Certainly such ores were locally and cheaply available to the Cleveland ironmasters and foreign competitors.

Two statistics illustrate the tenuous competitive situation of the iron and steel industry of south Wales and Monmouthshire. First, by 1857 of over 9 million tons of iron ore mined in the UK only about 380,000 tons were mined in Monmouthshire.[32] Secondly, the production of pig iron in the USA, between 1869 and 1873, increased from just under 1 million to almost 2 million tons.[33] As early as 1847 Scotland captured the leading position in pig iron production from south Wales, providing 27 per cent of total British production.[34]

The choice was stark, though apparently not clear to all involved in the industry, as the history and strange purchase of the Nantyglo company will illustrate. Companies in the Ebbw valley, and indeed south Wales, would remain in the industry despite not only the loss of competitive advantage but a decided turn against them. But to do so they needed to invest more heavily in technology than at least some of their competitors. They then needed to

produce much more in order to stabilize their profits, by selling increasing amounts at a reduced margin per ton, or develop their production of higher added value specialist steels. The traditional defence of a locational high market share was now closed. They would no longer be able to fix market prices. The last attempt seems to have been in 1836 when the south Wales ironmasters resolved to maintain prices by reducing the production of pig iron by 20 per cent and blowing out twenty-two furnaces.[35]

An effective path to rapidly increasing output was through the take-over of competitors. This could be a quicker method of expanding output than building new plant where output could be delayed by long lead times, though the comparative modernity of plant and equipment purchased in this way needed to be carefully analysed. But if the matter was well judged, such a method could be effective in instantly increasing market share and obtaining a better control over prices. Companies could also move into the manufacture of more sophisticated iron products. But the only one to pursue this latter course was the ever errant Blaenavon company, with its spectacular Crumlin viaduct and works. The other alternative was to move out of the industry very quickly, hopefully cutting one's losses and even more hopefully selling to an ambitious but gullible purchaser.

Whichever course was decided, the rapid development of the deep mining of coal in the Ebbw particularly after about 1850 (and thus roughly concurrent with the decline of the wrought-iron industry) presented an additional set of options. A company could mine the coal on their land, which was particularly cheap if the land was freehold, or take rent from others who wished to mine coal. Alternatively, it would be possible to use the increasing profits from coal to support the continuation in iron and steel, or use the shell of the old iron company to transfer completely to coal mining.

All of these alternatives were implemented by the Monmouthshire iron and steel companies and they are best perceived by examining in more detail the two largest of the Monmouthshire companies, at Ebbw Vale and Nantyglo, between 1830 and 1880. The history of these two companies are a case study of opposite strategies and opposite bequests. One was to expand and leave a legacy of continual employment to the end of the twentieth century. The other was to sell and leave only the legacy of a fortified roundhouse built as a protection against the possibility of an uprising of the workers of Nantyglo.

Ebbw Vale

In 1830 the balance of commercial advantage was so heavily weighted on the demand side that the key decision was whether or not to invest in the advances in technology so as to increase output and reduce costs. The invention of hot blast was not enough to deter new companies entering the area and established companies expanding by take-over or merger. The Monmouthshire Iron and Coal Company opened the Victoria Works in 1837 and shortly afterwards the

new British Company purchased Abersychan. The Beaufort ironworks was sold in 1833 to Joseph and Crawshay Bailey for £45,000 and in 1839 a merger occurred between the Cwm Celyn and Blaina Ironworks. The Tredegar and Rhymney Iron companies continued to expand in the 1830s and 1840s.

At Ebbw Vale, a fourth furnace was constructed in 1839 showing considerable confidence in the future, but then, in 1842, the Harfords went bankrupt. The circumstances were unclear but may well have been to do with associated activities in their Bristol merchant house trading in south America as distinct from their company at Ebbw Vale.[36]

At this stage, there was a short interregnum when the company was managed by trustees. Then the Ebbw Vale and Sirhowy Ironworks were purchased by a partnership consisting principally of Abraham and Alfred Darby and Thomas Brown. In the history of iron and steel manufacture in south Wales this event was one of the few truly fundamental decisions. It was the signal for the rapid and continual growth of the Ebbw Vale company. In 1849 the company purchased Victoria, in 1842 Abersychan, followed by Pentwyn in 1857 and Pontypool in 1864. By 1860 they employed 12,000 people. There were reorganizations in 1863 and 1864 and by the end of this period, in 1879, the Ebbw Vale works was producing about 161,000 tons of pig iron.[37]

When the partnership of 1844 purchased Ebbw Vale they were in a technological race with continual hurdles erected against them, which reached their highest with the invention of the Bessemer process in 1856. In this race they needed to perform better than others technically because of their need to import iron ore. Together with the building of the Grwyne Fawr dam, which is discussed in Chapter 7, the capital investment of the next thirty years was one of the most remarkable in the history of the Monmouthshire industry. Moreover, it was sustained by continual technical innovation led by a managing partner with almost no formal education but with a rare skill in the management of exceptional technologists.

Thomas Brown, in the 1840s and 1850s, introduced much better methods of coking small coal with an improvement in efficiency of 43 per cent.[38] He encouraged the development of a works laboratory, where George Parry the works chemist developed his most spectacular improvement by sealing off the blast furnace and using the previously wasted hot gas. The weekly output per furnace was increased by 33 per cent. More controversially, Parry is said to have succeeded in making steel before Bessemer and, according to Hilton writing in 1893, this was agreed eventually by Bessemer: 'This patent process together with the Martin process, Sir Henry Bessemer purchased from the Ebbw Vale company in 1866 for the sum of £30,000,of this amount £10,000 went to George Parry.'[39] 'In 1856 they purchased the patent for the Uchatius process and erected a large foundry for casting steel.'[40]

In 1871 spiegeleisen, a compound for the more effective manufacture of steel by the better exclusion of oxygen, was first successfully and

commercially produced in south Wales at Ebbw Vale. Prior to this date the spiegeleisen used in the Bessemer department was obtained from Germany.[41] In 1879 a new and powerful double cylinder blast engine was erected on the north side of the blast furnaces at Ebbw Vale by Messrs Darby of Coalbrookvale ironworks. This was to survive until 1990. They also invested in the size of furnace and, by 1884, the Ebbw Vale site possessed four, of sixty feet in height, replacing sixteen smaller ones.

How far this investment, as distinct from their strength in the coal industry, ensured their survival is difficult to judge. Certainly, without it, their continuation until 1914 would have been impossible. For the investment in iron ore reserves and their purchases in the Pontypool valley were seemingly unwise and their commercial performance unsteady.[42] Their restructuring of 1864 with a nominal capital of £4,000,000 did not result in any fundamental improvements in profitability. The ore obtained from the Brendon district of Somerset, the Forest of Dean, Ireland and Spain proved a poor bargain.[43] In 1875 they lost £165,000 on their iron and steel trade.[44] As will be seen from their dividends, the company never really recovered substantial financial strength.

The decision to remain in the iron and steel industry is shown in its sharpest context by the quite different path taken by the Baileys, a few miles away in the neighbouring valley to the east at Nantyglo.

Nantyglo

The ironworks in this town had been owned and managed successfully by the Baileys since 1820, following a partnership which Joseph Bailey had entered in 1811. They were the major iron company in Monmouthshire from about 1810 to the mid-1840s. In 1839 their company was producing at least 52,000 tons, about twice as much pig iron as Ebbw Vale, and this is confirmed by Johnson, who estimates their output at 62,500 tons.[45] They purchased Beaufort in 1833 and by the 1850s and 1860s there were seven furnaces at each site. In 1874 they had fallen well behind their local competitors but still produced about 94,000 tons.[46]

As early as 1860 they may well have decided to run down and sell the works. In contrast to the Ebbw Vale company there was no move into steel. Some ancilliary processes even for the manufacture of wrought iron were dated. Thus coke was still processed in the open air rather than in enclosed furnaces and, rather curiously, the Baileys do not seem to have developed their coal market: 'As regards the sale of coal there are almost insurmountable difficulties; our coal has not been offered for sale; comparatively unknown in home markets and wholly so foreign markets. We have no trucks to convey it away.'[47] In 1871 the Baileys sold the company to the Blaina Iron and Coal Company at the height of a short-lived boom, for a sum which Ince states as £4,000,000.[48] The finances are, however, highly convoluted, as the nearby

Blaina Ironworks owned by John Russell and Thomas Brown was also sold to the Nantyglo and Blaina Ironworks Company in 1873. This company then purchased the Blaina Iron and Coal Company. In the 1873 AGM it was stated that the purchase price was £950,000.[49] For this they received fourteen furnaces, sixty-seven puddling furnaces and four rolling mills.

The company was immediately in financial difficulty and, in March 1873, the Beaufort works was closed, followed in March 1874 by Nantyglo. The Blaina site continued to be run by a lessee – the Blaina Furnace Company – and two tinplate companies were operating on the site by the 1880s. By 1879 the Nantyglo company had been converted into a tinworks.

The purchasers were either deceived or foolish, perhaps both. At the AGM of 1873, Captain Heyworth, a prominent company director in the valley whose commercial acumen seemed as garbled as his grammar, stated:

> There was no doubt that the Nantyglo Works were valuable; but on the other hand Mr Crawshay Bailey would not have sold them for the money that he did, if they been worth like what Messrs Bird (the valuer) valued them at. It was proverbial that they could frame a mineral report to prove anything and this was not an exception. (*Such a meeting could only end in acrimony. A Mr Mason had the last reported word*.) If the property had been properly managed there would at that moment have been £200,000 to divide instead of a loss of £100,000 on last years business (Cheers)[50]

Thomas Brown, who was 75 and half deaf, had been appointed to manage the Nantyglo works but the old surety was long gone and the appointment was a disaster.[51] In 1874 the board 'are about to commence proceedings against Mr J. Charlton for the purpose of investigating the circumstances under which this property was bought and sold by that person'.[52] The agents for the sale Charlton and Grant did pay £40,000 as damages in 1877.[53]

This debacle signalled the end of the Welsh and Monmouthshire wrought-iron industry: a great ironworks had closed and one of the premier ironmaster families finally departed to their estates in the Usk valley. Their commercial judgement had survived to their last deal and they were the only beneficiaries of the sale of their company. The Nantyglo and Blaina Company continued to be listed in the *Stock Exchange Year Book* until 1914, letting its assets of land and coal, and recorded a maximum profit in 1910 over just over £50,000.[54]

The dominance of the Ebbw Vale Company, 1880–1914

Only four substantial iron and steel companies now remained in Monmouthshire and only one in the Ebbw valleys. Of these, Tredegar finally closed its furnaces in 1900 to concentrate on coal, though it continued to roll rails.

Rhymney followed suit in 1891. Blaenavon, which in 1873 was the third largest coal company in south Wales, with an assured tonnage of over 900,000 tons, only had one small furnace in blast in 1913.[55]

Despite the intensified competitive difficulties, output at Ebbw Vale over this period almost doubled. However, the glimpses we are able to obtain of this huge company, which by 1913 employed about 10,000 men at its collieries and works over an area of 14 square miles, with 100 miles of rail track and 1745 cottages, tell a curious commercial story. Their output of both coal and iron was enormous but their profitability was poor when compared with their neighbours. In 1913 the company produced about 300,000 tons of pig iron, a third of that of south Wales, and 1,750,000 tons of coal, which was almost 12 per cent of the output of Monmouthshire. In addition they manufactured 12–14 million bricks per annum, made their own wagons and produced 200,000 tons of coke.[56]

The capital investment and technological progress was considerable. As noted earlier, they reduced the number of furnaces, dramatically increased the size of their replacements, modernized the Bessemer department, which by 1907 produced about 4,000 tons per week, and better to supply the local tin plate industry established a Siemens department producing 500 tons per week by 1899.[57] To service all of this, the company developed an engineering department of 350 skilled men and the largest ore-importing wharves in Europe at Newport.

With such a large capital and technological investment, their development into higher added value specialist steels was considerable. This issue will be discussed more fully in Chapter 5. At this stage it is enough to note that by 1895 almost 9 per cent of the total production of Monmouthshire iron and steel was devoted to specialist products like chrome and ferro manganese, compared with 4.7 per cent in Cumberland and just over 2 per cent in the North Riding.[58]

That the operation of the company was marked by both periodic incompetence and fraud is certain and was particularly so in the early 1890s, after which C. B. Holland, the general manager, was replaced by Franklyn Hilton.[59] Some of their decisions were not only disastrous but long-lasting in their results. Their purchase of the West Somerset Mineral Railway line ensured losses on that property of between £7,000 to £10,000 per annum until 1919 and they were fastened into the contract by Act of Parliament.[60] There was long-standing fraud in the shipment of iron ore at their wharves in Newport, bleeding the company at the very cost where it was most vulnerable competitively.[61] Indeed, between 1866 and 1914, while the rest of the British iron and steel enjoyed the advantage of about 5 million tons of local iron ore per annum, only a few hundred thousand tons were available to the Welsh industry.

There is some circumstantial evidence, however, that the relationship with their employees, whilst being somewhat eccentric in that period of industrial

relations, was comparatively very positive. Whether these relations are described as advanced or weak depends not only on much more information but on one's point of view. In the strike of 1893 the Ebbw Vale workers refused to join their fellow strikers, organizing a system of defence with the management and fighting a short-pitched fight against intruding Rhondda miners.[62] As the *South Wales Times* rather joyously put it: 'Management and men, forgot their differences and united like true patriots to fight the external foe'.[63] Then, in the reorganization of 1894, there was considerable pressure on Hilton to reinstate incompetent or fraudulent managers. As noted below, this cooperation was also to extend to business matters.

Even so the company was under periodic investigation, and even barracking from shareholders, the press and eventually the workers between 1890 and 1914. Such criticism was not surprising. Between 1864 and 1891, the nominal value of the company dropped from £4,000,000 to £1,712,925 and by 1903 to £968,000.[64] Its dividends were low. Between 1910 and 1912 their neighbours in the Sirhowy valley, Burnyeat Brown, paid dividends of 10–20 per cent and the Tredegar Iron and Coal Company 6–10 per cent. Ebbw Vale could only manage 2.5–5 per cent.[65] There were occasional good years: 1900 was the best for thirty years with a profit of £246,734.[66]

The board was taunted by letters in *The Times*: 'Both for its high inland site and for its Board of Directors led by a solicitor, and harbouring a confectioner, who would prove a standby when English steelmakers, through a tariff, had to turn to the jam and pickle trade'.[67] In 1907 'the Board was said to be the laughing stock of London and the commercial world'.[68] The nadir was reached in 1911 when production was stopped:

> The workmen and the Newport Chamber of Commerce both asked the Board of Trade to make an enquiry – the workmen urged that if sheets were made by the firm they would make a profit and the Managing Director agreed. The workmen said that should this new trade be affected, so as to again cause a depression, we as workers will give our practical support and sympathy in finding and trying to remedy the cause.[69]

How far during this period the survival of steel production at Ebbw Vale was commercially viable without the support of coal and brick production is difficult to surmise. The Ebbw Vale Company by 1913 was producing 1,750,000 tons of coal, of which about 300,000 tons would have been used in the manufacture of pig iron and perhaps another 300,000 tons for the manufacture of steel products and bricks.[70] This leaves over 1,000,000 tons of coal for sale. The available evidence points to coal supporting iron from perhaps 1880 to 1914. First, the dividends were below all of the western Monmouthshire coal companies for which there are data between 1881 and 1914.[71] This may have been partially due to high director salaries, poor seams

or even corruption as in the early 1890s.[72] However, it is unlikely that a trend of this length and strength would be continually affected by such influences. Secondly, profits and return on capital in good years where figures are available seem comparatively low.[73] Of the four years for which AGM reports are available, in 1892, 1895, 1896, and 1901, only in one did steel make a profit.[74] It does seem as if this company was using coal as a 'cash cow' to support the trading of its ferrous products. This policy could be implemented either by the transfer of coal at a low, and in effect subsidized price, for use in its furnaces, in the sale of its coal as a separate and profitable product, or both.

These issues were however soon forgotten, or at least placed to one side with the start of the war of 1914.

Salvation by the state and deliverance by entrepreneurs, 1914–1939

The closing date of this period is extended to 1939 and the boundaries to those of the county. For in the development of this industry the Great War was markedly only an intermission, and the period to 1939, together with an increased concentration on the context of the iron and steel industry of the county, makes more intelligible the previous history of the iron and steel industry of the Ebbw valleys. Furthermore, after 1939 the metalliferous industries of the valley were dramatically changed by the location of the large aluminium processing plant at Rogerstone. During the period 1914 to 1939 development was characterized by the movement of the Monmouthshire industry in two opposing directions: salvation by the state and deliverance by entrepreneurs. Both directions developed within a framework of three groups of companies characterized by the sharply contrasting experiences of collapse and renaissance, steady growth and metamorphosis.

The first group consisted of the surviving companies of the integrated single-site producers at Ebbw Vale and Blaenavon, together with a tiny remnant at Tredegar. They were dual-product companies, mining coal often more profitably than producing iron and steel. All the companies within this group were to collapse and one was to experience a renaissance. The second group were the specialist steel producers concentrated around Newport and represented particularly by Lysaghts and Whiteheads. They were technically adventurous and highly entrepreneurial companies, which had developed between 1895 and 1910 in response to the new markets for steel in the electrical and automotive industries, and were joined by Panteg in the 1930s. Their origins and size were very mixed. Lysaghts, the largest, employed 3,000 in 1913 with an annual capacity of 175,000 tons. Apart from the war, this group was to experience steady and lasting growth. The third group was the tinplate industry based on handmills, which were spread more evenly throughout the county, including a strong outpost at Redbrook. They had

been in serious retreat following the McKinley Act of 1901, but had regrouped and increased in size between 1900 and 1914, stimulated by the new consumer demand for tinned foods. This group was to experience metamorphosis. In addition, there were a few smaller and less easily classified companies such as those at Pontymister and Rogerstone who had both installed open hearth furnaces, using scrap rather than pig iron for steel manufacture, and were parts of larger companies rather than independent entrepreneurial units.

In 1914 there seemed to be a reasonable future for the first group who looked likely to continue their 120 years or so of continuous production on their sites at Ebbw Vale and Blaenavon. There was enough optimism for the Ebbw Vale Company to return to its predatory ways, and bring the Ebbw valleys and Monmouthshire primary industry even more under its control. In 1915 they bought 90 per cent of the share capital of John Lancaster for £300,000, and, by 1922, had taken over the Newport Abercarn Black Vein Steam Coal Company.[75] This company, with a production of 223,862 tons of pig iron was easily the largest unit of the first group of integrated steel producers, contributing about one-third of the south Wales output and making a gross profit of £166,872 in 1914.[76] They enjoyed more success during the war than the other companies, which encouraged confidence in Mills, that most optimistic of steel managers. He had been appointed as general manager in 1899 and managing director in 1910. The war, when from 1914 to 1916 most of the works came under government control, gave a false sense of security, and more dangerously encouraged the idea that the steel-masters were very good at the management of their companies. Some of their future problems may be traced to this wartime optimism. In 1915 the Ebbw Vale Company bought 15,000 acres of mainly high phosphorus ore-bearing land in Northampton partly financed by the creation of 400,000 ordinary shares.[77] In 1912 they began their purchase of four local colliery companies which they completed in 1920, just as they began their long decline.[78] Even more disastrously, the company also issued £3,000,000 of debenture fixed-interest stock. By this time 34,000 people were employed, a dividend of 15 per cent had been declared and Mills was able to state with considerable certainty that 'all we require is a minimum of interference from the government'.[79]

However, the decline of the Ebbw Vale Company was irreversible, despite the pugnacious loyalty of Mills. In the 1920s the market for coal collapsed, there were two coal strikes and the markets for the products of Ebbw Vale were hit by dumping as the steel industry surged into over-capacity. The end was signalled in 1921 after seven years of growth and prosperity, with a loss from the strike of £790,000 and no dividend declared for the first time in twenty years.[80] By 1925 the company was in the most serious trouble, which was blamed on the high cost of coal and dumping.[81]

Mills was succeeded in 1930 by Sir John Beynon, a man of considerable sense and little passion who acted as a caretaker until 1935, nurturing the

much reduced colliery trade. Significantly, the sheet mill at Ebbw Vale continued in production, rolling purchased steel. In the early 1930s there was a change that would prove highly significant for the south Wales steel industry when the mill began to produce sheet steel for motor car bodies.[82] The company even reported a small profit in 1932 but reduced the capital of the company from £3,700,000 to £425,000 and the value of the preference shares from £1 to 5s.[83]

The other old integrated steel company at Blaenavon, which from 1880 to 1912 was a consistently much more profitable company than Ebbw Vale, fared even worse than its old rival, though trading between 1914 and 1920 was fairly good. At their AGM of 1917, with R. W. Kennard in the chair, they were optimistic and reported the building of four new Siemens furnaces, but in 1923 they reported a loss of £67,000.[84] Steelmaking ceased in 1922 though they occasionally rolled bought-in ingots.

The second group, the specialist steel producers, experienced a less fortunate wartime period but were to be the most successful post-war companies. Lysaghts' exports from its Bristol works declined from 127,000 tons in 1913 to 5,000 tons in 1918 but this disaster was to result in the building of a profitable plant in Newcastle, Australia. They had already established a steelworks at Normanby Park in Lincolnshire near to both coal and iron ore. Their Orb works at Newport continued to expand throughout the 1920s and by 1923 this works was the largest of its type in the world, employing 3,500 people. They managed to evade the coal strikes by using coal dredged from the River Usk, and developed their already strong links with the automotive industry and particularly with the Pressed Steel Company, whilst the construction of the grid increased the demand for electrical steel. Lysaghts installed the first mechanical mill in the UK to produce motor body sheets in 1933.[85]

Whiteheads' experience of the war was even more difficult, due partly to its two executive directors being on active service. There was a delay in the building of the Courtybella works until 1919, though the 30-acre site had been purchased in 1913. In 1922 they installed a new type of Morgan continuous hot strip mill purchased from the USA, the first of its type in Europe. Following the closure of the Tredegar Mill, the company centralized all production at Newport. In 1915 they acquired the wire mill of J. C. Hill of Cwmbran and this works operated the first electro-galvanizing plant for wire, which proved to be a great improvement on the old wasteful hot dip method.[86] Cwmbran had evolved from a wrought-iron works which had converted to steel after the First World War.[87] By 1936 Whiteheads were the largest cold roll strip producers in Europe. Both these companies were notable for their very advanced personnel policies, which included profit sharing tied to dividends and company loans.

In the 1930s these two specialist producers were joined by Panteg, which was on the site of a tinplate works acquired by Baldwins in 1902, and became

a steel sheet and galvanizing works with an open hearth furnace. In 1929 Panteg had nine smelting furnaces with a rolling mill, sixteen sheet mills and one plate mill. But it was during the 1930s that the company entered the market for special steels when they installed an electric arc furnace and produced chrome, manganese and silicone steels.[88]

Tinplate, the third group of steel products, was a well-established industry in western Monmouthshire, though it had begun losing its competitive position against west Wales from about 1870. In 1905 there were eleven works in the county containing fifty handmills. As late as 1931 tinplate was still a handmill industry, with the major company, Partridge Jones and John Paton, producing 1,060 tons of the approximately 25,000 tons produced per week in south Wales.[89] It was an industry with a remarkable resilience to international competition, a characteristic noted by the Ebbw Vale unions in 1911 when their advice was sought as to product range.[90] In 1928 exports from Britain amounted to 64 per cent of the world trade in tinplate.[91] But it was a batch industry about to be dominated by flow, a radical change heralded when Sir William Firth, the chairman of the Richard Thomas Company, bought the Ebbw Vale company, including the collieries of the Lancaster Steam Coal company in 1935 and so began the metamorphosis of the tinplate industry of Monmouthshire and Europe.

The change at Ebbw Vale commenced on 1 May 1936 when the task of dismantling the old works began. Brasserts were contracted to plan the new works on the site of the almost derelict shell of the old works to both the delight and the considerable astonishment of the town of Ebbw Vale and the county of Monmouthshire. Included in the new works were two blast furnaces now operating, appropriately for Monmouthshire for the process had begun its long life at Blaenavon about seventy years earlier, on the Thomas or basic Bessemer process, a hot strip mill, cold reduction processes, tinning machines and galvanizing. The decision to choose Ebbw Vale instead of the more advantageously sited Redbourn was controversial and mainly due to the persistence of Firth. It was a decision of utmost significance. For the commissioning of the first continuous wide strip mill in the country in 1938 revolutionized the industry of the county and, in the short run, that of the UK. The new plant was capable of producing 600,000 tons of finished and semi-finished products per annum, which outstripped anything that had previously been seen in Britain and was the beginning of a new era for British sheet and tinplate production. The multiplier effect on the valley was considerable. New railway sidings were built at Aberbeeg, the docks at Newport were much improved, the collieries revived and local contractors revivified.[92] Curiously, but reflecting the north–south communications of the Ebbw valley, the effect on the villages of the neighbouring Ebbw Fach valley was less obvious. There are no mention of these changes taking place five miles away, but over the hills, in the study of Brynmawr by PEP the London research institute.[93]

The commissioning of Ebbw Vale was not an isolated development. It was the centrepiece of a tripartite change in the south Wales steel industry between 1935 and 1947, and a chapter in the history of the rivalry for location which was a key characteristic of the British and Welsh steel industry to beyond the end of the century. This was a game of industrial monopoly played for very high stakes for whoever chose or remained, through a process of industrial inertia, on the worst sites would be the eventual and final loser. The first stage was the development of Guest, Keen and Baldwins integrated iron and steel plant on a coastal site at Cardiff between 1934 and 1936, the next the building of the hot strip mill at Ebbw Vale between 1936 and 1938, and the third, the building of the Abbey Steelworks at Margam in 1947, which crucially increased the width of strip from Ebbw Vale's 56 inches to 80 inches. Each stage was a technological advance on the last but at different sites.

The business changes which produced this transformation had occurred gradually throughout the previous fifteen years, with a jostling of companies engaged in a complex process of take-over and mergers as they positioned themselves for survival. Notably for Monmouthshire, Baldwins and GKN amalgamated their heavy steelmaking plants to form Guest, Keen and Baldwins, while Richard Thomas and Company increased in size from two steelworks and eleven tinplate works in 1920 to seven steelworks and thirty-two tinplate works by 1940.

These changes ran the risk of a repeat of the financial debacle generated by the optimism of the First World War and the post-war trading conditions. But this time the change was better controlled, coincided with a far more prolonged seller's market which continued for fifteen years after the war, and was for the first time, partially but formally, generated by social conditions. The government, through the Bank of England, bore part of the cost and some of the risk with a £6,000,000 loan. For the building of the Ebbw Vale works was the signal not only of a new era in the technology of the steel industry of the UK, but the beginning of transformation in the scale of state intervention on social as well as economic grounds. It was also the concluding chapter of the reign of the autocratic ironmasters of Monmouthshire which had peaked with Crawshay at Nantyglo in the 1850s. Their hegemony now ended with the forced resignation in 1939 of Firth, who, with his predecessor Mills, was probably, and perhaps fortunately for Ebbw Vale, closer to the managerial culture of the nineteenth century than the managerial revolution of the mid-twentieth. The Ebbw Vale site was not only the largest integrated steelworks in Europe, but now a part of another company, Richard Thomas, which was itself beholden to the government. It was a relationship that calls for all the managerial niceties as well as the pugnacious tenacity characteristic of Ebbw Vale. The commentators on the financial future were optimistic: 'Given reasonable assumptions about the course of demand, the economies of Ebbw Vale do not provide any snags.'[94]

Thus the mid-1930s witnessed the intervention of the state in the financing of a new era for the Monmouthshire industry in the mass production of steel at Ebbw Vale, which included the finishing processses of rolling and tinning, a strong position in 'specials' managed by entrepreneurial family companies of Lysaghts and Whiteheads, with a resurgent Panteg and Pontymister managing to survive. The casualties since 1914, despite a peak of unemployment in the early 1930s, when two-thirds of all south Wales steelworkers were out of work, were surprisingly few. Whilst Blaenavon was all but closed, the tinplate industry based on handmills at locations such as Abertillery and Redbrook was staggering, some of the older companies like Hills of Cwmbran taken over, and the Rogerstone almost derelict, the dominant site at Ebbw Vale was soon to experience a massive and phoenix-like transformation.

What is truly extraordinary in this history of coal, iron and steel is the longevity of centrepiece of this history – the iron and steel industry located at the town of Ebbw Vale. The Ebbw Vale works could well have ceased trading within a decade of the invention of hot blast in 1829; accompanied Crawshay's company which he sensibly sold in 1871; departed with the Tredegar works when they became primarily a coal company in the early 1900s, or with the Kennard's Blaenavon organization when the family ceased to be a serious contender in the 1920s. Instead, during the late 1930s, the Ebbw Vale works was at the vanguard of the most radical transformation of the British industry since the inventions of Bessemer and Gilchrist Thomas in the 1850s and 1870s and managed to survive until the restructuring of the European industry of the 1990s.

However, there was a downside. To the coal owners it must have seemed that the superb positioning of south Wales coal in the energy markets of the world would last forever. If a product is everlasting why bother with thoughts of diversification? A little coke and patent fuel was reasonable but petrochemicals was best left to the Germans as they educated so many chemists. To the ironmasters a forward integration into engineering was technically feasible, particularly into civil engineering, supported by the considerable railway investments of the Kennards and Crawshays, but for a variety of reasons the movement was weak. Nevertheless, from the iron industry and steel industry, some secondary industries were established and one of an unusual and even exotic type. It is their development that is the subject of the next chapter.

APPENDIX

Table 4.2. Pig iron output: Ebbw Vale company, GB and south Wales, 1796–1913 (000 tons)

Year	GB	S. Wales	E. Vale	E. Vale % GB	E. Vale % s. Wales
1796	149	34.4	1.6	1.0	4.6
1805	250	72.9	3.6	1.4	4.9
1823	454	182.3	10.4	2.3	5.7
1830	678	277.6	26.2	3.8	9.4
1839	1,249	453.9	26.0	2.1	5.7 (S)
1843	1,211	457.4	33.5	2.8	7.3 (S)
1855	3,218	840.0	51.0	1.6	6.1 (VS)
1858	3,456	886.5	95.8	2.8	10.8 (AVS)
1861	3,712	886.3	51.7	1.3	5.8 (ASV)
1864	4,768	937.6	84.6	1.8	9.0 (ASV)
1867	4,761	886.2	138.7	2.9	15.6 (ASVPp)
1870	5,964	979.2	137.4	2.3	14.0 (ASVP)
1873	6,556	817.8	137.6	2.1	17.8 (ASVP)
1876	6,556	756.1	186.3	2.8	24.6 (ASVP)
1879	5,996	669.9	161.3	2.7	24.2 (ASVP)
1882	8,558	934.4	211.0	2.5	22.6 (ASVP)
1885	7,416	792.8	135.3	1.8	17.0 (SV)
1888	7,999	870.9	178.6	2.2	20.5 (VP)
1891	7,406	760.6	122.7	1.6	16.1 (V)
1894	7,427	708.9	193.3	2.6	27.2 (V)
1897	8,797	804.8	167.7	1.9	20.8 (V)
1900	8,960	848.1	125.3	1.4	14.8 (V)
1903	8,935	815.6	230.4	2.8	28.2 (V)
1906	10,180	900.3	214.4	2.1	23.8 (V)
1909	9,532	742.9	247.6	2.6	33.3 (V)
1912	8,752	755.9	290.7	3.3	38.5 (V)
1913	10,260	889.2	296.4	2.9	33.3 (V)
	GB	S. Wales	Llanwern	Llanwern % GB	Llanwern % s. Wales
1995	15,700	5,800	2,400	15.2	41.3

Source: P. Riden and J. G. Owen, *British Blast Furnace Statistics 1790–1980* (Cardiff: Merton Priory Press, 1995). *1995 Information Blue Books* (London: British Steel, 1996).

Notes: Figures for GB are from Riden and Owen, *Statistics*, Table 1.1. Figures for south Wales are the total annual output figure, ibid., Table 2.1. Riden and Owen calculate this figure by furnaces in blast x annual output per furnace. Figures for Ebbw Vale prior to 1847, but with the exception of 1839, are calculated from the relevant works

figures in the south Wales section of Riden and Owen using the footnote material. All other figures, including that for 1839, are calculated by number of furnaces in blast x average annual output. Average furnace output is a significant obstacle to statistical accuracy for such a small sample. Secondary sources for the Ebbw Vale company are therefore also given, if available, and listed in Table 4.3. The following works are included with the Ebbw Vale company if noted:
A = Abersychan, S = Sirhowy, P = Pontypool, p = Pentwyn, V = Victoria.

Table 4.3. Pig iron production of Ebbw Vale company: secondary sources

Year	Output (000 tons)	Source
1839	35	*Monmouthshire Beacon* (6 July 1839), Johnson's table
1860	97	*Monmouthsire Merlin and South Wales Advertiser* (12 January 1861)
1892	165	Hilton, unpublished, private collection, 15
1901	195	*Kelly's Directory* (Newport, 1901)
1907	250	Company Brochure 1907, WIM 87.1391/3, 9
1914	300	'Souvenir Programme, Opening of New Lock, 14 July 1914', 08235 I 56, British Library

The results are very similar for 1913 (Table 4.2) and 1914 (Table 4.3) The figures in Table 4.3 are higher than those in Table 4.2. This factor reinforces the Ebbw Vale trend in Table 4.2 as being conservative and enables a postulation that between 1839 and 1914 the output of Ebbw Vale as a percentage of the output of south Wales increased from about 6% to about 33%. The precision of each figure must remain questionable. Both series show the same upward movement but should be interpreted as trends only.

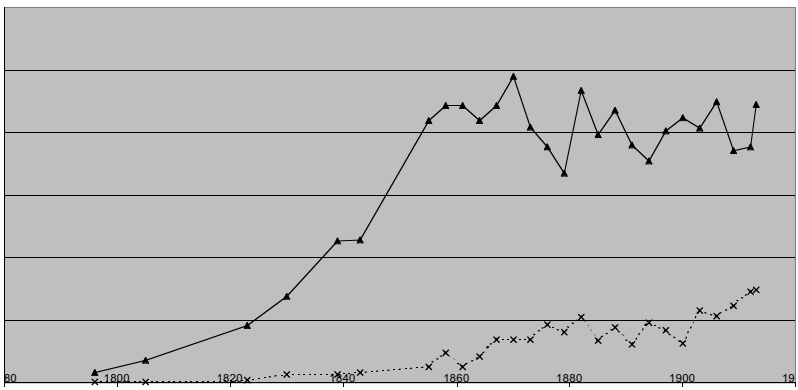


Figure 4.1. Production of pig iron, Ebbw Vale and south Wales, 1796–1913

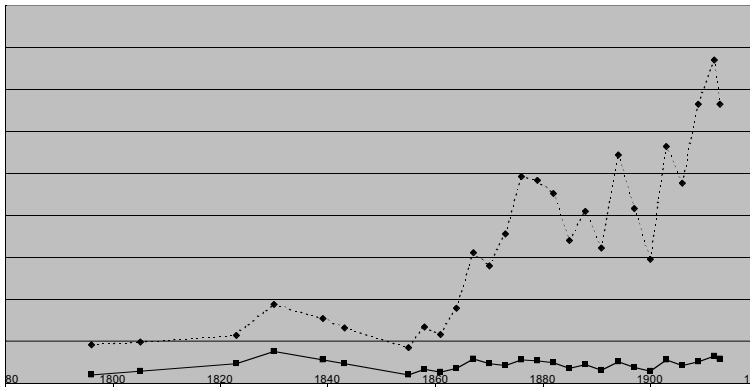


Figure 4.2. The pig iron production of the Ebbw Vale company as a percentage of the production of the UK and south Wales, 1796–1913

5

Secondary industry, 1850–1914

Secondary industry, apart from tinplate and a few small company histories, has received negligible attention from the historians of Wales, though very significantly, in the major conceptual study of the coalfield, John Williams does open the discussion on the development of manufacturing industry. He notes, using the census returns as his analytical base, that between 1851 and 1911, the proportion of the population of Wales engaged in manufacturing was 23 per cent, compared with the British average of 33 per cent.[1] Williams then poses the fundamental question when he enquires whether or not Wales was industrialized; arguably the key question in the study of the integration between primary and secondary industries.

The objective of this chapter is to build on this enquiry by discussing: Why did western Monmouthshire (and especially the Ebbw valley) fail to develop significant secondary and particularly manufacturing industry? The question is crucial to an understanding of the industrial history of south Wales. The development of secondary industries was amongst the few most important and certainly intractable of the political, economic and social problems which faced south Wales in the nineteenth and twentieth centuries and seems well set to continue in this century. A more accurate understanding of this problem may well be the most important contribution that historians can make to the development of Wales; it is fundamental to an understanding of the overarching themes of this history – change and integration.[2]

This issue is developed in three parts. First, the economic setting in which the valley developed is described mainly in the context of the potential of the multiplier effect of the primary industries of coal, iron and steel. Then the growth of secondary industry is described. This section focuses its attention on manufacturing, with a concentration on the Crumlin Viaduct Works, which is amongst the best case studies of diversification in the development of Welsh industry in the nineteenth century. Finally, the reasons for the particular industrial progression of the valley are discussed.

THE ECONOMIC SETTING

There are certain periods and places, such as the Ebbw valleys in the 1850s, when technology and markets are more than even rapidly changed. They are dislocated. In their new-found situation, once thriving industries and companies sometimes gently decay, merge, abruptly vanish or are sometimes galvanized into changing even faster than the new situation with which they are faced, emerging the stronger from their difficulties. The 1960s was such a period in electronics, the 1990s in financial services, but this was by no means a recent phenomenon. The 1880s witnessed the development of small-scale manufacturing based often on medieval craft skills in industries, such as engineering, leather goods and furniture, into mass production, causing unemployment crises in the old centres of these industries, particularly London. The old charcoal-based iron industry of the Elizabethan Weald faced the same problem but the iron industry of Monmouthshire in the 1850s was an even more dramatic example. For the first time, a British industry was faced with the unfamiliar phenomena of both truly international as well as regional competition and a breakthrough in technology.

The seeds of growth of secondary manufacture are to be found in this iron industry of the valley, rather than its coal or the shipping trade of Newport. In these iron companies the disadvantages of a poor location were very clear, probably by 1820, and certainly by mid-century. It is to be expected that there would be some attempt by the iron companies to break out of this economic straitjacket, either by technical innovation or by forward integration into companies which used their product in innovative ways. In attempting to fulfil this ambition they had three advantages. First, the western Monmouthshire companies were technically advanced, particularly those at Ebbw Vale and Blaenavon. As well as its own technologists such as Parry, the Ebbw Vale company was an early innovator with the Bessemer and Spiegeleisen processes, and Brown worked closely with Robert Mushet, who was one of the most brilliant of the steel technologists, based nearby in the Forest of Dean.[3] Sometimes, though, this very efficiency in innovation could turn against them. As noted earlier, Gilchrist Thomas's discovery in the 1870s at Blaenavon enabled the use of phosphoric ores, which were not common in south Wales, and opened the market to many new competitors.

Secondly, the labour market was flexible enough for considerable change. The iron and steel industry is basically an engineering and chemical industry and such processes developed large numbers of skilled men who could fairly easily move into other branches of engineering. This was not a complete advantage. They could also move to other and new centres of iron and steel manufacture. Lastly, the industrialists of western Monmouthshire were used to change in markets, products and manufacturing processes. Theirs was not a stagnant industry. Change had been a constant in the iron industry since its

foundation, giving a reasonably strong tradition of adjustment in the iron industry so as to add value, despite the loss of competitive advantage.[4]

Coal was quite different. As iron entered a new and less advantaged period, coal entered its great epoch of growth, which was to last until 1914. But unlike iron, the potential of coal to establish related industries was limited. The multiplier effect was weak with coal. This primary industry could go forward into some manufactured products, particularly coke, gas and patent fuels, but that was all. In Monmouthshire the deposits of coal were too friable for mechanical cutting, thus making even more difficult this sort of backward linkage. The Swiss or Swedish experience was not to be duplicated, despite the fact that small nations and regions can be competitive in segments which represent an important share of local demand. Swiss firms, for example, have long held a leading position in equipment and services for tunnelling. Similarly Swedish firms have long been leaders in equipment and rock drills for very hard rock. American firms lead in rotary mining equipment used principally for oil and gas exploration.[5]

The curious issue with the coal trade of western Monmouthshire was the disinclination to build on the advantage of a thirty-year start in the sale coal industry over its western competitors. Those early into a market do not necessarily have much benefit from this. However, the potential opportunity changes dramatically if there is a long period of protected consolidation, as there was in the western Monmouthshire coal industry. The fortunate companies then do have advantages, such as being first to reap safely economies of scale, establish brand names and customer relationships without direct competition, as well as choosing and developing the best distribution channels. Moving early can allow a firm to translate an innovation into advantages of other sorts that may well be more sustainable.

Amongst the reasons for this inertia may well have been a lack of leadership when the Morgans of Tredegar became rentiers instead of entrepreneurs, a disastrous transport bottleneck from ironworks and coalmine to port, which was evident by the early 1820s and was to continue albeit in differing forms to the end of the twentieth century, or an early inelasticity caused by what John Williams terms the 'enclave' problem. Intrinsically, mineral export locations have remained enclaves, better integrated with the outside world than with the host economies. They do not favour backward integration.[6] However, the valleys of western Monmouthshire, particularly the Ebbw, were not dominated by coal to the same extent as their neighbours to their west. They had some of the characteristics of enclaves but were certainly not colonial enclaves, in the sense of being completely dominated by external economic power. By the 1850s they contained a large iron industry and a very considerable concentration of engineering competence, probably ranking with some of the most advanced in the nation.

THE DEVELOPMENT OF SECONDARY INDUSTRY

Despite this engineering base, the development of secondary industry in western Monmouthshire was very limited. A few comparisons underline the point. There is no specifically Monmouthshire data but a comparison of south Wales with the nearby county of Worcestershire and north Wales can be made from a parliamentary inquiry of 1871.

Table 5.1. Manufacturing and coal output in south Wales, north Wales and Worcestershire, *c.* 1871 (excluding the iron industry)

Location	Coal output 1871 (million tons)	Coal used in manufacture (tons)	No. of steam engines	No. of types of manufacturing
S. Wales	9.1	157, 109	102	11
N. Wales	2.5	110, 617	39	9
Worcestershire	0	308, 738	112	26

Source: *Report of the Commissioners relating to Coal,* BPP XVIII (1871), appendix to the Report of Committee E.

Note: Coal used in manufacture refers to all manufacturing other than pig, malleable iron and metallurgical works. Tinplate is included in the Worcester returns but not in those of Wales.

From Table 5.1 the dearth of secondary manufacturing does seem more of a south Wales rather than a Welsh phenomenon. In 1871, in north Wales, there was an output of 2.5 million tons of coal, and, in south Wales, just over 9.1 million tons. The former used about 4.4 per cent of its coal output in regional manufacture compared with the south Wales percentage of 1.7 per cent.

Worcestershire, even after deducting 27,400 tons of coal used in tinplate manufacture, used about 75 per cent more coal than south Wales, despite having no local coal. The county also listed twenty-six different types of manufacture, with the largest being bricks and tiles, using 123,767 tons of coal, followed by tinplate. South Wales had failed to develop a small-scale manufacturing industry, as both contemporaries and recent historians have noted: 'The area resembled Wolverhampton in the combination of coal mining, iron and manufacture, it was noted in 1862, but entirely lacked the smaller and more varied manufacture that was so vital there.'[7] Lloyd George's admonition to the Cardiff Chamber of Commerce was as well justified in 1871 as in 1907 when he noted that they 'obtained all your prosperity from the superiority of your mineral wealth – why should not south Wales and Cardiff develop into one of the greatest manufacturing centres of the whole Empire?'[8]

But the paradox was much more complex than Lloyd George discerned, particularly if he had happened to be speaking in Newport rather than

Cardiff, and in 1857 rather than 1907. Engineering lay at the core of the development of not only the manufacture of metal products, but, increasingly as the century progressed, most other things, from food and drink to paper and chemicals. The Ebbw valleys and western Monmouthshire were comparatively highly developed in engineering, but were to experience very weak growth in the development of engineering companies. Compounding the paradox, in the early 1850s the Crumlin Viaduct Works was founded. This was a successful, technically advanced, civil and mechanical engineering company, competing in the most sophisticated of international markets. It is to this puzzle so basic to an understanding of the western Monmouthshire and indeed Welsh economy of the nineteenth century that we now turn.

An acute observer of western Monmouthshire in the 1750s or early 1830s might well have forecast a considerable future in engineering, and perhaps in the other products which were to become dependent on these skills, as well as iron and coal. Richard Pococke, visiting Pontypool in 1756, described a variety of domestic articles manufactured from very thin tinplate. Competitive advantage was derived from both easily mined local iron ores and the new rolling method invented by Hanbury. This allowed the manufacture of tags for the Manchester clothing market, wires, nails and very high-quality Japanned tinplate.[9] The Hanbury success was founded on the profound technical innovation of moving from the manufacture of pig iron to its rolling and then sale, as a variety of consumer products.

In 1832, Thomas Ellis of the Tredegar Company made an early entry into the steam locomotive industry, manufacturing their first steam locomotive and building a further eight. This industry traditionally used iron castings as a replacement for steel, even as late as 1945, in the building of almost one thousand engines produced by the North British Locomotive company.[10] This suggested a very long-lived and highly skilled industry which might have clustered around the Tredegar ironworks, perhaps to rival those of Derby and Crewe or Swindon, despite the disadvantages of its location.

Both of these very early developments grew out of a highly skilled engineering facility within the iron industry which was both considerable, and continually developing through the synergy with its iron and steel parent. Whilst there were only one or two millwrights and smiths in the Ebbw valleys of 1780, there were the eighteenth-century equivalent of development technologists at Pontypool. It was, and is, impossible for a large iron industry to develop without the servicing of a highly competent engineering facility. Not much research has been devoted to this key factor by historians, possibly because of a lack of interest in the engineering industry, as distinct from engineering companies.

The engineering services were located in the large works, particularly those of Ebbw Vale, Tredegar, Blaenavon, Nantyglo and Rhymney. They must have been comparatively advanced in the early nineteenth-century equivalents of

plant, production, design and development services and skilled in the disciplines of mechanical, civil and chemical engineering. In the 1850s, the increased speed of the Bessemer process compelled extensive mechanization when it was installed at Ebbw Vale.[11] By 1907, the engineering facility at Ebbw Vale was building steam locomotives and a 10,000 hp finishing mill engine, as well as servicing a complex of ironworks, steelworks and collieries. Between them in the 1850s the Monmouthshire iron industry must have employed over 1,000 skilled engineers. The Ebbw Vale engineering department, employing 307 in 1907, was described as follows:

> *Engineering.* The engineering department comprises Boilermen, Smiths, Joiners, Pattern Makers, Wagon Builders, Fitting Machine, Locomotive and Spring Shops. It employs something like 350 men, executes new work and carries through repairs for the whole of the Company's Departments. There is now building in this department a new Finishing Mill Engine calculated to develop 10,000 hp. This will be of the 3-crank High Pressure Condensing Type. There is also under construction a new 15'' locomotive. The Company owns 25 locomotives, and as a repairing staff must necessarily be maintained, it is found necessary to have a new loco in course of construction to keep the staff fully employed. – The Company's rolling stock also includes 3,000 wagons. The Coal Wagons are built in the company's own shops, and repairs to all wagons are also executed in this department.[12]

An example of the implementation of this substantial knowledge and skill may be found in the manufacture, in Monmouthshire, of specialist steels. These products are a classic example of the marriage of science and technology. They enjoyed a much higher added value than ordinary steel and adding technical value to the product was a very significant way of compensating for their now-disastrous location. Ebbw Vale had made an early start with Bessemer and the use of spiegeleisen and they were probably in the vanguard of this development. By 1895, as Table 5.2 shows, the newer regions of Cumberland and the North Riding had both overtaken the output of Monmouthshire, but the percentage of the special steels of the total make in Monmouthshire was far higher than in the two other regions. By 1909 Monmouthshire was producing 22,851 tons of special steels. This was around double the Cumberland and approximately four times the proportion of the North Riding.

There was, then, both a long tradition of engineering in the north of the valley and a very large reservoir of skills and knowledge on which a considerable engineering industry could have developed. Other industries did develop, but apart from one vital exception, with a low skills base.

The largest of these secondary industries in Monmouthshire was tinplate. In 1891 there were eighty-six mills in fifteen works, falling to fifty mills in eleven works by 1905.[13] There had been a westward drift from about 1870: in

Table 5.2. Regional production of specialist steels, 1895

	Haematite	Ordinary basic	Specials*	Total	% specials of total
Cumberland	604, 657	13, 546	30, 537	648, 740	4.7
Monmouth	212, 227	21, 883	22, 851	256, 961	8.9
N. Riding	699, 200	1, 296, 077	63, 002	3, 058, 279	2.1

Source: HM Inspectors of Mines, *Mineral Statistics of UK and Ireland* (1896).
*spiegeleisen, ferro manganese, chrome, silicon.

1843 of twenty-three works in south Wales, fifteen were east of Cardiff. Two factors influenced this westward movement of tinplate manufacture. First, more easily available supplies of sulphuric acid were obtained as a by-product of copper smelting in the Swansea area. Secondly, the increasing use of the open hearth method of steel making produced a steel more suitable for tin plate than the Bessemer process, mainly used at Ebbw Vale.

In Monmouthshire, the first tinplate company was founded at Pontypool in 1720. Within the valley, works were established at Pontymister in 1843, Abertillery in 1846, Brynmawr in 1867, Abercarn in 1875 and Blaina in 1879. They seemed to come and go, often on the same site, and were subject to many strikes. By 1936, Ebbw Vale was easily the largest of the south Wales producers, with a capacity of 60,000 boxes per week followed by Elba Tinplate of Swansea with 17,000.[14] At its peak, just before 1900, the tinplate industry in Monmouthshire probably employed around 5,000 people, about 3,500 in the Ebbw valleys.[15]

Bricks, tiles and quarried stone flourished alongside coal and the ferrous industries and their joint product will be seen, perhaps, for many a century in the houses of the valley. The former were produced from the fireclay of the coal measures, where they outcropped in the north and south of the valley. Hunt's *Mineral Statistics* of 1858 state that Monmouthshire produced bricks to the value of £72,000, compared with production to the value of £116,000 in the rest of south Wales. In total, this was a hefty 6.5 per cent of UK production in a total UK value of £2,911,980. The largest producer was the Newport Patent Brick Company with 3,000,000 bricks, 1,000,000 tiles and 1,000,000 drain pipes, followed by Cyrus Hanson at Henlis with almost 3,000,000 bricks and the Ebbw Vale Company with almost 2,000,000.[16] The Ebbw Vale Company continued this business, certainly until 1914, and by 1907 was producing 14 million bricks per annum for furnace lining and house building.[17]

In 1858 there were twenty-five quarries in western Monmouthshire, of which fifteen were in the Ebbw valleys. It was a differentiated industry in price and type of which there were three: limestone, building and paving stone. The quarries at Trefil were easily the largest, producing 55,350 tons per

annum at 1s 6d per ton for building, Risca producing 10,000 tons for limestone flux at 1s per ton and the Mynyddislwyn quarries of Moggridge producing 1,800 tons at 5 to 6s per ton.[18]

The third group were the early engineering companies, which clustered initially not around the primary industries but around shipping, and were located almost completely in Newport. The most advanced technically was the Uskside Engineering Company founded in 1827, when it made chains and anchors. The company then diversified into cannon for the Crimea and, in 1886, when Jones and Stevens acquired the works, expanded into mining engineering, producing cutters, conveyors and winders.[19] They manufactured one of the three winding engines installed at the Celynen South colliery, with the other two being manufactured by Richard Hopkins of Caerleon.[20] The *Newport Encyclopaedia* of 1937 also lists the Dos works which were established in 1835 and manufactured nails, shovels and later rails; W. A. Baker, who specialized in architectural ironwork, the Isca foundry in railway plant, and Braithwaites, who moved into Newport from West Bromwich in 1915, and were manufacturers of structural steel, particularly for bridges, such as the Howrah bridge in Calcutta. Some were attracted from Europe, notably Mannessman, who specialized in tubes and were later to be taken over by Stewarts and Lloyds. By 1914 then there had developed a downstream set of companies who sometimes overlapped with the steel industry but were basically a part of the engineering industry. By 1914 Newport had developed into the largest port in the country for both the import of iron ore and the reception of unwrought iron, which at 317,419 tons was double that of Manchester, the next largest. It did seem as if Newport could develop into a premier engineering centre based on the Monmouthshire steel industry.

There was nothing inevitable in this weak performance which, whilst promising development by 1914, was poor compared to the Midlands, Glasgow and the other great centres of engineering, with a particular lack of great indigenous engineering companies such as Rolls Royce and Vickers, despite early cannon being made at Merthyr and Rolls being raised in Monmouth. Indeed, the two components of a factory economy – steam and precision – were to be found mainly in iron manufacture and textiles. As Daunton notes, as late as 1870, only two sectors of manufacturing industry were affected on any scale by steam power. These were cotton and the primary processes of iron production, which accounted for 30.8 per cent and 22.7 per cent respectively of steam power in factories and workshops.[21] Precision was similarly pervasive, particularly in such crafts as pattern making.

The massive and growing mid-Victorian market for cast and machined artefacts had by-passed the Ebbw valleys and the rest of the county. Typical was the decorative ironwork industry based on the skill of the blacksmith, which, despite the popularity of its products in Wales, and some initiative by

Bakers and Jordans of Newport, found comparatively little development. As a recent history of cast-iron furniture notes: 'The euphoric enthusiasm felt in the nineteenth century for cast iron – led to a desire to make everything, absolutely everything in that material.' Ruskin was being too Ruskin when he stated, 'No ornaments are so cold, clumsy and vulgar so essentially incapable of line or shadow as those of cast iron.'[22] Certainly the Victorian consumer did not agree with him. By the mid-1860s Birmingham had forty-nine foundries producing furniture alone.[23] The historian of this craft in Wales notes: 'It seems ironic that the majority of the decorative examples of the cast iron work remaining in Wales came from Scottish foundries.'[24] Indeed amongst the very finest were the splendid gates from the Kennard works in Falkirk, which were presented to the marquis de Salamanca for his work as an agent for the Viaduct Works in Europe and South America.

There was some movement out of the old staples of rails, bar iron and munitions. The Cwm Celyn and Blaina Ironworks produced gas and water pipes, beams, pillars and sugar pans as well as railroad iron.[25] But such developments were limited. There was little movement into products where entry was technically difficult for many, but almost a matter of technical course for the Monmouthshire iron industry. The manufacture of cast-iron cylinder blocks, flywheels and manifolds for railway or other engines, in an industry where they dominated the manufacture of iron rails in the 1850s, would not have required a very long stride. Neither the Ebbw valleys nor Newport became a centre for such development. Nettlefolds at Rogerstone from 1886 continued the trend of mass production of simple low added value products, depending for their profitability on high volume rather than advanced technical skills and were less dependent on engineers than the iron and steel industry. Even stoves, which are as perfectly adapted to iron and coal as it is possible to be, may well have been imported from elsewhere.[26] The steel industry in the decade or so before the First World War did begin to transform itself but through innovative expansion within the steel industry by those newcomers to the Monmouthshire steel industry, Lysaghts and Whiteheads, rather than forward integration into engineering industry by the old-established companies at the heads of the valleys.

A rich variety of small firms and professionals, servicing the people of the valley, did establish themselves, following the course of increasing prosperity, legislation, entertainment and thirst. The Sun Life company was selling, through its agents, insurance policies in the area very early, teachers became increasingly important after the Forster Act of 1870, and in 1912 the Abertillery Electric Light Theatre with a capital of £3,500 in shares of £1 was founded.[27] Webbs of Aberbeeg was the largest and longest lived of the brewers, continuing as a distribution centre on the same site until 1988.[28] The Brynmawr Brewing Company, incorporated in 1867 with shares of £10, lasted only a few years.[29]

Most of the smaller, highly localized firms had shareholders of local farmers, colliery managers, pit officials, farmers and so on. Many were rather short-lived, such as public works companies like the Abercarn and Newbridge Gas and Water Company with shares of £5 in a nominal capital of £10,000, the Abercarn (Cwmcarn) Welsh Flannel with a capital of £2,000, which continued off and on for many years, its neighbour the Abercarn Glass Bottle Company which used an engraving of the Crumlin viaduct on its produce and the Ebbw Vale Public Hall Company with a capital of £5,000.[30] The larger enterprises were those directly linked with coal and iron, and financed by bankers, ironmasters and landowners. Only they could afford shares of £50 each, though there were exceptions. The butler at Tredegar Park, probably tipped off by his master, bought four shares in the Monmouthshire Wagon Company established in 1853, with a capital of £30,000, together with the far larger shareholders, Crawshay Bailey, Sir Charles Morgan and a few bankers.[31]

Some of the small family businesses were very resilient, such as the Dodds of the Navigation Inn at Crumlin. During the 1870s and 1880s they bought cider from the Hay area and sold it on to the local public houses. Later they became the gas agents for the area, distributing gas to customers in Crumlin and the area.[32] Others came into the area with some capital and skills, such as the Dicks of Llanhilleth from Calne in Wiltshire. They set up as bakers and traded on the same premises for almost 100 years, dominating with Webbs, for almost a century, the bread and beer of the central mile or so of the valley.[33]

Of the cluster of activity growing around coal and iron, easily the most important was the Crumlin Viaduct Works. Their history seems to contradict all the historical conventions of south Wales. Their great bridge at Crumlin was, for the Victorians, probably the most famous single structure on the coalfield. From its very perversity there is much to learn about the industrial tragedy of south Wales. For the story of this company is important both in its own right, as one of the very few medium-sized engineering company histories in British economic history, and for the increased understanding it gives of the causes for the limited development of secondary industry in south Wales from 1780 to the present day.[34]

THE CRUMLIN VIADUCT WORKS

The Crumlin viaduct, the first and most famous product of the works, was opened in style with bands, poems, dinners, speeches and great expectations in 1857. Contemporaries may have been concerned about the lack of engineering in the area but there is no evidence that they were surprised by the founding of the company. The *Monmouthshire Merlin* noted in its issue of 5 December 1884 that, 'These deficiencies (engineering) are remarkable

because every surrounding circumstance favours the locality as a seat of manufacturing', and this would have been even more fitting in 1854. Perhaps it seemed a natural development for the Kennards with their interests in railways and iron manufacture.

The company was founded in late 1853 and was to become one of the most remarkable engineering businesses of nineteenth-century Wales. There were not many competitors. Indeed, in some dimensions there is a reasonable case for including the twentieth century in this claim. The Crumlin Viaduct Works company did not, of course, make the contribution, particularly in employment, of a Hoover, GKN or Lucas and did not achieve their longevity. However, within its time it may well have equalled or surpassed them all in terms of technology, international marketing and logistics.

The company primarily built bridges for a world market. They were to be found from Blackfriars across the Thames to India, from New Zealand to Portugal, from Australia to Brazil. In one year alone, 1871, they built eleven spans weighing 6,800 tons for Buenos Aires.[35] The works manager gave technical evidence at that pinnacle of Victorian technology: the Institute of Civil Engineers.[36] One of its foremen, David Davies, won a Silver Prize for his steam striker at the Paris exhibition of 1878.[37] The Kennards, who started and owned the company for much of its history, operated at the top not only of the iron industry but of railway financing. They functioned on familiar terms with the Rothschilds with whom they both competed and cooperated.[38] Their agents included entrepreneurs like the previously mentioned Marquis de Salamanca, one of the early contractors for American and Iberian railways.

In 1878 the company went bankrupt. By 1888 there was a rumour that they were 'converting these works now a ruin into a tin works'.[39] The works then vanished into oblivion despite its masterpiece of a viaduct standing like some splendid obelisk over its grave for almost another ninety years. By 1937 even official publications, with a shabby inaccuracy, were giving the wrong story: 'for example the Bridge Works at Abertillery (!) built the Crumlin Viaduct and a number of bridges in other countries'.[40]

The participants: the Kennards and Henry Maynard

At this juncture it is timely to turn to the main participants in this history, for the development of this company could not have happened without the intersection of four forces: considerable and successful business experience, money, technology and confidence. An attractive place to settle was a very useful addition. It was very important for the principal innovators to be located near to the works, where they could better take their opportunities for the development of secondary industries. This criterion was well satisfied as

there is strong evidence that the Kennards intended Crumlin both to be their long-term home and to be developed as a tourist attraction.[41]

These resources were amply supplied by the Kennards and Henry Maynard. The Kennards were descended from John Kennard, banker of Lombard Street London. He had four sons and a daughter, and the second son was Robert W. Kennard (1800–70), one of the most remarkable men of his time. He was MP for Newport, Isle of Wight, the builder of major ironworks at Blaenavon and Falkirk, a director of many railway companies and, as noted earlier, an eminent railway financier working with James de Rothschild in the construction of the French railways.[42] He was also seconded by R. Stephenson and Cubitt on his election as an associate member to the Institute of Civil Engineers on 7 May 1850. It was probably his determination, experience and contacts which ensured the company had such a successful start.

His eldest son Thomas (1825–93) was a more restless character. He built Crumlin Hall presumably as a permanent home while building the viaduct, but did not settle long at Crumlin. According to the *Illustrated London News* he departed to the USA soon after the bridge was completed: 'Messrs T. Kennard and George Francis Train arrived by *The Persia* and have gone railroad prospecting in the West taking dogs and guns along.'[43] Thomas's reputation seems more sullied than the rest of his family. The Limerick and Ennis Line in Ireland announced they were suing him for compensation after the government inspectors had rejected his Warren Truss bridges as 'Unsafe, badly designed and badly made.'[44]

The third of the Kennards associated with the works was Henry Martyn Kennard (1833–1911). He directed the company from about 1858 until 1872 and seems to have eased himself comfortably into the role of local squire, shooting on the moors, where he accidentally shot his dog Carlos as well as birds, and giving improving lectures on elocution to the local improvement societies.[45] He was a considerable engineer, being elected a member of the South Wales Institute of Engineers in 1864 and taking out a number of patents. In 1863 Henry Kennard became high sheriff of Monmouthshire.[46]

Of Henry Nathan Maynard we know far less. He seems to have managed the company from about 1858 with Henry Kennard until he arranged a buy-out in 1872 and became managing director and partial owner. He was clearly a brilliant publicist and eminent engineer, invited to give evidence to the Institute of Civil Engineers. He wrote a superb marketing text for the company.[47]

There were three periods in the history of the company. These were the building of the viaduct between 1853 and 1857, the period under the management of Henry Kennard and Henry Maynard, and finally the period under Maynard as the major shareholder.

The building of the viaduct, 1853–1857

In late 1852, the Newport, Abergavenny and Hereford Railway, which later formed part of the West Midlands Railway, put out to competitive tender a contract to build a viaduct across the deep valley of the River Ebbw at Crumlin. The contract was won by the Kennards, the erection of the first length of cast-iron column was marked formally on 3 December 1853 and the viaduct opened on 1 June 1857.

The viaduct was the first product of the Crumlin Viaduct Works company and its purpose was certainly, in part, to be a fundamental marketing promotion for the long-term establishment of these works. In the language of the marketer, the purpose of the viaduct was not only to be profitable, but to build an international profile for the company where it was constructed. There is considerable evidence to show that the Kennards were planning for the development of a long-term business. They built Crumlin Hall, from designs by Owen Jones, one of the foremost architects and interior designers and a favourite of Prince Albert, and they advertised at the great exhibitions of the day.

The business, at least in its earlier stage, was predicated on the competitive advantage of building in iron rather than masonry. This was not a new technology. Darby had built his bridge at Coalbrookdale many years previously. What was new, or at least very highly developed, at Crumlin, was speed of fabrication of components and their rapid construction on-site into an elegant structure. Crumlin was a truly beautiful viaduct and meant to impress as such.

The company's intention was to sell bridges that looked very good, performed very well, with very short delivery times and were cheap in world markets. The *Monmouthshire Merlin* of 5 May 1854, probably fed by the Kennards, states these competitive factors succinctly:

> The piers will offer a very elegant illustration of the advantage of iron as compared to masonry. Instead of huge piles of stone or brick we shall have groups of slender columns – Thanks to iron such a viaduct can be constructed for a comparatively trifling sum whilst the cost of masonry would have been an enormous obstacle to the undertaking notwithstanding its commercial importance.

Most important for the future of the company, the ceremony was recorded with a print in the middle pages of the *Illustrated London News*, that *Picture Post* of the imperial establishment. It would have been seen and admired in the engineering messes of the military, civil palaces and lodges of empire, from Calcutta to Sydney, and by imitators from Rome to Madrid. It was all part of the imperial psyche and Kipling was to even write a short story about

the erection of a bridge, very much in the style of those manufactured at Crumlin and sent all over the empire.[48] This was advertising in its best form – stylish, blatant and quite clear that this was the best on offer.

Consolidation, 1857–1871

The major product of the company was iron bridges but over this period there was a diversification into three other product lines: first, railway signal and switch fastening, second, comparatively large steam-powered machine tools for riveting, striking, drilling and lifting, and third, other civil engineering ironwork such as lighthouses, piers and railway station roofing.

The maximum output was about 200 tons of manufactured iron per week and 'for some time we have actually turned out that quantity which at a profit of £1 10s a ton will produce a yearly revenue of over £15,000'.[49] The average employment was probably about 200 men and boys at the works, though this would not have included managers, supervisors and erection gangs working abroad.[50]

The bridges were usually designed at Crumlin, though one of their largest at Blackfriars (2,700 tons) was designed and constructed by Joseph Cubitt in 1864 with the Crumlin Works supplying ironwork to Cubitt's specification.[51] Other bridges were smaller but still substantial. The bridges for the Llanelly and Llandeilo railway weighed 60 tons, the East Indian 623 tons, the Murray River, Australia, 555 tons, the Pernambuco 364 tons.[52] The number of spans also varied considerably. The Ebro bridge in Spain had twenty-one spans, and the Aragon bridge eighteen spans. The Tagus bridge had sixteen spans whilst the Seisse bridge only had six spans.[53] The bridges also differed widely in the length of their spans. A bridge for North America had one span length of 165 feet and weighed 261 tons, another for England had ten spans of 131 feet and weighed 972 tons. Maynard constantly reiterated speed of delivery as a fundamental advantage of the bridges, 'Not long ago the Crumlin Viaduct took three and a half years to construct. The bridge over the Ebro took eight months and the bridge in Rome one month.'[54]

The second group of railway signal and switching gear products was much smaller and less important. Their interest lies in their natural development from the base product and technology of railway bridges and technology. The third series of products were steam-powered machines. These machines formed the foundation of mechanical engineering at the top end of mid-Victorian technology, and with a little more luck they could have revolutionized the manufacturing economy of western Monmouthshire. These included a self-acting steam striker, which won a silver medal at the Paris Exhibition, a riveting machine which had been patented by Henry Kennard, a drilling machine capable of the simultaneous drilling of 522 holes

and a machine capable of lifting a 2,000-ton ship out of the water for repairs. In this group may also be included travelling cranes, sand pumps and excavators. At every opportunity they were described at engineering society lectures where their customers congregated, such as Maynard's lecture 'On Multiple Drilling for Riveted Boilers, Girders, and other Wrought Iron Works' to the South Wales Institute of Engineers.[55]

Finally, they manufactured and assembled products associated with transportation. These included a landing stage for Wellington in New Zealand, 460 feet in length, lighthouses and a 'Railway roof in Spain 80 feet wide and 230 feet long – the ends are filled up with an ornamental arrangement of plain and coloured glass – at a cost of £2,000.'[56]

During this period, the company was very successful financially, with a sound structure particularly in terms of their lease, and an ability to absorb their overheads by manufacturing to their capacity. At the time of the take-over by Maynard, a letter written in 1871, probably by Bythway, their Pontypool solicitor, confirms this position and this agrees with the prospectus of 18 September 1871 which notes, 'The Crumlin Works are capable of producing about 200 tons of manufactured iron a week and for some time have actually been turning around that quantity, which at a profit of £1 10s per ton will produce a yearly revenue of £15,000.'[57]

Their employment policies seem to have been advanced. They even developed some of their staff for the industry of the valley. The manager of the newly established Abercarn and Newbridge Gas and Water Company was a Mr Taylor, formerly of the Crumlin Viaduct Works.[58] The company trained apprentices. At an exhibition of the Crumlin Mutual Improvement Society a model of a high-pressure horizontal engine by J. E. Rogers, an apprentice aged 16, and a well-executed vertical engine by D. Jones, a fitter, were on display.[59] Their Paris prize has already been noted. This tradition of technical expertise seems to have been firmly established. In the prospectus of the proposed Southern Railway of India, the chief engineer is Mark Carr who had been resident engineer on the Crumlin Viaduct.[60] There are no reports of strikes and the Kennards seem to have been good and highly respected employers.

But it is, above all, in the logistics of designing, manufacturing, shipping and erecting their many and large bridges all over the world, sending out a constant stream from the village of Crumlin, that they are to be most admired. To remain solvent they would have been operating on what is now termed a 'just in time' principle, thereby keeping stocks to a minimum. Unfortunately no records survive of this process.

Decline and bankruptcy, 1871–1878

In September 1871 a new and confident company led by Maynard took over Crumlin Viaduct Works on what seems to have been an amicable settlement with

the Kennards. Their confidence was well founded. At the first Annual General Meeting, reported in the *Monmouthshire Merlin* of 19 January 1872, the shares were stated to have been bought very quickly without going public. Many went to local people. W. J. Davies, a surgeon of Newbridge, took five, Susan Bases, a widow of Newport, bought thirteen and Henry Kennard twenty-five.[61]

Then the Kennards withdrew their support. Why is not clear, though they may well have been short of cash, for in 1872 the Blaenavon company had been refloated. Maynard was extremely assured, stating that 'the works were fully occupied and no more orders could be taken at present'.[62]

Initially, this confidence seemed fully justified. At the first Annual General Meeting, the signals looked promising. At the second meeting in December 1872, by which time the chairman Heyworth had been promoted to major, the company declared a dividend of 15 per cent.[63] This return compared well with even that most consistent of local dividend payers, the Bristol and West Wagon Company at 10 per cent, and was certainly better than the local coal and iron companies. In June 1874 they declared a half-yearly dividend of 10 per cent.[64]

But by 1877 the Viaduct Works was in trouble, and for the half year ending in April 1877, they made a loss of £4,251. More seriously, stock and work in progress was valued at £41,176.[65] They had probably taken on far too many orders for which they were either not being paid or being paid much too late. A case of a few bridges too far. They had run out of cash and were not able to finance the short-term running of their business. Their stock to sales ratio, including work in progress, which needed to be very well controlled for this sort of business, was running at a hopelessly high level. Indeed, in October 1877, Bythway was writing that they required £10,000 to carry on the business, noting that: 'The company has a good connection and with proper care and economy in carrying out its business I believe it will pay well.'[66]

However, it was a bad time to borrow. The Blaenavon Iron and Steel Company was forced into liquidation in 1878 when the West of England Bank collapsed, so that there was no help from the Kennards and the works were heavily in debt to the same bank. Confidence, crucial at such a time, would have been gravely impaired with the nearby Nantyglo and Blaina Ironworks facing collapse. On 21 November there was a creditors meeting, at which, following a proposal by Keen of the Patent Nut and Bolt Company, they agreed to postpone a claim.[67] But the Crumlin Viaduct Works Company was finished. They were passed over for a while to John Paton and Company to manufacture nuts and bolts but it was too late and far too inappropriate.

The Crumlin Viaduct Works was quickly forgotten. Maynard, rather affectingly, gave evidence on bridge construction to the Institute of Civil Engineers in 1880 but then completely vanishes from the view of the historian.[68] There are a few of the more usual remnants, and one marvellous and impressive reminder of this singular and impressive company.

On 25 June 1904 *The South Wales Times and Star of Gwent* reported that R. W. Kennard had presented a cup to be played for annually by the Monmouthshire Golf Club. Then, almost as if to demonstrate the breadth of the Kennards' interest, on 27 August the *Weekly Argus* noted that Mr Martin Kennard forwarded three cases of antiquities from Upper Egypt to Newport Public Library. To mark their international markets, a descendant of the Salamancas was still selling in Buenos Aires in the 1920s, but Rolls Royces not bridges.[69] More significantly and to their great credit, the Kennards laboured on at Blaenavon until 1930 and at Falkirk until 1950.

The marvel is in London. The entrance to one of the largest bridges supplied with its ironwork by the Crumlin Viaduct Works in 1864 has been preserved by the Express Newspapers. There, about 60 feet high in its vibrant Victorian colours, the iron entrance to the long-demolished London, Dover and Chatham Railway station at the south end of Blackfriars Bridge still stands. An ironic memorial indeed from the descendants of the Beaverbrooks to the descendants of the Chartists, though so fitting for Maynard and the Kennards.

The Crumlin Viaduct Works was the only engineering company of any international distinction to be founded in western Monmouthshire in the nineteenth century. What were the causes for this stunted growth?

CAUSES OF THE LIMITED DEVELOPMENT OF SECONDARY INDUSTRY IN THE EBBW VALLEY

Some of the reasons for the very limited growth of secondary industry are quite apparent. The whole of south Wales was one of the most backward areas in the UK in terms of the provision of education. There were limited individual savings as well as limited access to finance; the docks developed very few multipliers into manufacturing, and coal absorbed both capital and land. Other factors are more hidden. These included a deficiency in the key trade of toolmaking, the motivation of the ironmasters and the effect on the reservoir of local skills, as the labour market for skills became both national and international, following the industrial growth of the USA. Much will remain hidden.

Education and training

The study of education and training forms a major paradox in economic and business history. Despite a broad consensus amongst policy-makers of all sorts, including academics, that this subject is one of the most important influences on industrial development, it has received almost no attention

from historians. Perhaps this neglect is related to the indistinct nature of the links between education and economic performance and the need for new and well-researched concepts, particularly the relationship between education and the pressures to innovate and add value, but it is nevertheless a historical oddity. The first rather brief attempt at least to describe the history in its national context by Michael Sanderson was not published until 1999, though south Wales has been more fortunate through the recent work of Gordon Roderick.[70] This chapter aims to begin closing this crucial gap by drawing attention to a few of the more important and obvious issues. Far more research is required, particularly in the comparison of regions, before a more ambitious work can be attempted. Here I look at the two elements of primary and secondary education, with a concentration on the issue of technical education and the links with industrial development.

In comparative terms, the standards of primary education were probably about the same as in the other regions of the UK. Those who attended school and chapel could attain basic literacy and numeracy. Up to Forster's Education Act of 1870, the strength was adult literacy, due to the contribution of the Sunday schools. The 1847 'Blue Books' report noted in Bedwellty and Aberystruth as many adults being taught in Sunday schools as those below the age of 15.[71] Literacy went hand in hand with religious instruction. A generalized adult education did support that given in the chapels, through the formation of often short-lived libraries and literary institutes. The subjects for discussion sometimes reflected the tone of the provision, such as that at Crumlin in 1855 – 'Commerce Considered in its Subservience to Christian Knowledge'.[72] In common with other locations, the valley suffered from both a continuing belief that the purpose of primary education was to fit the masses for their predetermined place in society rather than as a ladder upwards and from the factional difficulties of the established and Nonconformist churches.

The weakness was absenteeism. The census returns of 1851 show 40–49.9 per cent of children aged between 5 and 14 in Newport at school, which was amongst the lowest proportion in England and Wales. In 1896 in Newport, the average attendance at school was again amongst the lowest in the country. The attendance at the valley schools in the 1870s was about the same as Newport. But there were localized advantages. In 1885 the grant per child given by the Mynyddislwyn School Board, which covered the schools in Crumlin, Newbridge, Pontllanfraith and Abercarn, was 17s 4d, against an average for England and Wales of 16s 7d.[73]

The difficulty lay in the continuing absence of a technical education system based on this primary base which would develop the competencies for effective craftsmen, technicians, technologists, managers and entrepreneurs. The training situation was probably stronger through a system of indentured apprenticeship that existed at the major ironworks from the 1860s, though it

was not supported by formal education. Certainly, without such a system, which covered the craft and technician requirements, the engineering division of the Ebbw Vale works of the 1900s, described in Chapter 4, could not have developed. Unfortunately, apart from some hearsay evidence (my grandfather was indentured as a pattern maker at Ebbw Vale in the 1870s), no records have yet been located which describe this system.

The need was very clearly stated. Brough, the mines inspector, summed it all up succinctly in his evidence to a mines inquiry of 1859:

> Education is far more important in Mining affairs than would appear on any superficial view of the subject; we generally obtain from the ranks certain very valuable officers of the pit, that is to say the overman and the deputies – but on their peculiar qualifications depends the lives of the workpeople and often the profit of the employer. It is exceedingly difficult to find men practical in workmanship and at the same time possessed of rudimentary knowledge in physics, chemistry and mechanical appliances; and yet such are the men that we want.[74]

The comment of Sir Henry de la Beche on the evidence of Tremenheere in a coal mining report of 1854 makes the same point: 'When we look at the great value (of coal and iron) it does seem strange that nothing is done in any of these districts to institute aid schools.'[75] These were the beginnings of that long complaint about poor performance compared with the industries of the USA and Germany and its root in an ineffective education and training structure.

This gap in provision might not have mattered so much if Wales had been included in the Schools of Design. These were a major advance in the provision of technical education in the first half of the nineteenth century. They were scattered all over Britain with a government grant of £8,424 in 1845. In Glasgow alone in this year, there were 549 students in Schools of Design, including seventeen pattern makers, thirty-two engineers and fifty-two clerks. In London, one of the principal schools was grandly housed at Somerset House, and students included twenty-eight draughtsmen and engineers, eight architects, and twelve ornamental painters.[76] The funding seems insignificant but was considerable in comparison to the government grant in 1849 of £110,000 for the running costs and new buildings for all primary education in the UK and even more so compared to the £100,000 of public expenditure on all forms of higher education in 1905 – equivalent to the cost of running one naval frigate. These schools were both large and very significant when compared with nothing and when note is taken of those trained. Draughting is the key technical skill of precision engineering. The twenty-eight trained at Somerset House might have made an enormous difference to Monmouthshire.

If this facility could have supported the engineering activity of the iron companies and the Crumlin Viaduct Works around 1850, then the history of

this valley might have been radically altered. For the great deficiency was in toolmaking, that locomotive of engineering craft skills, which was clustered mainly in Manchester, Leeds, London, Newcastle and Glasgow (Table 5.3). There were no companies of any note in south Wales. It was not as if the Welsh had no flair for this sort of thing. Indeed, Samuel Roberts was one of the foremost design engineers and toolmakers of his time, and the Crumlin Viaduct Works was diversifying into this skill. But after about 1860, a move into precision engineering would have probably been too late. The lead established by Maudsley, Whitworth and Roberts, because of the cumulative nature of development in that industry, would have made entry increasingly difficult. Machine tools are self-propagating, with each advance in their development depending on previous improvements.

Table 5.3. Location of principal toolmaking companies, 1797–1912

Location	No.
London	3
Midlands	4
Sheffield/Keighley	4
Manchester/Leeds	12
Glasgow	2
Newcastle	2

Source: Unpublished table, M. Davies, 32 Crispin Way, Farnham Common, Sl2 3UE, UK.

The mechanics institutes were more successful, particularly that of Ebbw Vale founded in 1849, with Thomas Brown as its patron. By 1862 there were classes in a range of subjects from mechanical drawing to Welsh grammar. By 1890 membership had increased to 760. However, as Roderick notes, none of the Welsh foundations were as strong as those at Liverpool, Glasgow, Edinburgh and Manchester which survived as technical institutes.[77] They were certainly not part of a cohesive drive for technical improvement and made very little difference to the formal technical education structure. In the 1913 report on Monmouthshire education a mining school is once more proposed and it is noted that a county engineering instructor 'would find much work to do at Crumlin'. Attendance at evening schools was at 1.9 per cent of the population, as against 2.6 per cent for Wales and Monmouthshire.[78] If technical education was required, then the Mining School at Bristol set up for the much smaller Somerset Coalfield would suffice. Indeed, the first local mining institute was not set up at Crumlin, appropriately in the Kennards' old house, until after 1914, despite mining becoming a recognized academic discipline by 1880. The comparatively weak development of technical

training in south Wales at the craft and technician level may have been due to a hesitation amongst employers to establish training centres from which others could benefit, as it is noticeable that those centres that were established were all company-based.

The number of skilled men developed in the iron and steel industry must have also been seriously reduced as they moved to new centres of iron and steel production in the USA and the north of England. It was easier to move and follow one's old skill in a new area than establish a technically based company in the Ebbw valleys. The labour market had become international at the same time as much of the old wrought-iron industry of western Monmouthshire collapsed. Net migration in Monmouthshire was about 3.5 per cent between 1851 and 1871 and a staggering 9.9 per cent in the next decade.

All of this was aggravated by the situation at the secondary level, where, even if the traditions were not technical, they were mathematical as well as classical. Mathematics was the bridge into engineering. At the secondary level there were no endowed schools for day boys or girls. The nearest was in Abergavenny, and that was of a low standard and too far away. So, even for those who could afford the fees, opportunity was very limited unless they were prepared to board at Monmouth. This disastrous gap in educational provision at secondary level was keenly felt and reflected in the quite vicious fight by the local authorities of western Monmouthshire for the siting of west Monmouth school about forty years later. The county compared poorly with some counties, such as Yorkshire with thirty such schools. The survey of the Taunton Commission uncovered a comparatively hopeless situation in Wales, which was confirmed by the Aberdare Committee, of '28 small endowed grammar schools mostly in remote market towns, inadequately endowed and with a total school population of some 1,500, together with a plethora of private schools of dubious standards'.[79]

This retarded development at the secondary stage was reflected in university education. By 1880 an Irish boy had almost three times and a Scottish boy almost ten times as much of a chance of a university education compared with his Welsh counterpart.[80] This was melodramatically so in the mining valleys of western Monmouthshire. Of the just over 600 Welshmen who had matriculated from the University of Oxford between 1859 and 1881, only fifteen were from western Monmouthshire and twelve of these were from Newport.[81]

From such an impoverished base any improvement would be considerable, and indeed the Intermediate Schools Act of 1889 was one of the most distinct dividing points in Welsh history. The implementation of this Act made a dramatic improvement in the choice of career open to men and women. However, though partly directed at technical education, the Act made little improvement in this activity. In the Ebbw valleys all secondary education was placed in the new intermediate or county schools, with the exception of a few

places at Lewis School. The first school was opened at Tredegar in 1899, followed by Pontywaun in 1900. By 1912 there were just over 700 pupils in the secondary schools of the Ebbw and Sirhowy valleys. In their intermediate objective the schools were soon successful. In 1902, three pupils went from Ebbw Vale County school to the university at Cardiff and in 1909 one boy won an open scholarship to Lincoln College, Oxford, from Pontywaun.[82]

The implementation of the 1889 Act was not only an educational landmark but also one in the history of Welsh gender relations. By 1903, 3,513 girls and 3,877 boys were enrolled in the ninety-three intermediate schools in Wales. In the valley schools of Monmouthshire girls outnumbered boys in a ratio of almost 4:3 (see Table 5.4 below).

Table 5.4. Number of pupils attending intermediate (county) schools in the Ebbw and Sirhowy valleys, 1911–1912

School	Boys	Girls	Total
Abertillery	92	122	214
Ebbw Vale	64	97	161
Tredegar	71	74	145
Pontywaun	92	98	190
Total	319	391	710

Source: PRO, ED 91/29, Board of Education (Welsh Department), *Report on Education in Monmouthshire* (1913). No figures available for Brynmawr.

It was not until the scholarship system of 1906 that English working-class children were to have a free-place system on a parity with that of Wales. Monmouthshire parents paid the lowest fees by 1914 at an average of £2 19s 5d compared with Glamorgan's £4 7s 5d and Newport's £8 5s 0d.[83]

Unfortunately, this remarkable advance was not congruent with local industrial needs. The great success lay in teacher training, where twice the percentage of boys and a much larger percentage of girls entered this profession than in England. This was supported by a higher percentage of boys and girls from these secondary schools proceeding to university than in England. It may well be that the beneficiary was not local but national education (Table 5.5). One set of figures is not a necessary indication of a general trend, but they do give an interesting and important signal that perhaps the occupational patterns of English and Welsh school leavers were diverging.

Lord Aberdare was proved correct in his early understanding of the proposed legislation when he stated, at the prizegiving in 1876 at Lewis School Pengam, 'Such a system (a University for Wales) could not prosper

unless they had a good system of middle class schools.'[84] He was to be disappointed, however, in his hopes for a technical education structure evolving from the Act. In the years leading to the First World War, the civil servants at Whitehall agreed with the Central Welsh Board in their perception of the two principal defects in the Welsh system. The first was that the intermediate schools were too academic, as they were not intended to copy the public schools, and the second that the technical education which had been specifically stressed in the 1889 Act was unsatisfactory.[85]

Table 5.5. Percentage of pupils who proceeded to university or some form of teacher training, other professional, commercial or clerical occupation, 1911–1912

	Wales		England	
	Boys	Girls	Boys	Girls
University	4.2	2.5	2.9	2.0
Teacher training	8.5	22.8	4.2	18.4
Professional, commercial, clerical	42.5	8.9	46.2	16.4

Source: PRO, ED 91/59, Central Welsh Board, *Welsh Education Today and Tomorrow* (1916), 59 and 60.

It is interesting to note that political seems to have been more successful than technical education. The link with the power to improve the course of people's lives was through political change, certainly up to the mid-twentieth century, and not any industrial improvement pushed by the diversification of industries, managed by any technocrats produced by the intermediate schools. The great indigenous personalities of western Monmouthshire, with the possible exception of the chairmen of the Ebbw Vale Iron, Steel and Coal Company, were politicians not industrialists. The Miners' Institutes began their libraries, transforming access to an eclectic collection of books for the next forty years, nourishing the Labour Party at its roots. At the same time as being confident enough to dispute with Ruskin College, the Western valley miners sent Frank Hodges to the Central Labour College and affiliated with the WEA in 1909.[86]

The difficulty was one of matching education structures and industrial needs. The significant opportunities were in the 1850s and the 1890s and both were missed. The result was that, by 1914, Wales was very good at teacher training and very poor at technical education, very good at offering a university education particularly for a mainly working-class country, and very poor at creating an environment conducive to the development of entrepreneurs. The precise links between education and training and economic

prosperity remain unclear, yet clear enough currently for western governments to position education as the priority investment. However, it is certain that poor education limits choice, which was disastrous for the Ebbw valleys. The movement of large numbers of highly skilled workers was into the north-east of England and the USA and away from the Monmouthshire iron and steel industry. Certainly the access to finance, either from local savings or bankers' funds, followed education in its lack of support for the development of secondary industry.

Access to finance

The savings of the middle classes of Monmouthshire were very low in both comparative and absolute terms. This factor must have constrained the opportunities for local people to set up small businesses. Indicators are scarce but reasonably conclusive. In 1846 the average life assurance policy by region for the Manchester Fire and Life Assurance Company given in columns 1 and 2 of Table 5.6 shows Wales 21 per cent below Ireland. Substantiating these figures, columns 3 and 4, which give the average amount in savings bank accounts, places Monmouthshire well below the other counties.

Table 5.6. Average life insurance policies and saving bank accounts by location, 1846

Location	Life insurance (£)	Location	Savings bank (£)
Town	889	Bedfordshire	31
English county	590	Norfolk	28
Scotland	725	Glamorgan	31
Ireland	495	Monmouthshire	24
Wales	390		

Source: For life insurance, R. Dearson, 'Thrift or dissipation? The business of life assurance in the early nineteenth century', *Economic History Review*, 2nd ser. 43 (1990), 246. For savings banks, J. T. Pratt, *A Summary of Savings Banks* (London: Clowes & Son, 1846).

In 1876 the average amount per head of population deposited in trustee savings banks is shown in Table 5.7. The figure for Wales was well below England and Scotland and not far above Ireland. These are very approximate figures, as clearly the census date of 1871 does not match the deposit date of 1876, and the class and wealth structures of the four countries are very different, making comparisons difficult without far more research. A comparison of similar towns such as Newport and Middlesbrough would be

much more appropriate. Nevertheless, the differences are so large (Scotland has savings almost five times higher than Wales) that the comparison is useful as an indicator of the low level of discretionary income in Wales.

Table 5.7. Average deposit per head of population in trustee savings bank accounts, 1876

	Total trustee savings bank deposits (£)	Population 1871 (000s)	Average deposit per head of population (£)
England	6,588,701	21,299	0.31
Scotland	1,995,125	3,360	0.59
Ireland	510,097	5,412	0.09
Wales	198,956	1,413	0.14

Source: *Comparative Figures Trustee Savings Banks*, BPP LXXXIX (1878), 186.

This comparatively tiny level of savings is reflected in the pattern of shareholdings. As Neil Evans points out, 'of shareholders in south Wales mining companies 57 per cent were external to the area – this was far above the national average of 40 per cent'.[87] But access to highly liquid bank or private funds when cash flow was weak seems to have been just as severe a problem.

The difficulty of access to investment is well illustrated by the bankruptcy of the Crumlin Viaduct Works, as it was this factor which was the key to their collapse. If there had been adequate short-term loans, the business would have probably survived. Any company in this sort of trade is likely at some time to find itself with too little cash and too many promises. Selling large pieces of relatively expensive bridge, when too many payments are unexpectedly delayed or late will push the best managed of companies in this direction. These problems had clearly occurred before, with losses of £13,000 in some unspecified year.[88] Credence is given to this interpretation from a review in *The Cape Times* of May 1877 reported by the *Monmouthshire Merlin*, which gave their products and skills excellent reviews at the South African International Exhibition:

> The exhibits of this company are of more than ordinary interest for the reason that they are engaged in some of our public works – The bridge at Bethulie was put up 21 years ago by the Crumlin Company and is now in as excellent order as the day it was constructed.[89]

Further support to this assumption is given by their accounts of 1877 when £10,000 was placed in the balance sheet for a South African contract.[90] It is

unlikely that the company was short of orders. Their problem was one of liquidity, aggravated by the difficulty of timing. They could not have chosen a worse year in the 1870s to have cash-flow troubles than 1878. The only way to compensate for the difficulties of education and finance was through the initiative of the ironmasters. This has been graphically illustrated by the history of the Crumlin Viaduct Works. Only they had the access to finance, managerial and technical skills.

The motivation of the ironmasters

The opportunity for the diversification of Monmouthshire's industry was probably at its greatest in the 1850s and early 1860s. It was then that the iron industry was forced to mechanize on a scale undreamed of previously. This was brought about both by the increase in the size of furnaces and by the introduction of the Bessemer process. Increasing size and complexity brought new ways of handling the ever-increasing size of pieces of metal, requiring large numbers of new devices all needing increasing engineering competence to manufacture and maintain. Armies of puddlers were replaced by machinery: 'Elevated platforms for loading the blast furnace, rails for transportation within the plant and even the forge sheds, overhead chain pulleys and cranes to lift the blooms and finished pieces – steam hammers and analogous large boring machines'.[91] It was the ironmasters who had the resources, and increasingly the engineering competence to diversify. But, with the exception of the Kennards, they either remained in the iron industry, moved out of not only the iron industry but industry completely, or transferred their attention completely to coal.

The reasons for the ironmasters' conservatism was that they were generally not interested in diversification and perceived better returns for their money in investments outside the valley. Their background and character was such that product innovation into the manufacture of sophisticated high value added products from iron and steel could not be expected. Brown was driven by the fascination of the technology of making iron and steel and it is easier and more natural to invest in technologies which are familiar. He had spent his remarkable career in the industry and of the major industrialists was the only one with no advantage of inherited wealth or family background. It was he who drove the technical development of the Ebbw Vale company in the 1850s. Darby, whilst a much more broadly experienced man with all the inherited advantages, seems to have been content to follow Brown's technical lead and, although aware of the opportunities for very fine cast-iron work, showed no inclination to initiate in this or any other product line.

The Ebbw Vale company bought out local competitors, developed technically into the new primary product of steel and became an iron, steel

and coal company basically prospering on the profits of coal. In the process it became the largest coal and steel company in south Wales, though one of the least profitable. It was to remain in the manufacture of rails until the 1900s. By 1914 the Ebbw Vale company advertised twenty products, such as tinplate bars, billets, slabs, flats, rails and general castings up to 40 tons.[92] None were machined.

Crawshay Bailey, at the age of 67, was at the end of his career when Bessemer invented his process in 1856, though he retained an active interest until his death in 1872. He and his brother Joseph's financial interest was increasingly in railway financing rather than railway-making both in the UK and abroad. He was a major investor in the Newport, Abergavenny and Hereford line in 1852 which was to go over the Crumlin viaduct.[93] His decision to sell the company was a very sensible commercial decision and a recognition that the age of iron was completed. The Nantyglo company moved out of both coal mining and the manufacture of iron and became a landlord by the early 1870s, though the process was tortuous. It left Crawshay Bailey with a reputed £4,000,000 and the purchasers with a bankrupt shell.

Kennard, the ironmaster of Blaenavon, was quite different. His background was very broad and included railway financing with the Rothschilds, a time as MP for Newport, Isle of Wight, and the ownership of a considerable ironworks at Falkirk which diversified into iron products such as decorative gates. He also had the advantage of two sons who, unusually for the time, were gifted mechanical and civil engineers. Reading the accounts of that company it sometimes seems as if the fundamental reason for his investment at Crumlin was to satisfy the engineering potential of his sons. The success of the Crumlin Viaduct Works company illustrated that forward integration into engineered products was certainly a sensible option.

The Tredegar Iron company at one time seemed as if it might go down the same road as the Ebbw Vale company. But, after installing the Bessemer process in 1882, it finally became a coal company in 1900, though it continued with some manufacture of rails. This factor, increasingly after the acceleration of deep mining in the 1860s, and overwhelmingly once the lower Sirhowy field had been proved from 1900, sidelined alternative investments in manufacturing. It is this issue that is now discussed.

The competition of coal for investment

With such a powerful market position, other reasons for the failure of diversification began their remorseless progress. Coal pushed out competitors for space in the valley and absorbed any potential skills in the local labour supply. Cardiff was similarly consumed by this astonishing giant of a product and Newport was either too timorous or not prepared to go its own way. Even

shipbuilding could not develop, despite a vibrant and very large ship-repairing industry employing 3,000 men at Cardiff in the 1900s. Thus, though Cardiff and Newport had an advantage over its southerly competitors of Bristol and Southampton in freight margins, with coal offering a bulky outward cargo so that higher value products by weight, such as cereals, could be brought back at very cheap rates, the opportunity was not taken. As Daunton observes, a vicious paradox was at work:

> Merchants were in general agreement that the benefits of outward cargo were rendered void by the congestion of the docks. This was the paradox. Imports might be desired to help pay for the unremunerative docks, but would themselves require a further investment in dock investments which were not welcome – It was Bristol and not Cardiff which eventually found the necessary impetus to provide the necessary import docks at Avonmouth and Portishead.[94]

As an initiator of different industries, transportation was ineffective. Canals, railways, improved roads and docks did not spawn much industry outside iron, steel and coal, though GKN, Lysaghts and Whiteheads may be argued as exceptions. The opportunity for Newport to develop as a major port for the Midlands was excitedly discussed and splendid plans decided, which continued well into the 1930s, but little progress was made. The value of imports to exports in 1880 was roughly the same as in 1914. They increased only with the need to service the output of primary products. The complaint voiced in the *Monmouthshire Merlin* of 2 April 1859 was characteristic of the total period: 'Most of the working classes' hard earnings are spent in food and clothing of which Newport imports no more than a few sacks of potatoes'. The inclusion of Newport for the first time in 1891 as a Blue Book port (a major port as defined by the Board of Trade) was due to it being the largest British iron ore importer, not because it was servicing the Midlands. There was some optimism when Ellerman's, one of the largest shipping lines, decided to make Newport a port of call in 1904, but little came of this venture.

The industries of coal, iron and steel diversified very weakly into secondary industries. When these primary industries declined and vanished so did everything else. One objective of this chapter has been to clarify the reasons for this feeble development. The valley and its county were not nourished by an appropriate and strong education and training system, ease of access to finance and, with the exception of the Kennards, highly motivated iron-masters interested and anxious to develop into unconventional industrial channels. Instead, a demanding, though commercially sensible, coal industry guzzled resources of men and money, for this was the easiest way of making reasonable and occasionally very large amounts of money. At the same time, the largest company in the valley behaved in a manner which was both commercially eccentric, and socially beneficial in terms of the jobs it created

and sustained, but was sensibly disinclined to diversify into engineering. Thus the opportunities for the Ebbw valleys and western Monmouthshire were lost at a time when a comparative advantage in education seemed almost within the rather unwitting grasp of both industrialists and civil servants. It was to be fifty years before the advantage was to return, following the Education Act of 1944, perhaps to depart again even more unrecognized than previously.

Coal, iron and steel and secondary industries, despite operating in an environment which was characterized by discontinuity of technology and markets and therefore opportunities for the quick and sure footed, did not fulfil the promise of the late 1850s. By this date the Ebbw Vale company was early into the technological race, the Kennards had developed a remarkable engineering company and deep mining of coal was strongly established with market trends running in its favour. All of this needed a highly effective transport system to integrate producers and customers so that trading was supported. It needed to be better than competitive systems which did not suffer the disadvantages of a long and narrow valley and a tide rising and falling by 40 feet at Newport. Instead the products of the industries of the Ebbw valleys were transported by a system with a long history of backwardness and corruption, characterized by a lack of integration with industries on which it should have conferred some competitive advantage. Transport supported the geographical disadvantages of the Ebbw valleys. It is this transport industry which is the next subject of this history.

6

Transport

INTRODUCTION

The development of transport was fundamental to the growth of the economy of the Ebbw valleys for it linked the products of both primary and secondary industry with their local, national and international markets. Transport was the system of integration. It needed to be continually excellent if the industry of the valley was to compete with other locations which were naturally advantaged in their geography. For the Ebbw valleys was long, narrow and steep with no natural harbour at its outlet. Any additions to value at the pit or works, as the coal of the valley competed against Glamorgan coal coming on stream after 1830, the iron and steel of the valley against UK competition and increasingly global competition after 1850, desperately needed to be reinforced by a highly efficient transport system of canal, railway and docks. Roads for industrial purposes were far less important, certainly until 1914. Unfortunately, for much of this period and particularly in the key period of industrial opportunity between about 1830 and 1880, transport was very inefficient and for twenty years or so a disaster.

The trends in historical scholarship tend to reflect this unhappy story. Together with the subjects of the Chartists and the iron industry up to 1840, transport has been more intensively researched and described than any other historical subject over this period, due to the work of specialized transport historians at a local and national level. However, there is a marked bias to this scholarship, with a concentration on the period up to 1850, a focus on the technology and chronology of transport in the valley, and a neglect of economic causes and consequences.[1] This chapter attempts to correct some of the imbalance and, in doing so, concentrates on two seriously disregarded issues. First, there is a detailed discussion of the promotion of the Monmouthshire canal in the 1790s and the resulting monopoly of the sale coal trade, with its long-term effect on the economy of the Ebbw valleys and that of its county. For the sale coal monopoly established by the Monmouthshire Canal Company was one of the great commercial advantages in the history of south Wales. Yet it gave rise to a lost opportunity of fundamental importance for Monmouthshire, and altered the direction of the coal industry of south

Wales for almost fifty years. Secondly, there is an emphasis on the importance of the GWR at the end of the period. For between 1880 and 1914 this company transported more coal to England and Cardiff from Newport than the combined coastwise and export trade of that port.

Transport in the Ebbw valleys followed the same sequence as in the other valleys of the South Wales Coalfield, albeit with significant differences in the economic processes of development. This progression was marked by three distinct periods between 1790 and 1914. The first, from 1790 to the early 1830s, was the canal and tramroad age. Initially, this period witnessed a commercial, though suspect, brilliance, which established a strong competitive advantage in the marketing of coal. Unfortunately, this was to be followed by a disastrous management of its affairs for the remainder of the canal company's history. The second, to the early 1860s, was a muddled transitional period between canal and railways and experienced a continuation of local control. The third, from the 1860s to 1914, was the railway age. National companies took over the monopoly of ineffective local interests, and the markets became increasingly national and international as well as local and regional.

THE CANAL AND EARLY RAILWAY AGE, 1790 TO THE EARLY 1830s

In 1795 the industrial weight of south Wales lay in the north and west, and was underlined by the completion of the Glamorgan canal in 1794 and the Neath canal in 1795. In 1797, the opening of the Monmouthshire canal was to shift this emphasis markedly eastwards for just over thirty years. There were two reasons for this change. First, this canal, and to a lesser extent, the Brecknock and Abergavenny canal, enabled iron to be shipped at a competitive price despite the increasingly disadvantageous location of the ironworks. Secondly, much influenced by the geology of the Mynyddislwyn coal seam, a coal economy, based on mining by level and selling with the advantage of a virtual monopoly, captured an increasing proportion of the total sale coal trade of south Wales until 1830.

The Monmouthshire canal, first promoted in 1791 and 1792, resulted in the Company of the Proprietors of the Monmouthshire Canal Navigation being incorporated by Act of Parliament. Its purpose was to make a two-pronged canal from Pontnewynydd in the Afon Llwyd valley to the confluence with the Usk at Newport, with a branch from Crindau farm just north of Newport to Crumlin in the Ebbw valleys. By 1830 they owned the canals and tramroads in the Ebbw valleys listed in Table 6.1, which were connected with another 72.5 miles belonging to private companies and individuals.

The canal was the key to an industrial revolution in terms of industrial output and population growth in the county between 1790 and 1830. Before its construction Chepstow was the county's most important port. In 1791,

Table 6.1. Canals and tramroads owned in the Ebbw valleys by the Monmouthshire Canal Company in 1830

	Date opened	Mileage
Canal from Crindau, near Newport to Crumlin	1798	10.5
Tramroad from Crumlin to Beaufort Ironworks	1798	9.5
Tramroad from the canal dock in Newport to Nine Mile Point	1805	8.0
Rassa railroad from Beaufort Ironworks to Sirhowy Ironworks	1797	2.5
Branch tramroad in Newport from Court-y-Bella Junction to Pillgwenlly	1808	1.0
Tramroad from Aberbeeg to Coalbrookvale Ironworks near Nantyglo	1824	5.5
Tramroad from Risca to Crumlin	1829	6.0

Source: E. T. Macdermot, *History of the Great Western Railway*, vol. 2 (London: Ian Allan, 1989), 58.

only 12,349 tons of produce in total were shipped from Newport, compared with 26,378 tons from Chepstow, which gives some measure of the limited springboard for development.[2] The comparative rapidity and force of the transformation is difficult to judge. The bravest attempts by economic historians to estimate national figures are negated by massive margins of error in their calculations.[3] A comparison with Glamorgan is sounder. The canal dominated the south Wales transport of sale coal throughout the period, carrying 533,408 tons in 1830. This amount was just over five times higher than that of the Glamorgan canal.[4] Iron carried on the Monmouthshire canal between 1802 and 1830 increased from 1,091 tons to 112,647 tons, which was almost 40 per cent higher than its rival, which it passed in tonnage in 1823.[5] The story of this rise to almost complete dominance in the coal trade to the east, lasting for over thirty years, and then its comparative decline over the next fifteen is murky, or perhaps shady is the better word.

It was not an enclosed revolution. Capital came from London and Bristol as well as from local landowners. Labour came from Carmarthen and Cardigan. It was 'ordered that hand bills be prepared and the same distributed to the counties of Carmarthen and Cardigan to give notice that labourers were wanted to work upon the canals and railways and that proper encouragement will be given'.[6] The resulting movement of population was estimated at 1,000 people, which must have considerably strengthened the Welsh-language culture of the valley. Unlike future in-migration this was a Welsh influx, strengthening the homogeneous character of the area, and enabling the valley to culturally absorb more easily the considerable immigrations from the nearby English counties of Gloucester and Somerset after 1830.

Canals, even those built in the same region at the same time by the same engineers, differ from each other in their detail. But, in one regard, the Monmouthshire canal was vastly different from the others of south Wales. It was far more expensive to construct and operate. The original estimate for canal and tramroads was £108,476, but the canal alone was to cost £220,000 and the tramroads another £119,330.[7] Belief in this estimate would have required an inconceivable innocence of civil engineering and finance in the major investors. However, as will be seen, their number included some of the least financially innocent people, not only in the county, but the kingdom.

The investors would have been aware of the opportunity to formalize an existing arrangement that coal shipped from Newport could be delivered duty free to all ports east of the Holms. This awareness must have figured large in the timing and the decision to construct the canal. In this expected lowering of the risk, just possibly by chance, but almost certainly by design, they were completely successful. The arrangement was legalized by an Act of 1797, which gave coal exported from Newport to the east a 5s 4d per ton exemption, and, in addition, a 1s 6d per ton bounty was paid on all other coal sent from Newport coastwise.

This very favourable outcome owed much to the leadership of the Morgan family. They had been considerably strengthened, following some difficult times, by the accession of Sir Charles Gould (1726–1806) to the estates in 1792. He was married to Jane, the sister of John Morgan of Dderw and on the death of his brother-in-law he assumed the surname and arms of Morgan. He represented a radical change in the fortunes of the Morgans and of Monmouthshire. He had been appointed judge advocate general in 1771, chancellor of Salisbury in 1772 and chamberlain of Brecknock, Radnor and Glamorgan. He was Member of Parliament for the borough of Brecon from 1778 to 1787 and represented the county of Brecon until his death in 1806. This, then, was no local inexperienced aristocrat, but an energetic man of 66, very knowledgeable and influential in both the detail of London governance and local politics. He was commercially astute, as is evidenced by his skilful management of his new estates.[8] He had the most appropriate experience and the strongest offer of a role amongst the participants to lead the venture. Above all, he owned some of the key land over which the canal was built, and indeed by the early 1830s 'the golden mile' yielded about £3,000 annually. Not only was his investment of £5,200 considerable. In addition, he sold his son-in-law Samuel Homfray mineral rights over 3,000 acres, insisted on £40,000 being invested in the new Tredegar works and all shipping being carried through the Morgan wharves at Newport.[9] Evan Phillips, the chief agent of the Morgan family, was a competent man in his negotiation of the sale of land for the building of the canal, as were his lawyers in the negotiations of exemption from duty, but it is unlikely that they would have been anything but advisers to the process.

Other investors included Thomas Dadford, one of the most experienced of all the canal builders, who invested £1,000, the Duke of Beaufort, who placed £4,700 and lobbied for the retention of duty exemption until 1830, Wedgwood, one of the sharpest and most successful of contemporary industrialists and an innovator in cost accounting, and the Harfords, business partners of the Homfrays, who invested £8,800.[10] Wedgwood was the second largest single shareholder behind the Harfords, with £7,000 worth of shares. He must have felt extremely confident in his investment, as he took no part in the financing of the local and much more conventional canal which transported his goods from Etruria.[11] The evidence supports a conclusion that this group used the excessively high costs, of which they must have had prior knowledge, to persuade the government to exempt sale coal from duty in order to encourage the coal trade of the area. Not surprisingly, there is no evidence of corruption, though expenses do seem excessive. In 1818 Moggridge and Bowsher were paid £300 on account of their expenses in London.[12]

The decision to build the canal and supporting tramroads was marked by some conspicuous disadvantages. First, unlike some other remote and hilly rural areas, there was only a tiny equivalent of the proto-industrialization of an industry such as the wool of Yorkshire. Further, there was no massive and firmly established coastwise market, such as the Vend which the coal owners of Newcastle had developed in London for sale coal. In addition, there was no experience of the large-scale mining and marketing of coal, even into the essentially local as distinct from national markets of this period.

The cost of the canal would have been a more justifiable investment if the primary industries of sale coal and iron had progressed to an advanced and sure state of development, compared with those in the hinterland of Swansea, Neath and Cardiff. The situation was, however, quite the reverse. The Swansea and Neath region was the major copper manufacturing location in the UK, while Merthyr and its neighbours contained the foremost ironworks. In 1788, of the 12,500 tons of pig iron produced in south Wales, 8,500 tons were manufactured in Glamorgan; of the eight coke blast furnaces, six were in Glamorgan.[13] In the Swansea and Neath area the smelting of non-ferrous metals was established by 1780, with 36,000 tons of copper ore being imported into the area from Devon and Cornwall in 1784.[14] Western Monmouthshire did not begin its dramatic expansion of iron manufacture until about ten years after the building of the canal. The assertion by Dr Griffiths, one of the principal witnesses to the 1810 Committee of Enquiry, that iron was the principal inducement to build the canal is questionable.[15] Coal was probably the primary reason for the construction of the canal. The total shipment of coals from Newport increased from 6,939 tons in 1797 to 64,393 tons in 1804: an increase over a comparatively short period of about eightfold.[16]

These commercial disadvantages were intensified by the topography of the Ebbw and Afon Llwyd valleys which made the canal and tramroads both

Table 6.2. Construction costs per mile of the major canals of south Wales

Canal	Length in miles	Cost £	Cost per mile
Swansea	16.25	55, 000	3, 385
Neath	10.5	40, 000	3, 809
Glamorgan	25.5	103, 000	4, 039
Monmouthshire	22	220, 000*	10, 000

Source: C. Baber, 'Canals and the economic development of south Wales', in C. Baber and L. J. Williams (eds), *Modern South Wales: Essays in Economic History* (Cardiff: University of Wales Press, 1986), 33. D. D. and J. M. Gladwin, *The Canals of the Welsh Valleys* (Oxford: Oakwood Press, 1991), 19, 24, 42.
*The estimate of Dr Griffiths was £300, 000 to build against an original estimate of £108, 000 so that £220, 000 is conservative, *Report from the Committee on the Petition of the Owners of Collieries in South Wales, BPP (1810) IV, 15)*.

very expensive to construct, and, because of their linear nature, limited in their trading. In the southerly section the canal could not follow the convenient course of the river for all of its length, simply because the River Usk was quite unsuitable due to its high tides, for the working of ships at its confluence with the Ebbw and Bristol Channel. This difficulty was increased by the need to have some joint course with the eastern section of the canal to Pontypool so as to obviate the need for two completely separate canals. The Ebbw valleys section of the canal was, thus, forced to climb steeply at a point above Newport before it could follow the River Ebbw for the rest of its construction to Crumlin. This necessitated a very steep incline, requiring the construction of fourteen locks around a complex system of ponds, channels, tunnels and weirs rising 168 feet in half a mile. From Crumlin to Ebbw Vale only a tramroad could be sensibly constructed and, to make a junction with the Sirhowy valley tramroad, necessitated an expensive viaduct. This increased the operating costs well above those of the canals to the west. Compared with the construction of the other canals in south Wales this was exceedingly expensive. It was over twice as much per mile as the next most expensive, the Glamorgan canal, and over three times that of the Swansea canal (Table 6.2). Further, the canal was difficult to continue above Crumlin in the Ebbw valleys and construction never attempted in the Sirhowy valley. Tramroads, which were a more expensive method of transport in terms of carriage, were therefore built from the heads of valleys at Ebbw Vale, Nantyglo and Tredegar to join the canal at Risca and Crumlin, and were themselves linked with a quite complex series of subsidiary tramroads. These did give some advantage, in terms of choice, at the heads of the valley to the ironworks at Blaenavon and Nantyglo. They could either travel south to Crumlin to join the Monmouthshire canal, or east to the Brecknock and Abergavenny canal, where tolls were cheaper. But both Jackman and Baber

agree that the average cost of goods carried by tramroad was about 65 per cent higher than canal transport.[17]

Thus, both capital and running costs were much higher than those of their neighbours. The Glamorgan canal was just over 24 miles long and followed the river into a dock near the old quay at Cardiff fairly comfortably. Despite its inefficiencies and the increased distance of the coal from Cardiff compared to Newport, these cost factors gave a considerable competitive advantage to the businesses it served. Indeed, the canal continued to expand its trade until the early 1860s, despite the competition of the Taff Vale Railway, completed in 1841. These were not complex topographical matters requiring a few packs of surveyor's equipment and a skilled eye to discern. Two short walks by the most inexperienced investor in the early 1790s, between Newport and Risca and Crumlin and Llanhilleth, would have made the costs transparent.

The high costs of the canal and tramroad system were aggravated by the fundamental trading weakness of a linear canal. There were no additional surpluses to be earned through communicating with other canals. Trade was, basically, up and down the valley. It was restricted to the margins on the primary products of coal and iron going down the canal and, increasingly, raw materials such as pit props, iron ore and some consumer necessities transported upwards. This handicap gave no opportunity to develop cross trading with its additional surpluses, using connecting villages such as Crumlin, with relatively easy links to Pontypool to the east or the mid-Sirhowy valley to its west. The limited trading which resulted was in considerable contrast to the development of canals in the Midlands and south of England, where canals gave early impetus to secondary trading. By 1810, not only was the navigable river and canal system of these regions, including London, constructed, it was connected.[18]

It was a good time to enter the market for both coal and iron. The Napoleonic war made for a burgeoning market. This ensured that the advantage was bitterly contested, particularly the inclusion of Bridgwater, which was about twelve miles to the west of the Holms but included on the tenuous rationale that it was necessary first to sail east to reach this port. There were vehement protests from their competitors on both sides of the Channel, forced boardings by customs officers and a government inquiry, but the decision was to stand for over thirty years. The customs even seized shipments of Newport coal to test the case, as it was calculated that the loss of duty in 1808 alone was about £36,000.

Of considerable utility to the Monmouthshire negotiators was the clarity of the Newport advantage. The Act of 1797 formalized an arrangement that 'for time immemorial Coal and culm have been carried and conveyed to the said river Severn, from any of the ports or places eastwards of the islands called the Holms duty free'.[19] This was grudgingly supported by the Chepstow customs officer, examined by the 1810 Parliamentary Committee, who stated

that no duty had been paid from at least 1740, though no books existed prior to 1779.[20] This was not a unique exemption, as there was a similar dispensation on the Firth of Forth. It gave Newport an exemption of 5s 4d a ton on coal compared with competitive ports, particularly Cardiff and Swansea, and had only decreased to 4s per ton by 1827. This enabled 1s 6d per ton bounty to be paid to shippers, which included 3d per ton to captains for coal shipped westwards. This was paid partly by individual owners, and partly by a consortium of owners through Salsebury's bank at Newport, so that their coal was given priority for shipment over their competitors.

The precise financial advantage is difficult to estimate, as contemporary accounts of costs and prices for south Wales are both very scarce and very variable, but are reasonably estimated at between 50 per cent to 100 per cent. A few examples substantiate this figure. In 1810, the selling price delivered on board was stated as 7s 2d per ton at Swansea.[21]

> At Bristol it is notorious that Newport coal is there put on board at 11s a ton, while from other collieries in the Bristol Channel, coal of equal value is shipped at 6s 3d a ton only. Great as the disproportion may seem, yet when the coast duty is added say 5s 4d a ton an insuperable bar presents itself to all competition.[22]

In 1833 Latch was buying good-quality coal at 6s 9d per ton delivered on board at Newport.[23] By 1842, coal prices delivered on board at Swansea were between 5s and 11s depending on quality and these would have only differed by a few per cent in 1830.[24] Coal prices in Newcastle for coal to be shipped to the London market were higher at 10s 6d and might well have been competing to a slight degree with Monmouthshire coal at the western edge of the London market.[25] An additional perspective may be obtained by considering that the duty, at 5s 4d per ton, was well over double the price paid to a collier of about 2s for a ton of cut coal.[26] In their turn, collier costs ranged between 33 per cent and 64 per cent of total mining costs between 1717 and 1830.[27]

This curious and intensely unfair trading advantage probably continued, despite vehement opposition, for three reasons. First, there was the able lobbying of the Morgans and Beauforts who were influential in continually placing the case of the company before Parliament. They were thanked, in July 1825, for 'ensuring that the Duty Act was not repealed'.[28] Secondly, there was the need for income by the government which would have decreased with the abolition of duty. This was aptly put by the Duke of Wellington in reply to a pleading by the Marquis of Londonderry for abolition of customs duties on the Tyne and Wear in 1830: 'The interest on debts is not paid, and troops are not supported without money, and money cannot be found to pay these demands without taxes.'[29] Lastly, there was inertia, particularly when change was confronted by legality. This was well summed up by the answer

to their competitors in 1810: 'The Monmouth Canal having invested their capital on their faith of their exemption, it would become a hardship to now interfere with it, and the aggrieved should have made their case known earlier.'[30] There may also have been some fear that, without high profits, investment in a capital industry would be at risk, thus threatening its development. This was the case put by Buddle, the most influential coal-mining consultant of his day, to the 1830 select committee.[31] The advantage continued until 1830 when the Act was repealed and followed in 1831 by the abolition of all coastwise duties.

The impact of the canal on the history of the valley was dramatic and, for some, very beneficial. The construction of the canal established firmly and quickly the fortunes of the Morgan family until 1914. Its general result on the coal industry of the valley was, however, much less certain and perhaps disastrous. The seeds of decay were seemingly encapsulated in the success of the canal. For almost the next fifty years the southern part of the valley was characterized by minimal investment in coal and transport. The advantage of the exemption from duty was not matched by an early investment in deep mining, a marked consolidation of the level companies, or much improvement in the quality of transport.

The causes for this calamity are reasonably clear. The interests in the iron and coal industry of the time were far too diverse to be integrated. The iron-masters and coal owners wanted cheap rates, the canal asked for and obtained expensive rates. Furthermore, the committee of the canal company seems to have become increasingly dominated by local landowners divorced from industry. In attendance at committee meetings by 1816 were Waddington, Capel Leigh, William Morgan, Leyshon, and the Reverends Tate and Lewis.[32] The problem with monopoly is that monopolists eventually come to believe that they have found the 'Holy Grail' of certain and continuing profit. All they need do is continue with the way things are and are supposed to be. Unfortunately short-term yearly profit is then apt to conflict with the much more important matter of long-term prosperity and the result is a series of self-inflicted impasses. So it was with the Monmouthshire Canal and Railway Company. They quarrelled with the coal owners over rates, they quarrelled with Benjamin Hall and Bailey over their tramroads, they quarrelled over wagons, and up to 1830 refused to believe that the old and marvellous game was lost. Protection was still easier to understand than adjustment, even if their duty advantage was a lost cause. In March 1830 the proprietors resolved:

> To obtain a copy of the plan of the Marquis of Bute intended ship canal from near the mouth of the river Taff into Cardiff Town.
>
> Resolved that 'As soon as a copy of the Marquis of Butes plan is obtained, a deputation from the Special Committee shall attend in Bristol with a view to engage those concerned in trade and shipping there in opposition to the intended canal.'[33]

Perhaps it was all too easy. Entry to this sale coal market was relatively cheap because the geology of the Mynyddislwyn seam determined that the coal could be accessed by level. This factor more than compensated for an uncertain profitability. For, despite the bankruptcies of Jones at Risca and Salesbury at Aberbeeg, at least sixty levels were developed, all able to send their coal coastwise with minimal external competition up the Severn valley and across to Bridgwater. Further, they were well placed to supply the iron industry in the north of the valley. There, in times of high demand, the ironmasters could add to their own coal resources by purchasing coal from the southern valley. In a sense, the sale coal area acted as a permanent stock to the northern ironmasters. They could simply increase their orders from the south, if their own pits were temporarily overstretched. Industrial co-operation was difficult amongst so many small producers and confined to the development of Newport, though, even there, acrimony was always bursting through between trader and trader and between trader and others. The tenor of the trial Frost v. Prothero in 1822 was not untypical of the many lawsuits, though Frost, later a Chartist leader, and his opponent Prothero, a Newport lawyer, had a particular hostile relationship.[34] The legacy of this early advantage was not orderly development but chaos, perhaps even more wretched than the northern Monmouthshire iron towns or Merthyr, and financed and managed by what Gwyn Williams described as 'a shoestring plutocracy'.[35]

Less easily obtainable entry may well have reduced the number of operators and concentrated capital accumulation, which could have resulted in an earlier start to deeper pits, as well as larger companies involved with levels. As it was, deep mining was much delayed and did not occur north of Risca until the sinking of the Alfreys pit at Abercarn in 1835, and even then further progress was slow and halting until the 1850s. The development was quite different from that of the north-east of England: 'Which retained its supremacy by virtue of its ability to generate both the large scale organisation and the technology necessary'.[36] In that area deep mining of coal was established by 1800 and very deep mining of coal below the magnesium limestone began in eastern Durham from the 1820s. This progress resulted in the first raising of coal from Monkwearmouth in 1831 and rapid development of deep mining after that date. Even the historian Wilkins, ever anxious to please his readers, writing in 1888, seemed disconcerted by the progress up to 1830, evincing surprise at the small amount of coal sent from Newport, 'considering at this time the port enjoyed an exemption from the coal duty of four shillings per ton'.[37]

The docks followed the canal in their neglect and it could not be otherwise. If the components of an integrated transport system develop at different rates then bottlenecks are the inevitable result. The matter was certainly discussed. In 1797, 'the wharfs, quays and landing places of Sir Charles Morgan were

large enough'.[38] There was a suggestion to build a dock at Newport in 1811 at a meeting chaired by Morgan in London, but the cost of £120,000 was thought to be prohibitive.[39] The dock was not to be constructed until 1835. Even so, in 1842, there were only four acres of docks, which shipped just over 11,000 tons, while almost 550,000 tons were shipped in the river.[40] The Morgans did not follow the innovative lead of their predecessor, the canal-building Sir Charles Morgan who died in 1806, which was a misfortune for the valley. The new bourgeoisie needed leadership not accommodation, another entrepreneur not a rentier. The industrial spirit had indeed declined at least in this family, though this may have been due to the stupidity of short-term greed as much as the complexity of the culture described by Wiener.[41] Whatever the reason, the consequences for western Monmouthshire were serious. Transportation and mineral industries are symbiotic and once this symbiosis breaks down, as it did shortly after the construction of the canal, further development is stultified. This was a key factor in the differences in aristocratic involvement in Monmouthshire and Glamorgan. The Morgans of Tredegar compared poorly with the Butes, particularly the second marquess, as developers and investors, not only in the construction of docks, but as the channel for people and ideas between the more advanced coalfield of Durham, the port of Newcastle and the Clyde and south Wales.

THE PERIOD OF TRANSITION, THE 1830s TO THE 1860s

Those in control of the future of the valley continued to bicker in a seeming vacuum of power. The canal company bickered with the coal owners, the coal owners quarrelled with the ironmasters, and Powell, after suing the Morgans, and an early start at Aberbeeg, left to start his empire in the Cynon valley. As a result the situation worsened. Blewitt tried to construct a competitive railway with a link through the mountain between Pontypool and Llanhilleth.[42] The most detailed description of the transport system in the valley in the 1840s was written by James Brown, brother of Thomas Brown and a distinguished engineer. He described both the state of the canal and tramroads and the decline of the trade upon them as a disaster, with the rates being well above those of the Taff Vale and other railroads. This was both because of its calamitous condition and the resultant breakdowns in tram axles, as well as the very high rates charged.[43] The comparison with the contemporary success of the Manchester to Liverpool Railway opened in 1830 despite enormous difficulties of geology, competition with the Bridgwater canal and the drama of Huskisson's death, makes dismal reading

By 1845 the old sale coal area was seen to be in a serious position and parliamentary evidence described the sale coal as close to exhaustion. In 1916 an article in *The South Wales Coal Annual* notes that in 1848 the general

manager of the Taff Vale Railway, when giving evidence before a select committee of the House of Commons, assented to a description of the Monmouthshire valleys as 'Old valleys in which coal had to a great extent been exhausted – and that instead of there being an increase in the mineral traffic it must be supplied from other quarters – by far the greater proportion was worked from outcrops.'[44]

Thus, although the canal and the advantage of exemption from duty established Newport as the major coal and iron port of south Wales for almost fifty years, no long-term advantage was taken of this dominance. It was as if all the energy and intelligence had been expended on the construction of the canal and in ensuring its highly protected position. Despite the very clear need, no docks were built until after duty was abolished, and the Town Dock was not opened until 1842. This facility was completely unable to deal with the trade, which between 1833 and 1858 expanded from 387,383 tons to 683,378 tons shipped from the port.[45]

An enlarged dock was opened in 1858, in which the Monmouthshire Railway and Canal Company invested £34,000. But this was, again, too small, increasing the area to only 12 acres compared with the eventual size of the Alexandra Dock of about 130 acres. These efforts were in marked contrast to Cardiff, where the West Dock at a cost of £350,000, opened in 1839 ahead of traffic, and where the Taff Vale Railway Company both removed the canals' hold on the region's transport system and speeded the development of the docks. As will be seen, in western Monmouthshire the railway built by the Monmouthshire Canal Company was more of an irritable submission to progress after a long period of pressure by the iron and coal companies of the valley.

The delay in Newport was not because of an obvious lack of return on the investment in the canal. The rate was reasonable, even after the duty was removed. Dividends averaged 8.3 per cent between 1799 and 1847, which was less than the Swansea canal at 10 per cent and Neath at 16 per cent. However, it was better than their most important rival, the Glamorgan canal, which was limited to 8 per cent by statute.[46]

The commercial, if suspect, brilliance of the construction of the canal was not to be repeated and was replaced by caution and the short-term comfort of adequate returns, which was a key characteristic of the uneasy relationship between Newport and the Ebbw valleys between 1800 and 1914. Unlike, say, Bristol and Liverpool, whose genesis as modern ports was founded not on their hinterland but on the external factor of the slave trade and a mass of products apart from coal and iron and including shipbuilding, Newport was completely and continually the product of its hinterland. For both to prosper they needed to work in an efficient commercial consensus. Unfortunately, this was not to be the case for much of the period.

The response of the canal proprietors and the coal owners to the ending of their monopoly was confused. It is difficult, from the squabbling of the

differing interests, to discern clear commercial responses. However, four are reasonably distinct. The first was to keep the amount of coal transported down the canal steady, against a rapidly increasing volume transported down the Glamorgan canal. If margin per ton, as well as number of tons sold, were to decrease, this would create a dangerous spiral of decreasing profitability. This constancy was achieved with a small increase of 4.6 per cent over the next ten years but it was tiny compared to their now-rampant Glamorgan competitor's increase of 134 per cent, as is shown in Table 6.3.

Table 6.3. Increase in tonnage shipped on the Monmouthshire and Glamorgan canals, 1830–1840

Canal	tons 1830	tons 1840	Increase tons	% increase
Monmouthshire	533,408	558,104	24,696	4.6
Glamorgan	106,170	248,484	142,314	134

Source: J. Williams, *Digest*, Transport 2. Note that the figures for Glamorgan include the amount carried on the Taff Vale Railway as well as the canal.

The second response was to construct the dock at Newport, which received assent as a bill in 1835 and was completed in 1842. Unlike the initiative of Bute West Dock at Cardiff, it was not built ahead of the traffic but in response to the competition of Cardiff. The Newport Dock was a case of too small, too late. Despite the construction of the railway, there was no integrated transport policy between railway and docks, and, indeed, the docks suffered years of neglect, with the books not being balanced between 1845 and 1856.[47] The Newport rates were excessive, overplaying to a huge degree, the advantage of geographical convenience.

The third response was to reduce maintenance costs on the canal, while at the same time fighting the construction of a railway. In a minute of the board of the Monmouthshire canal on 22 November 1836 it was 'Resolved that it is expedient for this company to give the projected railroad every possible opposition.'[48] The fourth response was to reduce wages, either directly or through truck. As Wilks notes from the R. H. Franks Enquiry:

> Prices were marked up by 15% to 20% in the Company shops. – The truck system of dealing is so common in the collieries of this district that our markets are closed; in the village of Blackwood the whole supply is monopolised by the company shop. The market house is closed. There is a terrorism existing over the men and they dare not speak out.[49]

The only long-term answer was to build a railway connecting the valleys of western Monmouthshire with Newport. This could either be built by the

canal company, who refused to initiate such a scheme, or by the exasperated rival traders. In 1843 the traders projected their scheme led by the mid-valley land and coal owner R. J. Blewitt MP, cousin of the proprietor of the *Monmouthshire Merlin,* and supported by regional banks, the National Provincial and Crawshay Bailey. The proposal was to build first from the Newport Dock to an intended passenger station at High Cross. The line would then proceed east to Cwmbran, up to Pontymoile and Abersychan and into the grounds of the Varteg works. Connecting the Afon and Ebbw valleys would be a tunnel of 2,420 yards through the Llanhilleth mountain to join up with a line to Nantyglo but not to Ebbw Vale: 'the main line of the railway will be double from Newport to Pontypool, with a double line to communicate with the wharfs from Jacks Pill to Newport Bridge, and the remaining branches will be single line'.[50] The total cost was estimated at £275,000 and the company was incorporated in 1845.

The battle was fought by the new company on two grounds: first, the very high cost of transport down the canal, and, secondly, the poor state of the system. The attack was bitter and sustained and despite its obvious bias does show the desperate and hopelessly uncompetitive state of the transport system of western Monmouthshire throughout much of this long and messy transitional period. Blewitt opened the attack in the *Monmouthshire Merlin* of 7 January 1843:

> Notwithstanding the comparatively trifling cost of opening and working the coal, the expense of bringing it down to Newport is one of the most extraordinary phenomena in the history of mining affairs – the coal travels principally on the tramroads and canals belonging to the Monmouth Canal Company and their charge for tonnage alone is at the rate of 1.1/4p per ton per mile. This has been the rate for some years past. It is higher than that enacted by any similar concern in the Kingdom and the freighters have accordingly been loud in their complaints. But if the charge for tonnage is higher, the accommodation given in exchange is still worse. The tramroads are in such a wretched state that the freighters who find their own tram wagons calculate that the expense of keeping them in repair at not less than 3s per ton.

Blewitt estimated comparative costs, as shown in Table 6.4.

Table 6.4. Costs in pence per ton mile of four transport companies

Carrier	Cost
Monmouthshire Canal	1.25
Taff Vale Railway	0.87
Liverpool Manchester Railway	0.55
Stockton Darlington Railway	0.38

He finished by estimating the very high cost of pilfering because of the unguarded trucks and barges and shaking due to the desperate state of the line at 1–2s per ton. Never one to mince his words, he attacked the canal company elsewhere as mere adventurers. 'The carrying traffic – is almost monopolised by a company which 52 years ago, obtained from parliament the most arbitrary powers for making canals and railways ever granted by any legislative to any set of adventurers.'[51]

James Brown, the consultant engineer of Newbridge, wrote the most reasoned description of the disastrous state of the transport system:

> On most other railways the side spaces average from 5 to 6 feet – On many places on your tramroads there is not more than 2 feet from the tramplate until you are at the edge of a wall – or precipice – Since the introduction of locomotive engines on your roads, the number of accidents from the bursting of boilers – or other misadventures outstrip those of all the railways in the country. – On the GWR not a single axle was broken between Jan 1842 and October 1845. Upon your roads with the breakages cannot be less than fifteen to twenty weekly.

Brown then compared the situation with the Taff Vale Railway where he noted that the carrying of coal to Cardiff between 1841 and 1846 increased 79 per cent, whilst in Newport it only increased by 2 per cent.[52]

At last, this threat induced the Monmouthshire Canal Company to apply to Parliament to make a new railway from Newport to Pontypool and become carriers. They obtained this authorization under the Newport and Pontypool Railway Act of 1845. Soon after, they arranged to sell their whole undertaking to Blewitt's Newport and Nantyglo Company. Unfortunately the buyers timed their purchase with the railway panic of 1846 and were unable to continue. The Monmouthshire Canal Company, who were one of the most undeservingly fortunate companies in railway history, kept the deposit of £20,000. However, because of their negligence and delay, their dividends were restricted to 5 per cent for the next ten years.[53]

In 1848 they obtained an amending Act which marked the beginning of the modern railway age in the valley. Their ineffective and disreputable history dogged them for a while. An investigative committee was established in 1851 to inquire into the affairs of the canal company, going back as far as 1821, and though Roscoe was accused of serious malpractice and even Sir Charles Morgan seems to have been sued by the company in 1831, nothing came of the matter.[54] It was time to start another phase. The luckless Blewitt, following his bankruptcy, went abroad. He was to suffer considerably from mental illness and an unhappy lawsuit with his own family.

The Act which changed the name of the company to the Monmouthshire Railway and Canal Company released them from the obligation of providing wagons for mineral traffic, and set a date of 1 August 1849, after which horses

were banned and only company locomotives were to be used on the line. The process of conversion was clumsy, with at one point eight locomotives failing, but by 1852, passenger and freight were operating from Newport to Nantyglo and Ebbw Vale. In 1855 the Eastern and Western Valley lines were joined at Newport, though it was not until 1858 that the last tramroad disappeared and the company used modern conventional railway lines with locomotives from Newport to Nantyglo and Ebbw Vale.

THE AGE OF THE RAILWAY, FROM THE 1860s TO 1914

This was the classic age of the railway when, with institutions such as the empire, and the Royal Navy, the railway symbolized the confidence and seeming continuity of Victorian and Edwardian Britain. The internal combustion engine was a competitor for only a few years and then rather exotic and not to be taken too seriously. However, for western Monmouthshire perhaps more than for much of the UK, the role of the railway both as consumer and transporter was not only conventionally important and symbolic: it was fundamental. For it pushed the pattern of coal trading into a quite different direction from that of the other valleys of south Wales.

Just before the beginning of this period, a dramatic harbinger arrived with the establishment in Crumlin of the Viaduct Works in 1853, which constructed the Crumlin viaduct in the 1850s and quickly established itself as one of the premier international railway engineering companies. This business was discussed fully in Chapter 5, but it is useful to note here that the works and its viaduct did place into high relief two characteristics of transportation in the Ebbw valleys.

First, there was its tardy development. At the same time as the clumsy transition from canals to railways was taking place, one of the most significant British civil engineering works of the mid-nineteenth century was being built over the River Ebbw in mid-valley at Crumlin. The most advanced railway construction was witness to the most laggard and business owners were leaving the valley:

> That some of the most influential firms and merchants are leaving the area there can be no doubt. Mr Powell is already sending a large portion of his coal to Bristol and the Ebbw Vale Company have recently sent a large quantity of iron to Bristol. – The directors have increased duty on coasting vessels in the last three months by 50 %. A ship with the same cargo would pay Bristol £140, Gloucester £ 96.5s, Hull £122.10s, Liverpool £105 and Newport £234 12s 8d.[55]

At the meetings of the Dock Company, the reformers, led by Bailey, were continually outvoted by a group led by the reactionary Cartwright. At a

crucial meeting on May 1860 the board voted 13 to 8 against equalizing the rates with Cardiff. This effectively delayed modernization until the arrival of Elliot in 1868. Crawshay Bailey was irritated to the end of his career with the small coalowners like Cartwright. The meeting of the Newport Dock Company which discussed Bailey's motion to reduce the rates is amongst the most useful in Welsh business history for those interested in margins, volume and profitability.[56]

Secondly, the viaduct was a dynamic symbol of cross-valley communication and the invasion by the large, powerful and increasingly national railway companies who followed the coalfield as it developed. The viaduct was built by the Newport, Abergavenny and Hereford Railway Company which, in its turn, was promoted by the Great Western. It joined west Wales and Swansea via Quakers Yard with the border country and gave an alternative route to the Midlands. In the north of the valley, the London and North Western Railway (LNWR) was moving rapidly into south Wales through the Merthyr, Tredegar and Abergavenny Railway Company, and took over the Sirhowy Railway in 1876. The history of railway transport in the Ebbw was now part of this national and south Wales story. 'By the end of the 1860s, the eastern part of the coalfield was well provided with valley railways mainly leading southwards to the ports, but also with east–west connecting lines, making a grid-iron pattern.'[57]

By this date, the pattern of transportation was set for a hundred years, with only a few significant modifications until the Beeching cuts of the 1960s. The railway map of 1910 shows western Monmouthshire divided between the GWR controlling the Ebbw and Afon Llwyd valleys and Newport, and LNWR dominating the rest of the industrial part of the county.

The Sirhowy tramway became a railway under the Act of 1860. After 1871 its trains ran into Newport Dock, connecting the Cynon valley with Newport via Pontllanfraith, though because of the take-over of the Sirhowy Railway by LNWR in 1876, it was not completely converted to a railway until 1912. The branch between Nantyglo and Brynmawr was finally settled in the mid-1870s but only because the invading LNWR had been pressed to withdraw. The Halls Road tramroad, which ran approximately between Risca and Manmoel and joined the Sirhowy and Ebbw valleys, was used jointly and often acrimoniously by the GWR and LNWR after its purchase by the latter in 1875. The northern towns continued the option of Crawshay Bailey's tramroad to the Brecon canal by becoming part of the LNWR as a way of transporting their iron and coal west as well as south to Newport. In 1875 the Monmouthshire Railway and Canal Company became a part of the GWR and the companies were legally amalgamated in 1880. The GWR paid a high price, though the dividends, between 5 and 6 per cent, were reasonable until 1914.

The date of 9 January 1886 was possibly the most important in railway transportation between the purchase of the Monmouthshire Railway and

Canal Company by the GWR in 1876 and the outbreak of war in 1914. On that date, an experimental coal train ran from Aberdare to Southampton, bringing with it a great accession of coal trade to Newport and they began their change over from broad to narrow gauge. The port now became a massive trading funnel drawing in the produce of western Monmouthshire and sending much of it out via the GWR to England and Cardiff. The GWR by 1900 dominated the large and now easily accessible market for their coal, including the 250,000 tons a year used by the railway in a triangle between London, Chester and Penzance. Hoovered into this market was the valley coal. The tonnage transported by the GWR closely followed between 1880 and 1814 the increasing output of the county. For much of the period it was over double that of the combined tonnage of coastwise and exports shipped from Newport.

Macdermot dates the great awakening of the GWR at July 1888 with the appointment of N. J. Burlinson as superintendent of the line. This began another period of expansion and great prosperity for the GWR. As Acworth, one of the most influential of the contemporary railway commentators, wrote in 1900:

> What the ultimate consequences of the opening of this great highway may be it as yet too soon to speak. Southampton and Portsmouth are already beginning to draw their steam coal by land instead of by water. That ships trading in Bristol will load in Bristol docks with a return cargo of South Wales coal is among the possibilities of the immediate future. Even now the travellers of Bristol houses are taking in the mining centres of Monmouthshire and Glamorgan, orders that formerly went to Cardiff shopkeepers –
>
> Twenty years since (1880) the Great Western stock might have been bought for 38. This winter it has been quoted at well over 150. But no one who know the line and its capacities for development can think that the rise has yet reached its limit.[58]

Newport, so as to cope with this expansion, was forced to enlarge its docks to a much more appropriate size and to order their governance more effectively. Sir George Elliot was the dominant influence. He established his Pontypridd, Newport and Caerphilly Railway and joined the board of the Alexandra Dock Company in 1868, of which he owned two-thirds of the shares by the time of his death in 1893. This first, and most unlikely, proposer of the nationalization of the coal industry opened the route from the Rhondda to Newport, as well as sending his own coal from the Rhymney valley. The Alexandra Dock, opened in 1875, was followed by further extensions in 1893 and 1906. The latter was both entirely separate from and nearer the sea than the original Newport Dock. In 1882 the two dock companies merged. Fittingly, the new company was now a railway as well as a dock and its name reflected this status and its ambition to extend west as well as east: The Alexandra

(Newport and South Wales) Docks and Railway Company. This was to be taken over by the GWR in 1922. The capacity of the docks was at last drawing level with the trade.

The economic cause of this development was the growth of national and international markets for coal. 'Whereas in 1850 coal exports as a proportion of production in south Wales was 4%, in 1870 it was 23%, in 1890 46%, and in 1913 57%. This takes no account of bunker coal which in 1896 amounted to 2.5 million tons.'[59] How far Newport followed this trend is not clear because of the unknown proportions of the total output shipped by the GWR to England and Cardiff. Certainly, however, the port between 1860 and 1914 increased its total shipments from around 816,000 tons to 5,459,000 tons and decreased the percentage of coal sent coastwise from 77 per cent to 12 per cent. Newport had become an export port, though not to the same extent as Cardiff, and was still expanding its traditional coastwise trade, as is shown by Table 7.5.

Table 6.5. Coastwise and export trade of coal for Newport and Cardiff, 1860 and 1914 (000 tons)

	1860			1914		
	coastwise	exports	total	coastwise	exports	total
Newport	629	187	817	707	4,093	5,459
Cardiff	782	1,133	1,915	1,362	15,857	20,244

Source: J. Williams, *Digest*, Coal 10.
Figures do not include coke and patent fuel.

As other ports were developed, they endeavoured to obtain entry to the valley market. The Barry line attempted in 1907 and 1911 to gain access to both the Sirhowy and Ebbw valley, via a junction at Nine Mile Point. But the continuing battle between the south Wales ports is evidenced at its most dramatic with the attempted invasion by Cardiff in 1887 of the Ebbw valleys trade. The *Monmouthshire Merlin* on 4 March 1887 reported, when 'The Cardiff and Monmouthshire Railway Bill' came before the House of Lords, that Mr J. Hurman, the traffic manager of the Taff Vale Company, estimated:

> At least one million tons of coal would be brought from Risca independent of what might be brought from above that point, and at the rate of 8.75d would yield to the undertaking £36,485. Estimating the back traffic of iron ore at 300,000 tons per annum would be equivalent to an annual income of £10,937.

Mr T. Thomas, consulting engineer to the Newport Abercarn Black Vein Steam Coal Company, stated that the previous year the company's output of 324,000 tons would have been considerably increased if there had been a

demand for coal. But they were practically confined to Newport, being shut off from Cardiff. The Manmoel owner, Mr Pond, noted, 'He had no complaint to make of Newport, but what was absolutely needed in order that the coalfields in the valley might be properly developed was an alternative route.' The junction would be at Nine Mile Point and the line extended to Abercarn, in the first instance. The initiative was heavily supported by the valley coal interests, particularly those at Abertillery, Tredegar and Abercarn, and the local government boards, but the opposition of Herbert, Lady Llanover, the Alexandra Dock and the Rhymney Valley line won the day.

The transport system of the mining valleys of Monmouthshire and Newport fundamentally ended as it had begun when the canal was constructed. It was a linear system with primary products going down, and raw materials such as pit props and, from about 1810, iron ore, going up the valley. The important exception of east to west routes did not influence this pattern very much, though it widened of the north–south channel to include Cardiff in the south, and a brought variable trade to Newport from the Glamorgan valleys, to the north west. The topography of the county dictated this pattern.

However, the efficiency of the system varied considerably over the period. In particular, after about 1800 there was no leadership integrating the industrial interests of the valley and indeed western Monmouthshire. The need was for a railway manager of the calibre of Sir Edward Watkin, that Welsh and arguably most remarkable of all nineteenth-century transport directors between 1860 and 1914, and for a second marquess of Bute, that most driven of aristocratic exploiters of mineral resources. Instead, the first sixty years or so following the construction of the canal were marked by a system which was completely unable to match the richness of the resources of coal and iron. They were characterized by acrimony and a deficiency of commercial vision. The succeeding period from 1860 to 1914 was stamped by a port and a railway system trying to catch up with Cardiff and its hinterland, not in terms of volume, but in terms of its service to the coal and iron companies. In this task it became part of the GWR which had the quite different objectives of its own survival and profitability and saw the south Wales coalfield as one system. In this matter their objectives and those of the valley coal owners were often congruent and were decided by the contingencies of the market. If this involved sending the coal of Monmouthshire to Cardiff to be exported as Cardiff coal, or eastwards to the English markets, both at the expense of the development of the port of Newport, so be it. Newport, after all, had only itself to blame when, with the canal company, it wasted thirty vital years of overwhelming commercial advantage. At the beginning of the twenty-first century the results of that dissipation are a continuing legacy to the economy of western Monmouthshire.

7

The provision of water and sewers

INTRODUCTION

The implementation of public health legislation from 1848 to 1914 and the need for water in the development of coal and iron established localized water and sewerage activities of a singular industrial type. These services were a part of the civil engineering industry in the building and maintaining of reservoirs and sewerage systems. They were managed by either local government or private companies with a governance that was often confused, as the objectives of profitability and service to the communities sometimes conflicted, with tragic results. They were often sited within relatively small, densely populated localities, and increasingly followed the configuration of local government, even if this structure was unsuitable for the effective management of a very complex industry. They were dominated in both their design and more crucially their implementation, by being at the centre of the fundamental changes in the nature of the Victorian state from what Max Weber termed as a 'decentralised patrimonialism' to a more innovative and centralized orderliness.

These changes in policy direction at the centre of government moved more slowly than the problems they sought to solve. These problems in public health and industrial demands for water were both caused in the Ebbw valleys overwhelmingly by industrialization. In particular, the complexity and magnitude of the civil engineering required was often far in excess of the normative scale of local government, both financial and managerial, and this placed the provision of these utilities in the forefront of localized economic issues for three reasons.

First, the large amount of capital employed in the Ebbw valleys was to exceed any single capital project in iron, steel and coal. Secondly, these very large engineering projects were paid for out of the rates, thus withdrawing considerable sums of money from the community. Indeed, recent estimates place output in the urban services of gas, water and electricity as growing nationally at 5.1 per cent per annum as against a growth of national output of 1.6 per cent between 1873 and 1913.[1] Thirdly, poor health makes for an inevitable decrease in productivity.

However, despite their economic importance, the comparatively very high death rates and incidence of painful disease caused by the inefficient removal of sewage and very poor provision of water, the local development of these utilities has not been of great interest to historians until very recently. Perhaps there is an inevitability in this omission. For the importance of this most basic of human activities is not matched by its allure and the story of its provision pays no heed to conventional historical boundaries. Social and political matters continually and insistently intrude, which makes for an interesting historiographical issue. This economic and social problem could only be solved by the political institutions of local government, which were not only inexperienced but needed to be integrated. Furthermore, unlike the continent of Europe where centralization and therefore the monitoring and control of local government was much more marked, the evolving British system was characterized by autonomy. Thus differences emerged at the local level in the implementation of the Public Health Act of 1848 and succeeding legislation and then, crucially for the management of water and sewerage, in the county councils of 1888 and the district councils of 1894. Nevertheless, these organizations were held accountable by both Parliament and the people who lived in the valley to implement the legislation and provide adequate water and sewers. Inevitably then, this topic presses for an analysis which is broader than has been previously applied in this history. Without it the economics of the construction of adequate sewers and reservoirs cannot be understood. This does not imply that the industries of coal, iron and steel, transport and engineering were untouched by forces other than economic. But they were not influenced to the same intense and continual degree as the water industry and its associated public service of sewage removal.

The growth of these services was at the very foundation of social conditions because the very lives of the inhabitants depended on the efficient provision of water. In the Ebbw valleys people had shorter and more diseased lives than almost any other place in the United Kingdom, though this was a small part of a massive and national problem. By the 1890s urban infant mortality in the UK was 30 per cent higher than rural mortality. In 1899 the rate in London varied from over 200 per 1,000 in the poorer districts of the East End to less than 80 in Hampstead. Judged by local newspaper column inches in Monmouthshire, it seems to have been the dominant social problem of the place and time, leading to an insistence on action by the local press for action between 1890 and 1910. This factor in its turn affected attitudes to other basic social issues, particularly religion. The relationship between disease and religion is not clear but the chapels were full at times of epidemics, like the outbreak of cholera in Risca in 1849: 'On Tuesday last the Dissenters of this parish held three united public prayer meetings imploring Almighty God to stay the hand of the destroying Angel. The three places of worship were crowded and many could not gain admittance.'[2]

These problems in water and sewerage were political because, more than any other, even education, they necessitated a consensus of planning and action at local government level which was ill-suited to both county and the valley. The configuration of the local government areas of south Wales illustrates this problem. The River Ebbw, with its tributary of the Sirhowy, passed through eleven urban and rural district councils, as a result of the local government Acts of the last quarter of the nineteenth century which established a structure unchanged until the 1960s. Their names deserve more than a footnote, for between them they influenced much of the economic, social and political history of the valley. They were Tredegar, Ebbw Vale, Nantyglo and Blaina, and Brynmawr in the north; Bedwellty, Abertillery, Mynyddislwyn, and Abercarn in the middle; Risca, Magor and St Mellons in the south. The other areas of south Wales were not as divided. For the rest of south Wales, west as far as Llanelly, thirty-five district councils sufficed for an area about ten times as large and of roughly the same topography. The Rhondda valley had one district council and the River Taff passed through five. To make agreement on common and fundamental issues even more difficult, Newport and the Usk shared the confluence with the Bristol Channel with the River Ebbw and the valley district councils, while Brynmawr was in the county of Brecon. The small populations of district councils were not unusual. In 1901, 15 per cent of urban district councils in England and Wales, 170 of them, had populations of less than 2,500. The difficulty was the disconnected government of the Ebbw valleys in its sharing of one indivisible river and one indivisible problem of water supply.

Water provision and sewerage must be discussed together for they are integrated services. A sewerage system cannot be effective without an adequate supply of water and water cannot be clean if it is infected with sewage (or to use the Victorian description – 'sensible filth'). The traditional method of disposal in the valleys was to deposit these waste products, together with an increasing amount of industrial waste, in the river, which conveniently and cheaply transported it to the sea. This was a reasonable solution if the river was large, the filth was small and if there was some way of controlling disposal, to avoid those who lived further down the valley, being the unwelcoming recipients of the waste of their more northerly neighbours. But these solutions to an ancient problem may have been breaking down even before the start of the massive immigration into the valley of the nineteenth century. As early as 1779 Edmund Jones complained of pollution killing the fish in the River Ebbw.[3]

This remainder of this chapter is divided into two sections: first, the period of divided and ineffective action from about 1830 to 1890, and secondly the period of concerted action between 1890 and 1914. This led to a dramatic, if too long delayed success, which has been a lasting and splendid gift to those who live in this valley. It was to be a bequest made even more admirable by

the solidity of the construction of both reservoir and sewerage facilities which has necessitated little additional capital investment over the past hundred years or so.

THE PERIOD OF DIVIDED AND INEFFECTIVE ACTION, THE 1830s–1890s

There were two conflicting pressures on the improvement of the health of the people who lived in the valley. The first was a national and powerful push for the improvement of public health starting about 1830. The second and opposing pressure was the ineffectiveness of a highly divided form of local government to deal with a unitary problem which was aggravated by an unbalanced class structure.

This first and national pressure resulted from the changes in attitudes to water and sewerage systems, initiated by a combination of advances in medicine, engineering and national politics. These were rapidly translated into local action. The increasingly powerful, even strident, but above all simple and certain thesis of this pressure, was that disease was the result of impure water and inefficient disposal of 'sensible filth'. The solutions lay not in prayer, hope or good deeds, but in cheap, efficient piping and pure water to flush the pipes, to drink and to wash one's person. Chadwick, that unlikely combination of publicist and bureaucrat, forced the pace with the publication in 1842 of his *Report on the Sanitary Condition of the Labouring Population of Great Britain*. This national pressure was supported by the local distress of a valley with a rapidly increasing, congested and viciously diseased population, together with an industry that demanded an ever-increasing supply of water.

Between 1830 and 1890 the situation and the solution became increasingly clear with a succession of both local and national reports and a mass of legislation. The difficulty at the start was that of speedily integrating central legislation with local needs, particularly the delay between memorializing the central Board of Health, the visit of the inspector and implementing the improvements. There was only one report on the Ebbw valleys. This was occasioned by G. T. Clark's visit to Brynmawr for his report to the General Board of Health in 1850. The death rate in the Llanelly parish was 35.1 per 1,000 and the more rural Llangatock 29.7, compared with Cardiff's 20 per 1,000 and Salisbury's, the unhealthiest in Wiltshire, of 24.3 per 1,000. He noted that:

> For 5,000 people there are not more than 24 privies – The ash heaps and even the public streets are often used as privies. – There is no water supply by means of pipes. The people go to distant and often dirty springs and pits for water – Yet even in the dirtiest quarters I found the inside of the houses clean.[4]

Rammell's report on nearby Merthyr gave much more information, and with almost the same death rate, was probably comparable with Brynmawr in other respects. He noted in 1852 that the average age of death in Merthyr was 17.5 years: 527 children out of every 1,000 born died under the age of one in that year and the overall death rate was 36 per 1,000.[5]

In 1854 in London Dr John Snow analysed the causes of 616 deaths from cholera at the Broad St Pump, proving that the disease was water borne. From the 1850s everything was subordinated to sewers and water. Even the doping of small children with laudanum and the need for workhouses would have been much reduced if there had been clean water and good sewers.

If more local evidence was required, Simons's *Ninth Report to the Privy Council* of 1866 included Newport in the record of what could be achieved through 'Improvements from Proper Works of Drainage and Water Supply'. Newport experienced a reduction of almost one-third in general death rates between 1860 and 1865 compared with 1845–7 (Table 8.1). This was a much higher rate of improvement than in other towns in his sample. Bristol, the nearest town, improved by only a few per cent; Leicester, the closest in population, experienced a similarly small amelioration; none improved by over 8 per cent. After 1865 Newport compared favourably with the other towns. These figures are also evidence of the disastrous state of the health of western Monmouthshire before the improvements in the effective provision of water and sewerage facilities.

Table 7.1. Improvements in public health after effective works of drainage and water supply (death rate per 100,000)

Towns in order of population size	General death rate before 1845–7	General death rate after 1851–62
Bristol	215	206
Leicester	236	225
Cheltenham	194	185
Carlisle	284	261
Newport	318	216
Stratford	217	202
Worthington	139	136
Ashby	216	202

Source: T. H. Jordan, *The Degeneracy Crisis and Modern Youth* (New York: State University of New York Press, 1993), 29, table 2.1.

But the Ebbw valleys was marked by an inability to take advantage of this national improvement. The disease and the high mortality continued. Life expectancy in 1861 shows Nantyglo and Blaina as amongst the most dangerous places to be born in England and Wales, with a life expectation at

birth of below 35 years.[6] The Rivers Pollution Commission, reporting on the cleanliness of all the Monmouthshire rivers in 1872, noted that the mortality rate was very high because of unsanitary conditions, and that typhoid, scarlet fever, small pox and measles were particularly prevalent, but did nothing to improve the situation.[7] It merely mirrored the constantly reported general and localized epidemics: 200 cases of typhoid in Abertillery in 1887 and sixteen deaths from measles at Ebbw Vale in 1888.[8] Intervention by public works was crucial, for it seems that sanitary improvements in sanitation and nutrition were more significant than medical intervention in lowering the death rate.

The developments in the Ebbw valleys seem to support his postulation. By the early 1900s there had been no improvement. In 1902 the Sanitary Commission of the Monmouthshire County Council reported the figures shown in Table 8.2.

Table 7.2. Death and infant mortality rates, 1902

Death rate per 1,000	
Nantyglo and Blaina (the highest in the Ebbw valley)	25.92
Usk	12.02
Average England and Wales	16.00
Infant mortality rate	
Abertillery	209
Nantyglo and Blaina	201
Abergavenny	53

Source: *South Wales Times and Star of Gwent* (27 June 1902).

A tragedy in terms of human life had developed in the Ebbw valleys less dramatic, less noticed by historians, but perhaps even more desperate than the strikes and the conditions of work of men and women. The great reforming legislation of the 1870s had passed by the Ebbw valleys. The pressure for improvement had been neutralized politically by the divided organization of local government, particularly in the need for an agreement in investment. The reason was as stark in its clarity as it was to prove stubborn in its solution: eleven local authorities shared one river, down which the sewage was forced to run, and one hilly area of high rainfall which offered numerous options to reserve water.

This common use of one small river forced three economic questions. They were to prove highly destructive in reaching a consensus both of policy, and its implementation. First, why should places at the head of the valley – Ebbw Vale, Tredegar and Brynmawr – help pay for a structure of common piping

and the water to flush them, for those who happened to be located further down river at Abertillery, Abercarn, Risca and St Mellons? Secondly, why should the eastern part of the county of Monmouth pay any part of the costs of either sewerage systems or water for the industrial mining valleys to their west? They had no instincts in common, even if a considerable part of their wealth was derived from this industrial area and it formed the main market for their agricultural produce. Further, why should Newport, even though it drew its prosperity directly from the valleys to its north, allow its port to be possibly contaminated by a scheme which deposited vast quantities of intensely unpleasant material into the Bristol Channel? Landlords like the Beauforts and Morgans and companies like the Ebbw Vale Iron and Steel Company were only too ready to add their mixture of quite proper concern and the chance to benefit financially to the stew.

The divided structure of local government in the valley in the 1870s was aggravated by the absence of large industrial towns or smaller older places with established structures. Since 1848 a local board of health could be established if an effective petition were organized and the board had the power to appoint a public health officer. There were seventeen places in south Wales which took advantage of this Act, and there were many others up to the Local Government Act of 1872 and the Public Health Act of 1875, which consolidated the mass of previous legislation. However, the development of the industry of the Ebbw valleys was well in advance of a supporting local government. As Ieuan Gwynedd Jones points out:

> The model of town government that observers had in mind as most needed by these mineral districts was that of the municipal corporation – those ancient chartered boroughs whose governmental systems had been reformed and remodelled by statue in 1835. They had been given forms of democratic self government in which councils elected on a franchise wider than the parliamentary one, were responsible to the ratepayers for whom they acted – The inhabitants of the iron districts (and the coal areas) might be urban; they were certainly not civic.[9]

Swansea was one such municipality; Cardiff, Neath and Newport had similar corporations. But it was more than the lack of antiquity of the valley towns and villages which delayed progress. A burgeoning and reforming central government, whilst it established a legal framework for better policing, education and health, was not prepared to pay for the necessary improvement. This had to come out of the local rates with a minimal donation from the centre. To the Victorian reformer, implementation was a localized affair. There was no equalization of rich and poor. If an area was as poor, badly organized, and industrialized as the Ebbw valleys, then it was certain to be comparatively very unhealthy.

This is among the least researched and most important economic questions in the history of south Wales. If there was not enough money for all the improvements, how were the decisions to be made between expenditure say on education and public health? Some work has begun at a national level, particularly that of Robert Millward.[10] However, Wales remains rather neglected, despite this being a question of fundamental contemporary as well as of historical importance.

The almost complete absence of a local government designed to manage these problems was symptomatic of a basic difference between the old towns and the new mining valleys: namely, social structure. In the Ebbw valleys there was a scarcity of people to direct and manage the development of these utilities. The bourgeoisie living in the valley was small in number and limited in experience. The upper landowning class lived outside the valley and the Tredegars, who were the most local, were divided in their interests. That curious and impotent anachronism, 'The Commission for Sewage', reflected this dangerous vacuum at the summit of class power. Though, in terms of membership, this institution was probably the most potentially influential of any in Monmouthshire, it included no one who lived in the valley. The commission was headed by a duke, a baron and a bishop and included eighty county gentlemen in its membership. As late as 1885, from their offices appropriately in Usk they were requesting the Home Department to add six to their number.[11]

Paradoxically, the most considerable contribution to public health by the Monmouthshire upper class involved in the valley was on a national scale. Sir Benjamin Hall, one of the most influential landowners in the valley, had sponsored the founding of the Metropolitan Board of Works in 1855 which paved the way for the eventual construction by Bazalgette and his successor of 1,300 miles of sewer in the capital, despite very strong localized interests. He was appointed president of the General Board of Health in 1857. According to Sir John Simon, he was crucial to its affairs with his sensitive and sensible balancing of central and local powers.[12] This was the issue which had destroyed Chadwick though, according to Chadwick, 'Big Ben' was a 'huge impostor of a man'.[13] Nevertheless he would have been just the man to manage the political implementation of an early valley sewerage and water scheme. Ironically, his very astute management of the dilemmas of power was the very attribute required in the valley, so weakened by the lack of a strong middle class and by an upper class that had abdicated from this responsibility.

This is not to imply that there was no action but it was limited precisely because it was highly localized. Brynmawr, which seems to have been particularly active, established a local board of health in 1852 and advertised for '£4,000 on the security of the rates repayable with interest by equal annual instalments over 20 years'.[14] In 1855 it was reported that water and sewage pipes were not the only problem:

> The town of Brynmawr consists of about 950 homes of which about 800 are supplied with water from your works (Crawshay Bailey's) – and we have not been able to proceed with water closets as fast as water supply and drainage have been provided with – occasioned by a lack of water closet pans.[15]

The town was just as active in the building of a waterworks, which in the early 1850s was supplying 4 million gallons and, by 1865, 8.5 million gallons. This contrasted with nearby Nantyglo where it was reported that 'the roads are still ankle deep in mud and water there being no drains for the cottages'.[16]

So there were initiatives and they did multiply. However, as well as being localized, they often combined the wrong issues, such as gas and water, as distinct from water and sewerage, and for economic rather than social reasons. There is no evidence of any attempt to establish a complete valley initiative. Indeed, most did not operate outside the boundaries of the old parishes or new urban district councils. Throughout the 1860s and 1870s private gas and water companies were formed throughout the valley. In the *Monmouthshire Merlin* of 10 November 1866 notice was given of the incorporation of the Abertillery Gas and Water Company and the Risca and Pontymister Gas Company. These companies were also licensed to deal in coals, lime, slate and stone, which perhaps took attention from their primary objectives.

In 1872 a new Public Health Act was passed. It was hoped that there would be concerted action. A principal objective was to concentrate authority with respect to sanitary arrangements in each district in the hands of a single body. But even this legislation made no impact on the required consensus in the governance of the basic utilities. The result was a further, short-lived and inefficient increase in local developments in public health and a good economic result. The Abercarn and Newbridge Gas and Water Company was formed, with directors from the emergent and local middle class. Their manager was a Mr Taylor, formerly of Crumlin Viaduct Works, and the board consisted of local managers and small businessmen. They were Mr Green (the manager of the Newport and Abercarn colliery), Mr Pond (the manager of Abercarn colliery), two publicans and the agent for the Abercarn tinworks. Their nominal capital was £10,000 in shares of £5 each.[17] This company prospered, declaring a dividend of 7.5 per cent in 1886 and a profit of £221.[18] But it made no impression on the need to supply clean and plentiful water and effective sewerage systems. These companies were to be transferred to the local boards in the 1880s for a high price. Thus, in 1884 the Tredegar Gas and Water Company made over its gas- and waterworks to the local board for £59,981.[19] The Brynmawr and Abertillery Gas and Water Company was sold for £17,000 after declaring a dividend of 5 per cent in 1894.[20]

To the fear of disease was added another danger occasioned by the topography of the valley. This was the problem of the flooding of pits by the

collapse of inadequate dams or, conversely, the subsidence and collapse of reservoirs caused by mining. The most tragic example occurred in July 1875. The *Illustrated London News*, always quick to report a tragedy with pictures, was on the scene and a local observer noted:

> It was nearly five when the Roger's pond burst. It was up in the hills on the Cwmcarn side of the valley, with a solid stone dam, and had been built to provide power for the woollen mills and water for washing. – When it hit the buildings and houses nearby, they were all swept down the valley and the thirteen or fourteen people who slept there went down with it. Some of the bodies were found in Cokers wood, caught up in the trees.[21]

The dread of the flooding of pits was a constant concern, particularly at Cwmtillery, because the dam at the head of that village was constructed with a retaining wall of earth.[22]

It was not that the people of the Ebbw valleys were incapable of the management of financial investment. Much more energy, as would be expected, went into those activities which were well structured, and where belief in the order of priority was certain. Thus, investment in chapels burgeoned. In 1854 it was noted: 'The dissenters of Wales have built 700 chapels over the last 30 years at a cost of £400,000.'[23] A proper proportion of these were built in the valley. The lower Baptist church at Abercarn cost almost £1,000 to build in the mid-1850s and its financing was not straightforward: £400 was borrowed at 5 per cent and the rest from a variety of loans, including £30 collected in Bristol.[24]

THE PERIOD OF CONCERTED ACTION, 1890–1914

So the Chadwick legislation of the 1840s, the Local Government Board Act of 1871 and the Public Health Acts of 1872 and 1875 had failed to lead to a basic improvement in water supply and the removal of sewage in the Ebbw valleys. The need for economic, political and social combination had foundered on the twin rocks of a divided and inexperienced local government system and an ineffective class structure.

The first attempt at integration was supplied by the formation of the Monmouthshire County Council in 1888, and it made its first move in 1891. It was then agreed: 'That the County Surveyor be authorised to inspect the rivers Afon Llwyd, Usk, Ebbw, Wye and Sirhowy and report on the extent of the pollution alleged to exist upon them.'[25] They reported in November 1892 and recommended a total valley system. But even the considerable added weight of the county council support was unsuccessful in providing the leverage necessary to amalgamate sewerage systems and water supply. Both

utilities were acrimonious and piecemeal in their progress to their successful and, in the case of water, extraordinary solution.

At first, progress with water supply was rapid. In 1891 'The Western Valleys Water Bill' was placed before Parliament by the Monmouthshire County Council but met considerable opposition from Mynyddislwyn District Council and was thrown out. Its seemingly innocuous and worthy objective – 'To incorporate a company with power to supply water within certain limits, to make waterworks, to deal in meters and to raise capital' – was too much for a structure of intensely independent, if small, units of local government.[26]

The next twenty years were marked by two issues. First, an increasing awareness of the tragedy of disease in terms of its local increase, particularly after the appointment of district officers of health in the early 1890s. Secondly, despite the horror of disease, the long delay of a solution which could only be brought about by political and economic consensus both within the valley and within the county. The medical officers of health forced the issue and their reports read with a splendid conviction. Many of the officers came from Ireland and Scotland and were a mixture of colonial district commissioner and medical/social worker. Their duty was to be both the adviser and executive officer of the local authority on the health of the community. Simon described this office as 'One for the redress of wrongs and he emphasises again and again its responsible nature and the qualities of heart and mind which must be possessed by the holder of it.'[27] Although their appointment had become nominally compulsory by the Public Health Act of 1872, they did not become active in the valley until the early 1890s.

The Ebbw valleys had become a very dangerous place to live and particularly to raise children. By the early 1900s the valley was reported to be the amongst the most disease-ridden places in the country and had not improved since the 1860s. Measles was endemic in Abercarn and Ebbw Vale and diphtheria throughout the valley but particularly in Abertillery.

The medical officers continued to recommend an integrated system for the valley of water supply and sewage disposal. Their reports, which were almost a facsimile of those of the 1850s, noted that, without a plentiful supply of fast-running water, sewage could not be carried away from dwellings and water from springs. Wells were in constant danger of pollution from excreta, which was deposited locally and haphazardly. As the medical officer for health for Abertillery noted in his report for 1896:

> The plan now almost universally adopted throughout the district for dealing with the sewerage is 'the Water Carriage System'. This is the cleanest, quickest and most inexpensive method in a locality like yours where you already have the conditions that are essential for success in;
> 1. Abundant supply of good water.

> 2. Excellent sewers having a rapid descent towards the river and there remains only one requisite to make it a success. I refer to the proposed scheme of the County Council for constructing a main sewer to extend from Nantyglo to the sea, which would carry off the excrement of the entire district and so prevent continued pollution of the river Ebbw.[28]

This was phrased even more strongly in the 1897 report: 'The river Ebbw is the outfall of all your sewers, thereby converting this fine stream of water into a wide open sewer as far as the sea.'[29]

The reports went on and on, both enervating and awful in their persistence and graphic description. These social reports forced political and economic action,[30] but progress was slow in the valley until the two key problems of adequate water and a main sewage pipe to the sea were solved. The solutions are now described separately.

Water

Tanks were built but their storage facility was slight compared with an accelerating need, as both population and industrial expectations increased, and were expected to increase even more. The drive for improvement centred on Abertillery, where there was an under-capacity of water storage of 30 per cent which could only increase. The medical officer of health in his report of 1893 clearly stated this problem, when he recommended a tank capacity of 700,000 gallons in three tanks, supplying water by gravitation for the population of almost 11,000 people. This latter proposal was to prove very difficult and here lay the kernel of the economic problem of an adequate water supply for an industrialized area at a comparatively high altitude.

Abertillery was at too high an altitude for a reservoir to be constructed locally.[31] It was this issue, and a much larger projected gap between the demand and supply of water, that was to push the Abertillery UDC into the leading role for improvement over the next twenty years. This was a curious role for the most recently developed of the larger towns of western Monmouthshire and was to prove a heavy burden for its comparatively unsophisticated level of local government. It was estimated that, by 1921, Abertillery would have a water deficit of about 613,000 gallons per day, with the next highest deficit at Nantyglo and Blaina being 173,700 gallons and the whole of eastern Monmouthshire, including the rural districts of Magor and St Mellons, being short of 522,260 gallons. In the Ebbw and Sirhowy valleys there was a truly frightening estimated shortfall of almost 33 per cent (Table 8.3). To construct a distant and large reservoir was far too expensive a project to meet from their own resources.

Table 7.3. Projected deficiencies in water supply in UDCs situated in Ebbw and Sirhowy valleys by 1921

Urban district council	Gallons of water required per head per day	Projected deficiency in 1921, gallons per day
Abercarn	366, 100	16, 100
Abertillery	1, 313, 580	613, 580
Bedwellty	438, 260	138, 260
Ebbw Vale	617, 480	82, 480
Nantyglo and Blaina	318, 700	173, 700
Risca	297, 720	127, 720
Tredegar	420, 940	20, 940
Mynyddislwyn	83, 620	68, 620
Total	3, 856, 400	1, 241, 400

Source: Gw. RO, Minutes of the Proceedings taken before the Select Committee of the House of Lords on the Monmouthshire County Water Bill, 18 May 1908.

There is also some evidence of a fear that Newport might draw off some of the valley's already insufficient water supply by building its own reservoir at Cwmcarn. Certainly, in 1896, meetings were held in Newport to discuss the possibility of obtaining, 'That pure delicious water from Cwmcarn – and not the shady prospect of having that muddy water from Wentwood.'[32] At first Abertillery proceeded, as did the others, to satisfy its own needs, constructing a reservoir and waterworks at Cwmtillery. By an Act passed on 15 June 1894 they were advanced £18,000 for the purchase of a gasworks and new mains and £52,000 for the construction of a new waterworks and a reservoir. The repayment period was forty-five years.[33]

The massive problem which faced the valley was financial. At Abertillery, the height of the valley was a considerable 1,300 feet above sea level so that the nearest site where water could be impounded was thirty miles away in the Black Mountains. In 1906 the site selected for the water catchment and main reservoir was the Grwyne Fawr valley.[34] This remote spot was 1,640 feet above sea level and had already been surveyed by the Metropolitan Water Board in 1907. They had been thwarted by the Monmouthshire County Council in their plans who now presented their own bill to Parliament. The opponents of the bill included the Marquis of Abergavenny, the Pontypool Gas and Water Company, the Breconshire CC, Tredegar UDC, Nantyglo and Blaina UDC and others.

The case for concerted action, the link with sanitation and the problem of persistent opposition was put well by the county's counsel Balfour Browne in his opening statement. He noted that small local bodies cannot carry out a large scheme of water supply and that the county in the context of water and sanitation was one integrated unit. He was dismissive of the opposition:

'Now I will go to some of the more persistent opposition and I think that I might take Ebbw Vale. They have been at our throats most of all.'[35] But this was only a reflection of the much larger economic issue of many authorities in Monmouthshire already having an adequate water supply and not being prepared to subsidize others. The authorities which had their own supply were Abercarn, Abergavenny, Abertillery, Blaenavon, Ebbw Vale, Llanfrechfa Upper and Tredegar. Four districts were supplied by a water company or by other local authorities. Bedwellty took its supply from Tredegar, Caerleon from Newport, Llantarnam from Llanfrechfa Upper and Nantyglo and Blaina from Ebbw Vale. The districts which were supplied by water companies were Abersychan by the Pontypool Water Company, Chepstow by its own water company, Monmouth, Risca, Rhymney and Usk.[36] The particulars of the total county water supply and demand were cogently stated but the opposition was too strong and the bill was thrown out.

A unitary approach at county level had therefore failed. In 1909 Abertillery, Abercarn, Risca and Mynyddislwyn prepared a new joint bill to sanction the Abertillery and District Water Board. This town contained almost half the population of 70,000 people to be serviced by the new utility. This time the only opposition was from Abergavenny, which was based on the far more tenuous grounds that it was fearful of navvies prowling their streets.

The Bill was passed and became an Act of Parliament on 3 August 1910 with a board divided proportionally in terms of membership. Abertillery was given nine members, Abercarn four, Risca four and Mynyddislwyn two. Pending completion of the reservoir, the Tredegar UDC and Rhymney Valley Water Boards were to be assured of a continuous supply of water. The reservoir was not to be opened until 1928, though by 1915 water was flowing into the service reservoirs in the valley at Cwmtillery.[37] It was to be both the most extraordinary civil engineering feat in the history of the Ebbw valleys and a major planning disaster, costing four times its original estimate and taking over twenty years to build. The dam was the highest in Britain at the time of its completion, impounding 400,000,000 gallons with a flow of 900,000 gallons daily. It included a 1,600-yard tunnel to carry the main through the Coity mountain to a 2,000,000-gallon service reservoir at Cwmtillery.[38]

The scheme entailed a rate of 10 pence in the pound for seventy years and caused considerable problems of repayment in the depression years of the 1920s and 1930s. In 1929, one year after its completion, it was sliding towards bankruptcy, with capital financing revenue and debts of £35,000. It provides an interesting illumination of the effect of the depression of the inter-war years on local government income for basic public services. In 1930/1 income for the scheme was only £2,800, contrasted with incomes in Wakefield of £52,420, Harrogate of £61,148 and Preston of £71,348, which were noted in the minutes as comparative areas.[39] Amongst the unnoticed heroes of this period were the accountants of the mining valley water boards. A fitting postscript is

that, without the reservoir, the 1976 drought would have been a disaster. There were only 5,000,000 gallons of draw-off water remaining when the rain started.[40]

Sewerage systems

The pressure that was eventually to force action was again initiated by the county council. They had no legal jurisdiction over the urban district councils, as was noted at this exchange at a meeting of their representatives at Abercarn in 1900:

> Mr J Williams – I thought that Mr Jacob (County Councillor) said that unless some scheme were adopted the county Council would step in and force them to do something.
> Mr Jacob – I wish we could. We would have done it eight or nine years ago.[41]

But they could exert pressure, particularly over disease. At the same meeting it was noted that the death rate in the Rhondda valley fell considerably when the main sewer was completed, and that the death rate in the Ebbw valleys was considerably higher than in any other part of the United Kingdom. But now, at least in the minutes, their moral responsibility was stressed for the first time: 'It arose from want of proper sanitary arrangements and therefore if not legally, the councils were morally responsible.'[42]

Following this seminal meeting, action proceeded quickly, helped considerably by the direction of T. S. Edwards, the most respected solicitor in the valley. He was clerk to the Western Valleys Sewerage Board, a close friend from boyhood of Brace, the miners' leader, who was now an MP, and legal adviser to the Monmouthshire miners. Edwards was one of the most prominent members of the middle class who was born in the valley. He established a successful legal practice in Newport and devoted his career to the service of the valley. He seems to have been reasonably well rewarded, living in some style at 'Homelea', the largest house in Newbridge. There was now less opposition from local interests. Thus, as early as 1898, the medical officer of health for Ebbw Vale noted in his report, 'It is satisfactory that a movement has been set of foot with a view to promoting a general scheme of drainage for the whole valley – together with the valleys lying parallel with it to outlet into the Bristol Channel.'[43]

Even so, there was no immediate agreement and, until 1903, Abertillery, Ebbw Vale, Abercarn, Risca and St Mellons were opposed in varying degrees by Lord Tredegar, Newport and the councils of Nantyglo and Blaina, Brynmawr and Tredegar. A reputation as the most diseased place in the kingdom was not enough to remove the supremacy of economic self-interest. Indeed, it

was noted in 1902 in the minutes of the newly formed Western Valleys (Mon.) Sewerage Board that:

> The main reason which has influenced the councils proceedings by Act of Parliament rather than by Provisional Order was the fact that the Urban District of Nantyglo and Blaina had so far declined to join the scheme, and as their district was situated at the top of the river Ebbw it was essential that they should be compelled to cease pollution of the stream if the Scheme was to be effective.[44]

There now proceeded a succession of Acts which ensured the completion of the sewer by 1910, extending over the valleys of the Ebbw and Sirhowy for about fifty miles. The Act of 1903 brought in Abercarn, Abertillery, Ebbw Vale, Nantyglo and Blaina and Risca. That of 1906 brought in Mynyddislwyn, to be followed by Bedwellty and Tredegar in 1907.

As noted earlier, though the systems were far too slow in their progress, they were extremely well constructed. In 1962 the sewerage system was reported to be quite sound, despite the additions of part of Newport and the whole of St Mellons to the scheme.[45] The reservoir at Grwyne Fawr unobtrusively and efficiently sends in its water. Both systems seem well set to continue their service for presumably the next one hundred years and beyond.

Water, with its integrated service of sewerage, completes the industries which developed in the valley between 1780 and 1914. With the exception of the other utilities, such as the quite prolonged change from gas to electric light, and aluminium after 1939, a shift from rail to road transport, and some development of a light electrical industry, particularly brown goods, in mid-valley, this list was to change little until the 1980s. Water in the Ebbw valleys was and is a localized service industry at the foundations of the quality of life of the people of the valley and a monopoly service to industry. There is both an economic and moral compulsion on society to make these particular utilities work effectively which is less significant for the other industries. For this reason they would fit just as comfortably into a social or political history, integrated by the people who lived, died and migrated into and out of the valley. In the next and concluding chapter the focus changes to these people.

8

The people: demography, labour movements and decisions

The people of the Ebbw valleys bind together the often disparate elements of industrial change and so, fittingly, they form its conclusion. These people occasioned and integrated the great and small events and trends of this industrial revolution, including the proficiency of the industry of the valley to attract labour that was so fundamental to its development. From the directors of the Ebbw Vale Company worried about balancing the expense of iron ore against the cheapness of coal, to the overman considering whether to try for election to local government, and the hewer concerned how the change from pillar and stall to longwall would influence his ability to support the apprenticeship of his son at the Crumlin Viaduct Works: they were all involved in the constancy of change and the integration of its components.

This chapter is inevitably selective, choosing those human issues where the relationship with industrialization is both significant and clear. Thus religion, leisure and language are given only a passing mention while demography, labour movements and those crucial decisions which determined the nature and direction of change occupy the centre stage. There is first a description of the broad demographic flows and then these flows are integrated with the developments of industry. The changes which lurk behind the linearity of the very rapid increase in population over 140 years are then examined, including a glance at some of the characteristics of the resulting society. This is followed by a discussion of those two obvious results of the interaction of industrial development and the people who worked in mines and works: the Rising of 1839 and the genesis of highly formalized trade union organization, particularly the South Wales Miners Federation. Finally a selection is made of those few key decisions which determined the direction of industrial change in the valley.

DEMOGRAPHY

The pattern of the broad movement of population of the UK, Wales and Monmouthshire is explicit. The people of the UK were both on the move and rapidly increasing in numbers, with Monmouthshire, because of the

remarkable scale of its industrial revolution, an extreme example of both. In the 1851 census, 54 per cent of the population of the UK were recorded as not living within two kilometres of their stated place of birth and the population of the UK roughly doubled between 1750 and 1850 and 1850 and 1950.[1]

Between 1801 and 1911 the population of Monmouthshire grew from just over 45,000 to about 396,000, and that of Wales from 587,000 to 2,421,000. As a proportion of the population of Wales, this was an increase from around 8 per cent in 1801 to 16 per cent in 1911. Monmouthshire, in company with Surrey, Durham, Middlesex and Glamorgan, had the highest growth rates in the UK between 1801 and 1911.[2] Glamorgan, closest in location and industrial structure, grew almost sixteenfold and Monmouthshire almost ninefold (Table 8.1).

Table 8.1. The population of Monmouthshire and Glamorgan, 1801–1911

Date	Mon.	% +	Glam.	% +
1801	45,568		70,859	
1811	62,105	36.29	85,067	20.02
1821	75,801	22.05	102,073	19.99
1831	95,126	29.45	126,612	24.04
1841	134,368	36.93	171,188	35.21
1851	157,418	17.15	231,849	35.44
1861	174,633	10.94	317,752	37.05
1871	195,488	11.92	397,859	25.21
1881	211,267	8.09	511,433	28.55
1891	252,416	19.48	687,218	34.37
1901	298,076	15.51	859,931	25.13
1911	395,719	32.76	1,120,910	30.35

Source: J. Williams, *Digest of Welsh Historical Statistics*, Population 1 (Cardiff: Welsh Office, 1985), 17, 20.

In 1851 just over half were born outside the county, with most of the migrants, about 37,000, coming from Gloucester, Somerset and Hereford. In 1911 about 38 per cent were born outside the county, with most, about 35,000, coming from Glamorgan and Brecon.[3] In approximate terms this growth followed the industrial development of the valley and in turn enabled this development, but with one oddity – the decade between 1831 and 1841.

Between 1801 and 1811 a 36 per cent increase of 17,000 people followed the opening of the canal. Between 1811 and 1831 the increase of 33,000 follows the rapid development of the protected sale coal trade and the spasmodic, though generally burgeoning, iron trade. This increase is followed by a sharp rise of almost 40,000 between 1831 and 1841 and for the first and only time there is an absence of strong correlation between population movement and

industrial development. A very large population increase was concurrent with a rather static industry. Between 1841 and 1851, influenced by the shock of the 1830s and the increasing competition of the Glamorgan valleys, there was a steep decline in growth to 23,000. Then there were markedly lower increases in percentage terms between 1851 and 1881, with an increase of 54,000 spread fairly evenly over three decades following the decline of the wrought-iron industry, particularly the closing of Nantyglo, and the rather slow development of deep mining. This relative decline in growth was followed by a return to a massive increase between 1881 and 1911 of 184,000, concentrated between 1901 and 1911, which correlated with the great period of growth of the coal industry in Monmouthshire, including the winning of the deep seams of the lower Sirhowy and Oakdale area.

However, like many a demographic straight line, that of Monmouthshire tends to camouflage the interesting bits. This massive increase in population disguised highly localized differences between counties, parishes and district councils within these counties, as they were influenced by the differing trajectories of industrial change. So, continuing the comparison with Glamorgan, net migration rates of the counties were in almost complete contrast, with Monmouthshire's being negative for four of the five decades between 1851 and 1911 and Glamorgan's being positive throughout the period (Table 8.2). However, the natural increase for the two counties varies much less, though Monmouthshire lags behind Glamorgan between 1841 and 1901, probably because of the difficulties with the provision of water and the disaster in public health in western Monmouthshire (Table 8.2).

Table 8.2. Net migration and natural increase, Monmouthshire and Glamorgan, 1851–1901

	Net migration		Natural increase	
	Mon. %	Glam. %	Mon. %	Glam. %
1841–1851	+6.4	+23.5	+10.9	+11.3
1851–1861	–3.4	+18.4	+14.6	+17.5
1861–1871	–3.6	+5.8	+15.2	+18.6
1871–1881	–9.9	+7.5	+16.5	+20.3
1881–1891	+1.6	+14.9	+15.9	+18.7
1891–1901	–1.9	+5.9	+16.8	+19.2
1901–1911	+10.9	+10.6	+20.0	+19.9

Source: J. Williams, *Digest*, Population 1, 72, 73.

How far factors such as the competition for labour between Monmouthshire, Glamorgan, particular parts of England such as the Middlesbrough area and the USA, and the differential rates of growth of iron and steel and coal

mining, influenced these rates is impossible to judge without a far more detailed analysis.

Certainly between 1861 and 1911 the balance of employment between coal and iron and steel fundamentally altered, from approximate equality to domination by coal, with the coal industry experiencing the massive increase in employment (Table 8.3).

Table 8.3. Numbers employed in mines, quarries and metals in Monmouthshire, 1851–1911

Date	Mines and quarries	Metals	Total	% mines and quarries	% metals
1851	15,771	10,038	25,809	61.1	38.9
1861	14,929	13,429	28,358	52.3	47.7
1871	16,565	14,739	31,304	52.9	47.1
1881	16,208	13,089	29,297	55.3	44.7
1891	25,993	13,402	39,395	65.1	34.9
1901	34,951	12,794	47,745	73.2	26.8
1911	53,504	18,147	71,651	74.7	25.3

Source: J. Williams, *Digest*, Occupational Distribution of the Population, 115.

Population movements reflected the differentiated and localized pattern of industrial change. This pattern is evident from the settlement of the inhabitants at the end of the period. The oldest towns of Ebbw Vale and Risca, which developed around the early sale coal and iron industries, have a higher proportion of occupied males in secondary occupations than the other districts. While always shadowing Newport, they had become the primary trading and commercial centres of the valley because of their earlier beginnings and the continuity of their industrial histories. Despite being larger than both towns, Abertillery lagged behind them in its proportion of occupied males in secondary to primary occupations by almost 20 per cent. This difference is a probable reflection of its later start down the road of industrial growth of about fifty years. Nantyglo, though one of the oldest centres of industrial growth, lost its importance after the closing of its ironworks in the 1860s and became gradually eclipsed by Abertillery (Table 8.4).

Apart from the provision of water and sewerage services, evidence of the precise interaction of these localized changes between industry and local government is very scanty. Certainly each village and town, because of the long time lapses between their development, tended to perceive themselves as both separate from, and competitive with, their neighbours. There was even pressure to make the units of government smaller. The minutes of the

Table 8.4. The occupations of males by district in the Ebbw valleys, 1911

District	Total	Coal	Iron, steel	Agriculture	Total primary occupied males	Secondary occupied males	% of secondary to primary
Abercarn	5, 980	3, 693	341	174	4, 208	1, 172	27.8
Abertillery	12, 759	9, 108	213	84	9, 405	3, 354	35.7
Ebbw Vale	10, 928	5, 713	1, 263	38	7, 014	3, 914	55.8
Risca	4, 916	2, 428	680	68	3, 176	1, 740	54.8
Nantyglo	5, 154	3, 714	117	38	3, 869	1, 275	32.9
Mynyddislwn	3, 531	2, 259	1	129	2, 389	1, 142	47.8
Newport	27, 800	148	2, 947	232	3, 327	24, 473	735.6

Source: Census 1911, table 24, Grouped occupations males aged 10+.
Total of all occupied males in all valleys in western Monmouthshire except Ebbw valleys: 38, 913. Total of all occupied males in Ebbw valleys: 43, 268.

first meeting of the Abercarn Local Board in 1892 capture localized loyalties firmly as there was almost a falling out of the members. Some members demanded the title 'Abercarn District Board' and others 'Newbridge, Abercarn Local Board'.[4] The movement of the working and lower middle class into local political organization from about 1870 in western Monmouthshire probably supported this intensity of highly localized loyalties. With something of a more sideways view, rugby football certainly followed this pattern with dramatic reverberations continuing well into the twenty-first century: Crosskeys, Abertillery, Newbridge and Ebbw Vale all having their periods of first-class glory, with Pontypool having the longest and most continual period of success in the neighbouring valley. There was never the slightest movement towards combination, with all contending, sometimes successfully, the superiority of Newport, and others, such as Abercarn in the 1930s, attempting short periods of rivalry. This was a very different pattern of sporting development to the rest of the coalfield, particularly after 1918. Other south Wales first-class clubs tended to be much more widely separated, with larger catchment areas and with little attempt at rivalry from nearby towns and villages.

There was also a serious political consequence resulting from this pattern of local government developed from the spasmodic character of this industrial revolution. These very small district councils were inevitably at risk from a forced reappraisal of their boundaries and a combination into larger districts. Local identities were to be no match against the possibilities of improved efficiency through an increase of size. This was particularly so when the industrial tasks of local government were to change dramatically from the support of the old mineral economy to the sustaining of new and imported

industries. The local government reorganization of the late twentieth century which was to destroy the old map of Monmouthshire had at least one strong root in the local government structure of the late nineteenth century.

This remarkable movement of people into an isolated rural valley produced no truly significant industrialist with the possible exception of Thomas Brown. There was nothing comparable to the great industrial dynasties of the Wedgwoods, or on a European scale the Philips dynasty of Holland or Krupps of Germany, which so strengthen the continuity of industrial location. There were splendid individual contributions but these tended to be cultural. Indeed, there is a reasonable case to be made that Monmouthshire people led the Welsh renaissance of the nineteenth century, through the contributions of Sir Thomas Phillips, assuredly amongst the most broadly gifted of nineteenth-century Welshmen, Lady Llanover and the patronage of the Morgans of Tredegar.

This great movement did, however, despite the migration, produce a distinctive and perversely cohesive society. The singularity and remarkableness of the people of the valley and western Monmouthshire lay not with individuals but in this society. The valley epitomized the perplexing diversity of beliefs and styles of life of the UK as the pressures of the slowly emerging mass media towards uniformity even by 1914 were still comparatively primitive. A few of the small events give the flavour. A large audience of 270 sat down at Tabernacle, Newbridge, to listen to the impossibly named Sir Marville Wrascall, Bart, give a lecture on the Indian Mutiny though it sounds suspiciously like a spoof for too earnest historians.[5] Tonic solfa had done its work and even Edward VII put his seal on that accomplishment, presenting a baton to the conductor of the Abercarn male voice choir when they sang to his private party in 1902.[6] The Blackwood Foresters received the most remarkable gift of the period when they requested a trophy of the hunt from the Kaiser. He sent a set of silver embossed antlers.[7]

The crucible of the industrial revolution in the narrow valleys of south Wales produced in a very short time, from a mix of rural and industrial cultures, English and Welsh people with a smattering of Scots, Irish and Jews, the unique society of the south Wales coalfield of which the Ebbw valleys was a fundamental strand. The social oddity, at least to this onetime member of that society, is the very rapid development of this singular society despite its closeness to England, its power to integrate diverse groups and its continuity to at least the 1950s. There is much in the society of 1914 that is familiar to my generation. By 1914 the south Wales miner had been accepted into the folk iconography of the UK along with others like Scottish crofters, Irish navvies, Oxbridge toffs and Jack Tars.[8]

What was the result of industrial development, in so far as it can be separated from other influences, on the characteristics of the people of the

valley by 1914? They were certainly healthier than in 1870 and, particularly the girls, more likely to follow education beyond the age of 18 than in comparable areas of England. In the main they had an intense and highly localized loyalty to their towns and villages, worked for large companies and units of companies, and thus tended to be a corporate rather than an entrepreneurial people; were strongly unionized, politically voted for the Labour Party and, other than the few who benefited from secondary education, saw their opportunities for advancement within their union and party, where they were highly successful. They were more devout than most people of the UK and in the Ebbw valleys dominated by the Baptists, comparatively skilled in their performance of choral music and intensely competitive and skilled at rugby football. Particularly after Rorkes Drift, when the South Wales Borderers headed the league table of regimental Victoria Crosses, they were seen as tough and courageous, a quality cemented on the sporting field by the Welsh victory over the All Blacks in 1905. In 1901 about a quarter of the people in the valleys of western Monmouthshire spoke Welsh, with a range from almost 70 per cent in Rhymney to 5 per cent in Risca. However, language was not the only influence forging the valley into a very Welsh, though differently Welsh, place which has still to find its full settlement and ease with a far older and rural Welsh culture. The complete loyalty of the valley rugby clubs to Wales, Nonconformity, trade unionism, the inclusion of Monmouthshire in parliamentary Welsh legislation, particularly licensing laws and education and the competence of valley communities to absorb migrants all played their part. The influence of this society upon its industry is a most complex tangle of cause and effect but pre-eminent is the effect upon the organization of labour and the seminal labour movements which it produced.

THE LABOUR MOVEMENTS

There were two very significant movements: first, the murky combinations of workers of the 1830s, that curious mix of a violent anarchy and the legalistic Chartists, which culminated in the Rising of 1839; secondly, trades union development between about 1870 and 1895. During these periods western Monmouthshire, and the Ebbw valleys in particular, were in the van of the labour organization of the mines and metalworks of south Wales.

The Rising may be traced to the labour-market disaster of the 1830s when, for the first and only time, there was very little correlation between population growth and industrial development. The drama and considerable importance of the events of 1839 has ensured that the 1830s is by far the most extensively researched decade in the history of the Ebbw valley, as evidenced by two fairly recent books by David Jones and Ivor Wilks.[9] My intention here

is not to describe these events, for together these histories rank amongst the most distinguished social and political commentaries on a localized event in British historical writing. Rather, my purpose is to investigate causes. It is worth noting that, whilst both historians discuss labour economics, their analysis is more in terms of the social context of the decade than would be the case of a conventional labour-market study. The central and stark economic issue of the demand and supply of labour tends to be hidden, or not even discussed, amongst the sometimes discursive though remarkable mass of social and political detail.

The basic facts of the demand and supply of labour are plainly stated. The population increased by almost 30,000 in western Monmouthshire, despite a static sale coal trade, and an iron industry both using much less coal per ton of iron produced and with an increasing but spasmodic output. It does seem as if western Monmouthshire, as well as being influenced by a complex of political and social issues, from disappointment over the democratizing effect of the 1832 Reform Act to the Poor Laws, was made even more fertile ground for the phenomena of the Rising by a labour-market disaster in the 1830s. It is highly unlikely that Newport could have comfortably absorbed much of this population increase as this town was completely dependent on its valley hinterland for growth. If trade declined, then the services declined too, along with opportunities for employment at Newport. Truly dismal economics rather than a nascent Welsh nationalism or Chartist influences could well have been the primary cause of the Rising. The interaction of the supply and demand for labour had turned the area into the 'Calcutta' of the west of England and south-east Wales. (See the appendix to this chapter for an analysis of the labour market between 1830 and 1840.)

The second important labour movement influence in western Monmouthshire was the early growth of leadership in trade unions, particularly in the coal industry. The mainspring of this leadership is less clear than the causes of the Rising and this opacity is illustrated by the very indistinct links between the events of 1839 and the growth of trade unions. In addition, two of the primary influences upon the development of trades unions were in opposition, making these links of cause and effect even more difficult to solder neatly together. The influences of the corporate industrial structure of large deep mines and even larger steelworks, with their tendency towards continuity and increased opportunities for the formalized organization of labour, were a counterbalance to the influence of a migratory population upon trade union organization. Men increasingly from 1850 worked in large units in a labour market in a continual state of flux.

The expectation in a migratory society is of a divided class. The marginal privileges conceded to the indigenous worker combined with the intensive exploitation of immigrants combine to make a barrier between the two groups. In turn this often results in a weakening of working-class organization.[10]

Indeed, apart from rumblings and the occasional eruption, trade union formation was rather delayed in the valley from about 1840 to 1870. When activity returned, perhaps the failure of the Rising, its rather lenient treatment by the government, the tendency towards the stability of larger units developed by deep mining (as distinct from over fifty years of drift mining), and the collapse of the Nantyglo and Crumlin works pushed pressure for reform, as with the UK generally, into a multiplicity of legal channels including trade unions.[11] These uncertainties apart, it is clear that the trade unions of the Ebbw valleys developed in a variety of directions and in turn influenced their parent industries differently.

Those of the Monmouthshire coal industry were to have a very strong, even dominant influence, upon the early growth of Welsh trade unionism. The Newbridge, Risca area, with a meeting of 3,000 miners in 1873, captures the ambience of tough but reasonable legality. They expressed their 'willingness to form Boards of arbitration and conciliation with employers – and that working men of this country should return representatives to parliament from their own ranks and pledges to assist in securing the return to parliament of such persons'.[12] The first regional lodge of the Miners Federation of Great Britain was formed at Newbridge in 1893, and the trade unionists of the Ebbw valleys contributed three of the four senior positions to the South Wales Miners Federation formed in 1898. Thomas Richards was secretary, Brace vice president and Onions treasurer, with their first office in Beaufort.

There were continual strikes, though apart from 1871 most were localized. The break point came in 1898 when the miners, after a five-month strike, were forced to capitulate on terms which, particularly in comparison to those following the Rising of 1839, were both vengeful and foolish. These conditions made the events of 1898 arguably a more radical turning point than those of 1839 and ushered in a long period of industrial conflict shot through with class war. The Monmouthshire leaders substituted the accommodating Mabon, with Brace even suing him, until in their turn they were replaced by the more syndicalist Rhondda about 1910. By then Brace was safely in Parliament (resplendent in top hat), and Onions addressing the Tredegar miners in 1911 was certain that the publication of *The Miners' Next Step* had resulted in a damaging and detrimental effect upon the strike negotiations.[13] The culmination of the leadership of Monmouthshire trade union activity came when Hodges from Abertillery was appointed as general secretary of the MFGB in 1918 at the age of 31, possibly the most naturally gifted of British trade unionists of the inter-war years.[14]

Significantly, the Monmouthshire valleys, with both a radical tradition in the 'Black Domain' and the Chartists, and a more accommodating approach in the legal instincts of Mabon, Brace and Onions, voted more strongly for Labour in the 1918 elections than the Glamorgan valleys. Just over 50 per cent of the voters made their mark for Labour in the constituencies of Abertillery,

Bedwellty, Caerphilly, Ebbw Vale and Pontypool, compared to 37.5 per cent in Aberdare, Merthyr and Rhondda East and West.[15] Nationalization by the Labour government, that most important of all influences upon the industrial development of south Wales and the old mineral industrial locations of the UK after 1945, was strongly rooted in the radical politicization of western Monmouthshire between 1839 and 1914. In terms of the political personalities it produced, particularly Bevan, these valleys were even the point of reference for this movement. The industrial development of the Ebbw valleys is a striking example of a local movement being very influential in a national political movement which, in its turn, fifty years later, was the most significant influence on the industrial development of that same small place.

Less well documented, though more rancorous in its early industrial relations than coal mining, was the tinplate industry located particularly in Abercarn, Abertillery and Pontymister. This industry had a long history of violence in the valley, from attempts to destroy machinery at the works at Tydu in 1843.[16] The most concentrated period of unrest seems to have been from about 1887, when there was a fourteen-week strike, to the four-month strike in 1894, when blacklegs were brought in from Scotland and ten men sent to prison for six months. On the latter occasion the strikers were addressed by Keir Hardie who 'Hoped that not for a moment that the blacklegs imported into Pontymister were not typical Scotsmen (Cheers)'.[17] The development of unionism followed the development of the industry, with Monmouthshire men particularly important in the foundation of the South Wales, Monmouthshire and Gloucestershire Tinplate Workers Union in 1887, with Thomas Benjamin of Abercarn the first president.

Balancing this rancour the Ebbw Vale miners sided with their employers in 1893 and refused to go on strike. This perversity resulted in a march to Ebbw Vale in August of that year by miners from Nantyglo, Abertillery, Blaenavon and the Rhondda. The event was overplayed by an excited press presumably astonished by such consensus, who initially reported 50,000 men from the Rhondda marching on the town. Certainly the troops were called in to defend the town and several miners were badly injured in a pitched battle between the two sides.[18]

This cooperation was a feature of the Ebbw Vale company until 1945. As if to match these local differences with the coal industry, the great period of iron and steel industry of Monmouthshire in its contribution to the development of national trade unions was to come after 1950 with four general secretaries, including one knight and a member of the House of Lords.

Both of these nationally influential movements were grounded upon the experiences of working people, their expectations and their power to change their lives through industrial action. They would have shared disproportionately in financial prosperity as hewers' wages between 1850 and 1900 increased by 110 per cent against an average of all real wages of about 75 per

cent.[19] This differential was the key factor in attracting labour from neighbouring counties which was in its turn the key factor in the massive growth in the output of the coal industry between 1900 and 1914. But, overall, improvements seem to have been spasmodic in time and place. Under the exemplary stewardship of the colliery manager Rogers, Abercarn in the 1850s was particularly well served, with model housing at the Ranks complete with bakehouse, laundry and excellent sewage removal, and this extended to labour contracts, whilst the Nantyglo of Crawshay appears to have had none of these advantages. The quality of life over the period for the working class probably improved, though historians are a long way from accurately measuring these improvements and even further from measuring happiness. Work has yet to be done on this key subject in south Wales by the use of such tools as the Human Development index of the United Nations or by developing the work of Crafts and Layard.[20]

The impression of power and class up to mid-century is one of an almost conventional exploitation of worker by capitalist, though the battle for power and profit was not limited to class warfare. Whilst there were many sale coal strikes, such as those of 1816, 1822 and 1842, there was also some vicious in-fighting between entrepreneurs like Powell, the landowning Morgans and Crawshay and the directors of the canal company. Both then eased until 1898 as the rawness of early industrialization was humanized. This was coupled with an initial blurring of entrepreneurial and rentier roles between landowner and bourgeoisie, and then settled into a more distinct division by around 1830. After 1839 the trend was towards accommodation, marked by the occasional though considerable upheaval in an industrial society which was, however, far removed from insurrection. The press is littered with slight but intriguing indications of this accommodation. During the strike of 1873, with no sense of incongruity though perhaps a dash of bravado, Miss Crawshay appeared as Anne Boleyn and Mrs William Crawshay as Marie Antoinette at the annual Twelfth Night Ball at Tredegar House.[21]

The histories of the principal families and their networks is complex and deserving of a separate study but generally it does seem that at the top of the pile the old rentier aristocracy succeeded to a large extent in maintaining a cultural hegemony and in reshaping the industrial bourgeoisie in its own image though others have disagreed with his thesis.[22] This was the case in the Ebbw valleys where those who profited most from the industrial development sometimes departed to and even married into the landed families of eastern Monmouthshire. Others stayed nearer to their workplace like the Hanburys of Pontypool who were active in Abercarn as early as 1570; Powell in Newport and particularly the Morgans of Tredegar who occupied the pinnacle of the class structure in their splendid house at the bottom of the valley.

The demographic change that followed and fed these transformations was very considerable. However, the indigenous population of 1780 contributed

only marginally to these changes. It was too small to have much impact as is indicated by the following examples.

DECISIONS AND INITIATIVES

Given the proven existence of deposits of coal and iron ore, together with a sufficiency of limestone and water, it was certain that the Ebbw valleys would be developed as a centre of the coal and iron and steel industries. The direction and pace of this development was not, however, certain and there were a few decisions and initiatives, or their lack, which were crucial in deciding the content and pattern of change.

The most crucial decision was probably that taken by the consortium of ironmasters led by Guest and Thomas Brown to purchase the Ebbw Vale company when they outbid Crawshay Bailey at the auction of 1839. If Crawshay Bailey had purchased, and the competition was severe including some reported fisticuffs between the parties, then the Ebbw Vale works would presumably have followed the same path of development as the Nantyglo works. The Bessemer development would have been most unlikely and there would have been a sale or liquidation most probably in the 1860s or just possibly in the 1890s, together with the works at Rhymney and Tredegar. This decision was the foundation stone of the continuity of the steelmaking at Ebbw Vale and supported by the determination and decisions of a succession of like-minded directors after 1914 particularly Mills, Beynon and Firth.

The most important absence of initiative lay in a deficiency of leadership by the principal owners of land, industry and money – the Tredegars and Baileys – in the endowment of any substantial form of secondary education in the valley. They were both immensely rich and could have easily afforded the gesture. The Morgans particularly might have been expected to consider more carefully their long-term contribution and memorial. For they were fervently Welsh, public-spirited, generous with their time though not their money, and for much of the period well regarded. But from around 1810 they did not have the impact of the Bute family particularly the second marquis who, despite his absenteeism, led the development of Cardiff and was much more involved with his mineral estate. They ignored, or were oblivious to, the opportunity taken by Glasgow, London and elsewhere in establishing Schools of Design in using very early government funding of technical education. Similarly they made no endowment of a secondary school as occurred at Lewis School, Pengam and West Monmouth school at Pontypool. Such a school, which could have been well firmly established by 1850 and quickly aping the fashions of the time set by Arnold at Rugby, would have doubtless educated aspiring lawyers, civil servants and other professionals. But it could have bridged the educational chasm between 1850 and the development of the

intermediate schools. For just the occasional entrepreneurial engineers or chemists, like Edwards and Sir Terry Mathews of Newbridge and civil servants such as Thomas Jones, educated at Lewis School, could have made for a different set and pattern of events. The educational generosity of those who made their fortunes from the valley was more marginal or else was placed elsewhere. Lady Llanover was active in the founding of Llandovery College, Sir Thomas Phillips endowed Cwrt y Bella, a school at the primary level, was involved in the development of Lewis School, and the attack on the Blue Books. Thomas Brown encouraged the Literary and Scientific Institute at Ebbw Vale, but his generosity was paltry compared to the £30,000 he gave to his daughter as a dowry, and the institute did not fulfil its early promise and become a technical institution.

The relationship of education with the development of entrepreneurs is indistinct. However, its lack, together with the type of corporate industrial society which existed in the valley with its proclivity to blot out smallness and difference, would have made any form of organic sequencing to a more entrepreneurial society based on engineering very difficult. This characteristic was intensely persistent. At the beginning of the twenty-first century the UK start-up rate of new businesses was two and a half times the Welsh rate and 'two thirds of the Welsh adult population believed that successful entrepreneurs were not envied in their community'.[23]

Associated with this lack of educational initiative was the decision by Maynard and the Kennards to close the Crumlin Viaduct Works, thus effectively concluding the first and only attempt to introduce high-technology civil and mechanical engineering into the valley. The decision was probably inevitable following the bankruptcy of their bankers, but unfortunately ended the last opportunity for south-east Wales in the nineteenth century to enter the high-technology sector of both civil and mechanical engineering. The development of power tools, the experience of the construction, and logistics including transport, of large iron and steel bridges, their international experience, were irrevocably lost.

Probably less important, though still significant in its long-term consequences, was the decision of the investors in the canal to take no further initiative in the construction of the transport system following their great success in 1796. They took no long-term advantage from the relief from duty which lasted for over thirty years until its end in 1829. If they had done so the coal industry of these valleys would have been better placed to compete, an efficient transport support for engineering could have been developed, and the competitiveness of iron and steel improved. But though discussions took place as early as 1811 there was little investment and continual delays in construction. Crawshay often lost patience with the directors of the canal and developed alternative routes, Blewitt went mad and the GWR eventually scooped both the transport and some of the coal. Newport has developed in

Cardiff's shadow ever since and there has been a heavy price to pay for short-term greed.

The fifth decision of importance was to splinter the local government structure of the Ebbw valleys, including that of the Sirhowy, though the origins of this decision, or decisions, are unknown. Eleven urban and rural district councils were formed, which inevitably delayed the building of adequate water and sewerage services. The neighbouring valley of the Afon Llwyd fared even worse, as this river was the sewage disposal channel until the 1930s. T. S. Edwards, the solicitor, and the Abertillery district council who between them sawed through the Gordian knot, tied seemingly by every interest in the county including the eleven district councils, saved many lives and initiated the largest single civil engineering project between 1780 and 1914.

Lastly, and perhaps more debatable, was the decision to deal relatively lightly and sensibly with the leaders of the Chartist rising of 1839 and vengefully and foolishly with the miners when they were beaten in the strike of 1898. The first supported and may well have been a primary cause of the rather rough and ready industrial relations accommodation between 1840 and 1898 not only in the Ebbw valleys but in the UK. The second marked the end of accommodation and the beginnings of the long battle on the British coalfields between capital and labour shot through with class war. This was to culminate in the nationalization of the coal industry, and more tangentially in the sporadic nationalization of the steel industry, with the political personalities of the western Monmouthshire being an iconic point of reference.

Apart from the strike of 1898 and the Rising of 1839 (though this included the iron industry), there are no decisions directly and only related to the coal industry in this list. Perhaps this was because the coal industry lacked a great manager of the calibre of a Crawshay or Brown. More likely it was because the development of the coal industry compared to iron and steel and engineering was fixed by the quality, quantity and geology of the deposits. There are many iron and steelworks without local deposits of iron ore, but there are no coal industries without deposits of coal. The opportunities for the adding of value to coal and iron are completely different. It does seem that, whoever had managed the coal industry, the development would have been broadly the same. Levels, with the inevitable chaos of their management, would have come first followed by deep mining. Once a company's coal was on the Admiralty List (and the decision to construct this list was crucial in determining the success of the south Wales coalfield), markets at good prices to balance the competitive disadvantages of a rather poor geology were assured. Integration with iron might have been better managed, development of deep mining might have been more rapid if Powell had delayed his departure to the Cynon valley, the unions might have developed more quickly with different leaders but none of these potential changes seems radical in their influence.

The histories of the industrial valleys of south Wales were different, not only in their detail but in the broad story of their development, including the over-arching processes of change and integration. First, those locations with an iron and steel industry were very different in their development from those dependent only on coal. Secondly, none of the iron industries were successful in the development of long-lasting secondary industries with their markets developed outside the valley. Thirdly, the development of the sale coal industry based on a considerable competitive advantage in the market place until 1830 resulted in a coal industry in the valleys of western Monmouthshire which dominated the sale coal trade of south Wales for thirty years, and delayed the development of the east Glamorgan valleys. In its turn, this advantage contained the seeds of discontinuity in the development of transport which was to support the turning of this advantage on its head, as Glamorgan increasingly gained the ascendancy over its eastern neighbour. Fourthly, the pace and integration of change in the valleys varied and this process was particularly reflected in the movements of population which between 1840 and 1900 were quite different to those of Glamorgan. In the Ebbw valleys a competitive and profitable coal industry partially supported a more vulnerable iron and steel industry, particularly after 1860, the iron and steel industry made one spectacular branch into civil and mechanical engineering, the massive increase in population coupled with the structure of local government produced both one of the most diseased areas of the nation and a exemplary piece of social and civil engineering in the Grwyne Fawr reservoir. These differences and characteristics determined the particular development of the valley, including the nature of the reciprocal relationship with Newport.

This mixture of the decisions and cause and effect of industrial development which sometimes seems almost whimsical, perhaps changes less dramatically in its entanglement of social, political and economic forces than might be immediately apparent. Neither of the two major industrial innovations of the past ten years in Monmouthshire, those of the Celtic Manor Leisure complex and Newbridge Electronics, would have been sited in this part of the country unless their billionaire founder had been brought up in Newbridge. Similarly one of the premier cultural bequests, that of the very valuable Fox collection of porcelain recently given to Newport Museum, was willed by an entrepreneurial family made wealthy from their success in the Scottish antique trade, because of their connection with the same village.[24]

The combined result of these decisions and lack of initiatives was to lock the Ebbw valley, and in a wider context Wales, out of the great international industrial learning race. During the late 1880s Wales was given a lead, with the introduction of secondary education, but then followed the example of England, rather than branching out into technical education as Lord Aberdare had envisaged. The enormous energy produced by this industrial revolution

found its outlet and escape in other and diffuse matters of British and to some extent international importance. These included the politics of the welfare state, the preservation of the Welsh language and the drive towards devolution, and for fifty years or so rugby football.

By 1914 the Ebbw valleys and south Wales was into the final stage of its growth. The industrial structure had some resemblance to the undeveloped nations of eastern Europe of the 1980s, though some of those countries are already benefiting from their high-quality technical education. Both were to face the problems of changing from an economy which no longer worked, though moved towards opposite economic solutions – the Ebbw valleys towards an effective mix of market and command model from around 1930 to 1970. It was saved by government intervention, the tenacity of its people and the economics of Keynes, though many of the structural problems of 1914 were still intact as the people of the Ebbw valleys moved into the twenty-first century. But that, as they say, is another story.

Finally, it does seem that only by the building and integrating of all its dimensions on a solid and acceptable industrial foundation will the local history of south Wales move more rigorously forward, and regional and national histories find, their own sources not only of information, but concepts for their work. Thus a more effective and balanced iterative process will take place. The point is supported and perhaps comes better from a different discipline, that of geography: 'A more satisfactory depth of understanding is likely to be obtained by studying one valley or one valley system in totality than by studying a sample drawn from the entire steamcoal field, however carefully this is drawn up and executed.'[25]

APPENDIX: THE LABOUR MARKET 1830–1840

In brief, the quantification of the supply and demand for labour is as follows, beginning with the supply side. Between 1831 and 1841, the population of western Monmouthshire increased by about 30,000, from just over 49,000 to about 78,700 (Table 8.5). This increase differed considerably between locations in the valley. The population of the northern iron district of Aberystruth almost doubled from just under 6,000 to just over 11,000. The southern sale coal district increased its population by 9 per cent in Mynyddislwyn, where the inhabitants increased from about 6,900 to around 7,500. The population of the more recently developed and neighbouring sale coal area of Manmoel recorded the largest percentage increase of all as it more than doubled from about 3,200 to 6,800 (Table 8.5). It was perhaps no accident that the hamlet of Crosspenmaen was a centre of the Rising.

The demand for labour was influenced by two of the most important and coincidental developments in the industrial history of the Ebbw valley, and

perhaps south Wales, between 1780 and 1914. These were the abolition of duty in 1830, which effectively ended the monopoly of the eastwards coastwise trade in the sale coal of Newport, and the implementation of hot blast, which was a revolution in blast furnace technology. The first resulted in a decline in the output of coal for the largest market for the sale coal of western Monmouthshire. The evidence for this trend is supported by a reduction in the volume of coal being carried down the canal from 533,408 tons to 456,060 tons, a considerable 14 per cent fall, between 1830 and 1834. By 1839 it was still below the volume of 1830.[26] To make matters considerably worse, the implementation of hot blast reduced the amount of coal needed to produce a ton of pig iron from about 4 tons to 2fi–3 tons. This technology had been introduced in eleven of the thirteen furnaces in Aberystruth by 1839.[27] The pressure on margins in the sale coal industry, particularly in those pits and levels which were also supplying the iron industry, must have been intense and could only be passed on in one direction – downwards to the coal miners, either through the truck shops or directly. It would have been easier if coal miners could have transferred into iron manufacture when demand for their labour declined, but this was generally not the case as the skills were both different and protected, and the iron industry itself experienced turbulent times in the 1830s, which culminated with the bankruptcy of the Ebbw Vale works.

Thus though the production of iron went up, as is evidenced by an increase in the volume of iron being carried down the canal from about 112,000 tons to 176,000 tons between 1830 and 1839, it was not in the form of a reasonably constant increase year on year. It was strongly influenced by a discontinuity in the markets. For example, between 1837 and 1839 there was a rise in the price of bar iron but there was a collapse in railway construction, from 955 miles in 1836 to 54 miles in 1838.[28]

This simplistic analysis of supply and demand is not, of course, the end of the story. In particular there is need for research on the push factor from Gloucestershire and Somerset, which between them supplied a very high proportion of the increase encouraged by the attraction of the potential doubling of earnings estimated by John Williams for 1840. For even with this economic evidence to add to the analysis of Jones and Wilks, it is difficult to comprehend that conditions in reasonably nearby rural places were so appalling that people were encouraged to move in such numbers to that terrible valley in western Monmouthshire, particularly as there was a reduction in the national earnings of heads of households in mining from £66 in 1831–5 to £42.73 in 1836–40 and it is very doubtful that Monmouthshire would have escaped this trend.[29] By mid-1840 the sale coal trade seems to have settled down, albeit at a much lower rate of growth. Perhaps with the failure of the Rising there may have been some encouragement to in-migration so as to bring down even further the wage rates, as is evidenced by

Table 8.5. The population of western Monmouthshire, 1801–1851

Locality	1801	1811	1821	1831	1841	1851
Aberystruth	**805**	**1, 626**	**4, 059**	**5, 992**	**11, 272**	**14, 383**
Tredegar						
Manmoel	619	1, 230	1, 764	3, 208	6, 789	9, 120
Ushlawrcoed	513	2, 728	3, 640	5, 359	13, 140	15, 424
Ishlawrcoed	302	632	978	2, 070	2, 484	2, 639
	1, 434	**4, 590**	**6, 382**	**10, 637**	**22, 413**	**27, 183**
Pontypool						
Llanhilleth	203	344	438	545	662	899
Trevethin	1, 472	2, 423	3, 931	10, 280	14, 942	16, 864
Mamhillad	209	262	237	277	303	297
Llanvihangel	136	171	158	149	202	205
Panteague	550	1, 052	1, 478	1, 584	2, 171	2, 349
	2, 570	**4, 252**	**6, 242**	**12, 835**	**18, 280**	**20, 614**
St Woolos						
Duffryn	208	191	228	213	193	274
Graig	331	417	439	581	589	636
Rogerstone	447	650	662	870	949	1, 249
Risca	240	564	358	742	1, 072	2, 044
Hentlis	188	182	209	207	245	265
others St Woolos	1, 895	2, 042	2, 248	2, 966	2, 717	3, 291
	3, 309	**4, 046**	**4, 144**	**5, 579**	**5, 765**	**7, 759**
Mynyddislwn						
Clawrplwyf	476	882	1, 250	1, 918	2, 055	2, 096
Mynyddmaen	454	1, 098	511	942	856	1, 519
Penmain	614	1, 010	1, 425	2, 175	2, 474	2, 379
Bedwas/Machen	1, 060	1, 639	1, 602	1, 870	2, 113	2, 887
	2, 604	**4, 629**	**4, 788**	**6, 905**	**7, 498**	**8, 881**
Newport	**1, 423**	**3, 025**	**4, 951**	**7, 062**	**13, 443**	**19, 892**
Total	**12, 145**	**22, 168**	**30, 566**	**49, 010**	**78, 671**	**98, 712**

Source: 1851 census, Monmouthshire parishes, Area, Houses 1841, 1851.
Note: The figures for Manmoel are labelled 'Mamhole' in the 1831 census but agree with the 1851 figure. Rhymney valley border parishes excluded.

a return to recruitment in 1840: 'Wanted one thousand men at the Monmouthshire sale coal collieries where good men can earn 4 to 5 shillings per day. Applications to the Newport Coal Company.'[30]

Notes

1 Introduction

[1] For a perception from outside Wales see particularly K. Wrightson, *Earthly Necessities: Economic Lives and Early Modern Britain* (New Haven and London: Yale University Press, 1999), 25.
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[3] C. Baber and L. J. Williams (eds), *Modern South Wales: Essays in Economic History* (Cardiff: University of Wales Press, 1986), 1.
[4] D. L. Jones, 'Theses on Welsh history, numbers 2 to 7', reprinted from *Welsh History Review*, 7, 1 (1974) to 19, 2 (1998).

2 The Ebbw valleys in 1780

[1] F. J. North, *Coal and Coalfields in Wales* (Cardiff: National Museum of Wales, 1931), 103.
[2] *Report of the Commissioners Relating to Coal*, BPP XVIII, vol. 1 (1879), 9.
[3] J. Bradney, *A History of Monmouthshire*, vol. 5 (Cardiff and Aberystwyth: South Wales Record Society and National Library of Wales, 1993), 131.
[4] A. Bassett, 'The port of Newport and its coalfield', *Transactions, South Wales Institute of Engineers*, vol. 5 (1866–7), 138.
[5] Wren Library, Trinity College Cambridge, A. J. Munby, Diary, 21 September 1865 (not edited).
[6] J. Ginswick (ed.), *Labour and the Poor in England and Wales*, vol. 3 (London: F. Cass, 1983), 110.
[7] G. A. Cooke, *A Topographical and Statistical Description of the County of Monmouth* (London, 1810), 121.
[8] W. Coxe, *Historical Tour in Monmouthshire*, vol. 2 (London, 1801), 257.
[9] Ibid., 257.
[10] E. Jones, *A Geographical, Historical and Religious Account of the Parish of Aberystruth* (Trevecka, 1789), 12.
[11] J. A. Bradney, *The Hundred of Abergavenny* (Cardiff and Aberyswyth: South Wales Record Society and National Library of Wales, 1992), 474.
[12] A. Pickford, *Between Mountain and Marsh* (Newport: R. H. Johns, 1946), 62.
[13] Blaenau Gwent DC, 'The Old Parish of St Illtyd', 1 (Miscellaneous papers, 1993). Note there is no reference number for these papers. Apart from my copy it is probable that these papers no longer exist.

[14] R. Williams, *The Welsh Industrial Novel* (Cardiff: University College Cardiff Press, 1979).
[15] G. H. Jenkins, *The Foundations of Modern Wales* (Oxford: Oxford University Press, 1991), 88.
[16] Blaenau Gwent DC 1993, 'Old Parish of St Illtyd', 2.
[17] NLW, Tredegar Papers, vol. 1, MS and Documents, no. 811.
[18] A. Pickford, *Between Mountain and Marsh*, 88.
[19] NLW, Tredegar Park Muniments, boxes 58–76, no. 64/12.
[20] E. T. Davies, *Religion and the Industrial Revolution in South Wales* (Cardiff: University of Wales Press, 1965), 111.
[21] PRO, Tithe Act 1836 Monmouthshire Papers, Map Room.
[22] A. Gray-Jones, *A History of Ebbw Vale* (Newport: Gwent County Council, 1992), 31.
[23] G. H. Jenkins, *Foundations*, 101.
[24] Ibid., 98–9.
[25] Blaenau Gwent DC, 'Old Parish of St Illtyd', 4.
[26] E. T. Davies, *Monmouthshire Schools and Education to 1870* (Newport: Starsons, 1957), 123.
[27] Gray-Jones, *History of Ebbw Vale*, 37.
[28] PRO, Committee Book Monmouthshire Railway and Canal Company 1792–1812, Rail 500/5.
[29] P. Morgan, 'From a death to a view: the hunt for the Welsh past in the Romantic period', in E. Hobsbawm and T. Ranger (eds), *The Invention of Tradition* (Cambridge: Cambridge University Press, 1993).
[30] J. Byng, *Rides around Britain* (London: Folio, 1996), 90.
[31] NLW, Tredegar Park Muniments, boxes 58–76, no. 64/303.
[32] J. E. Southall, *The Welsh Language Census of 1901* (Newport, 1901).
[33] D. Williams, *A History of Monmouthshire* (London, 1796), 345.
[34] A. H. John, *The Industrial Development of South Wales* (Cardiff: Merton Priory Press, 1995), 4.
[35] J. A. H. Evans, 'The witness and testimony of ordinary people in the vicinity of Blaenavon', *Gwent Local History*, 81 (1996), 2.
[36] R. Hanbury Tenison, *The Hanburys of Monmouthshire* (Aberystwyth: NLW 1995), 19.
[37] Coxe, *Historical Tour*, appendix 16.
[38] P. Riden, *A Gazetteer of Charcoal Fired Blast Furnaces in Great Britain in Use since 1660* (Cardiff: Merton Priory Press, 1993), 11.
[39] NLW, Tredegar Park Muniments, boxes 58–76, nos 76/33, 36.
[40] Ibid., nos 76/163.
[41] J. G. Jenkins, *The Welsh Woollen Industry* (Cardiff: National Museum of Wales, 1969), 313.
[42] W. J. Lewis, *Lead Mining in Wales* (Cardiff: University of Wales Press, 1966), 256.
[43] S. K. Roberts (ed.), *The Letter Book of John Byrd, Customs Collector in South Wales 1648–1680* (Cardiff: South Wales Record Society, 1999).
[44] T. Koditschek, *Class Formation and Urban-Industrial Society in Bradford, 1750–1850* (Cambridge: Cambridge University Press, 1989), 30.
[45] Pickford, *Between Mountain and Marsh*, 18.
[46] Gw. RO, Records of Elliott Mineral Estate, Blaencwm, Probate will of Martha Hoskins, D 3212.6.
[47] David Williams, *History of Monmouthshire* (London, 1796), 348.

3 The coal industry: mining and productivity

[1] See, particularly, *The History of the British Coal Industry*, vols 1–5 (Oxford: Clarendon Press), vol. 1; J. Hatcher, *Before 1700* (1993), vol. 2; M. W. Flynn, *1700–1830: The Industrial Revolution* (1984), vol. 3; R. Church, *1830–1913: Victorian Pre-Eminence* (1986), vol. 4; B. Supple, *1914–1945: The Political Economy of Decline* (1987); W. Ashworth, *1946–1982: The Nationalized Industry* (1986). The absence of design conventions in industrial history is illustrated in this work. In vol. 1, the section titled 'production' which includes 'mining', is immediately followed by 'consumption' which includes 'marketing'. In vol. 2, the section dealing with 'technology' contains much of what would be described as 'production' in vol. 1. This is followed, after a considerable break, by two chapters entitled 'Markets' and 'The organization of marketing'. In vol. 3 the order is reversed. Marketing is part of the first chapter entitled, 'Rise of the coal economy: output and demand', while 'mining', which is mainly discussed within the chapters on 'technology', is discussed two chapters later.

[2] *Mines Eight Hour Day Committee*, BPP XV (1907), part 2, 570–1 and 634–7.

[3] *Report for the Committee on the Petition of the Owners of Collieries in South Wales*, BPP IV (1810), Dr Griffiths' Evidence, 18.

[4] NLW, Tredegar Park Muniments, boxes 1–45, no. 45/204.

[5] *MM* (31 April 1835).

[6] *MM* (3 August 1839).

[7] *Children's Employment Mines*, BPP XVII (1842), 472, para. 8.

[8] *MM* (24 Jan. 1835). Note 'Labourers not agricultural' designated as coal miners by author.

[9] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 386.

[10] J. G. Davies, 'Industrial society in north-west Monmouthshire, 1750–1851' (University of Wales, Aberystwyth Ph.D. thesis, 1980), 31.

[11] BPP XXXV (1913), 231–5.

[12] A. Bassett, 'The port of Newport and its coalfield', *Transactions, South Wales Institute of Engineers*, 5 (1866–7), 135.

[13] D. Williams, *History of Monmouthshire* (London, 1796), 147.

[14] A. Gray-Jones, *A History of Ebbw Vale* (Newport: Gwent CC, 1992), 91.

[15] C. Parry, 'The past and present history of Ebbw Vale', prize essay submitted to an eisteddfod held at Bethel Chapel, Victoria 1869 (private papers), 17.

[16] Bassett, 'Port of Newport', 138.

[17] J. Bradney, *A History of Monmouthshire*, vol. 5 (Cardiff and Aberystwyth: South Wales Record Society and National Library of Wales, 1993), 466.

[18] Edmund Jones, *A Geographical, Historical and Religious Account of the Parish of Aberystruth* (Trevecka, 1789), 19.

[19] Gray-Jones, *History of Ebbw Vale*, 72.

[20] Gw. RO, D 43/7193.

[21] Bassett, 'Port of Newport', 141.

[22] *WA* (27 April 1907).

[23] Welsh Industrial Maritime Museum, J. Tallis, 'Colliery and coking department', *The Ebbw Vale Steel, Iron and Coal Company Limited* (1907), 87.1391/ 3. Parts of this document are to be found in a number of private and public sources and can confuse the historian.

[24] Gray-Jones, *History of Ebbw Vale*, 92.
[25] *MM* (26 June 1846).
[26] *MM* (30 November 1850).
[27] G. Spencer, *A Community Underground* (Crumlin: Treowen Press, 1994). Pages not numbered.
[28] NLW, Tredegar Park Muniments, boxes 45–57, no. 57/58.
[29] Anon., 'The Newport and Abercarn Black Vein Steam Coal Company Ltd', *Syren and Shipping*, 8 (1910), 79.
[30] Anon., 'The Tredegar Iron and Coal Company Ltd', *Syren and Shipping*, 2 (1918), 46.
[31] *MM* (6 March 1874), Annual Report South Wales Colliery Co.
[32] Gw. RO, Elliott Mineral Estate Blaencwm, D 3212.
[33] J. Ginswick (ed.), *Labour and the Poor in England and Wales* (London: F. Cass, 1983), 146.
[34] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 313.
[35] *South Wales Weekly Argus* (23 July 1904).
[36] *MM* (15 May 1864).
[37] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 502.
[38] Ibid., table 65, p. 500.
[39] *Dr. W. N. Atkinson's Report for South Wales District (Mines and Quarries*), section 1, BPP XXXV (1913), table 1.
[40] R. H. Walters, *The Economic and Business History of the South Wales Steam Coal Industry* (New York: Arno Press, 1977), table 31, p. 255. Crudely adjusting Walters's figure of 33 per cent down to 25 per cent so as to correct for the higher wages of hewers, about 15,000 of the total employees of 57,718 were employed as hewers and butties in Monmouthshire just before the outbreak of the First World War.
[41] C. Smith, 'Apprenticeship of a coalminer', oral evidence on tape loaned by Prof. Angela John.
[42] W. G. Dalziel (compiler), *Records of the Several South Wales and Monmouthshire Coal Owners' Associations 1864–1895* (London: 1895), 359.
[43] T. Dyne Steel, 'The Tillery coal seam and workings', *Transactions, South Wales Institute of Engineers* 5 (1866–7), 234.
[44] E. D. Lewis, *The Rhondda Valleys* (London: Phoenix House, 1959), 64.
[45] Bassett, 'Port of Newport', 186.
[46] J. Nasmyth, 'The pillar and stall, double stall, and longwall methods of working coal', *Transactions, South Wales Institute of Engineers*, 3 (1863), 193.
[47] Dalziel (compiler), *Minutes*, 355.
[48] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 208.
[49] Dalziel (compiler), *Minutes*, 354.
[50] *Report from Committee 4 (Noxious)*, Evidence G. Elliot, BPP X (1873), 299, para. 7543.
[51] *Mines Eight Hour Day Committee,* Evidence Three Shift Working, BPP XV (1907), para. 9649.
[52] *Children's Employment Mines*, R. H. Franks, BPP XV (1842), para. 388.
[53] Ibid., para. 62.
[54] Ibid., para. 166.
[55] Tallis, 'Colliery and coking department', 14.
[56] Anon., 'Newport and Abercarn Black Vein Steam Coal Company', 81.
[57] Tallis, 'Colliery and coking department', 14.

[58] BPP XXXVI (1911), para. 55487.
[59] Spencer, *Community Underground.*
[60] Tallis, 'Colliery and coking department', 17.
[61] Spencer, *Community Underground*.
[62] *Children's Employment Mines,* BPP XV (1842), para. 118, p. 489.
[63] *Ventilation of Mines,* System in South Wales, Evidence Kenyon Blackwell, BPP XXIII (1850), 450.
[64] G. Ginswick (ed.), *Labour and the Poor in England and Wales,* vol. 3 (London: Frank Cass, 1983), 145.
[65] G. L. Galloway, *A History of Coal Mining in Great Britain* (London: David & Charles, 1969), 52.
[66] Tallis, 'Colliery and coking department', 13.
[67] Gray-Jones, *History of Ebbw Vale*, 92.
[68] PRO, HO 45/9549/60775, 9.
[69] Church, *History of Coal Industry,* vol. 3, *1830–1913,* 340.
[70] PRO, POWE 6/14, XC 16472.
[71] *Dr. W. N. Atkinson's Report*, BPP XXXV (1913), table 3, p. 5, table 4, p. 8.
[72] *Mines Eight Hour Day Committee,* part 2, *Minutes of Evidence*, BPP XV (1907), 37.
[73] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 359.
[74] *Electricity in Mines*, BPP XXIV (1904), p. 62, para. 1862.
[75] Church, *History of Coal Industry*, vol. 3, *1830–1913*, 502; *Colliery Guardian* (2 June 1871), 586–8.
[76] *Royal Commission on Mining Royalties*, Evidence R. Barnes, BPP XLI (1890–1891), pp. 356–7, paras 13944–13964.
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[79] NLW, 'Minutes of the Conciliation Board meeting – reference the Eight Hour Act', Coal Owners Association 1954, 12.

4 The coal industry: marketing and financial performance

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[2] R. H. Walters, *The Economic and Business History of the South Wales Steam Coal Industry 1840–1914* (New York: Arno Press, 1977).
[3] J. Ginswick (ed.), *Labour and the Poor in England and Wales 1849–1851* (London: F. Cass, 1983), vol. 3, 145.
[4] A. Strahan, *The Geology of the South Wales Coalfield,* part 1, *Newport* (London: HMSO, 1899), 30.
[5] *MM* (2 June 1866). *The South Wales Coalfield, Regional Survey Report* (London: HMSO 1946), 13. F. J. North, *Coal and Coalfields in Wales* (Cardiff: National Museum of Wales, 1931), 103.
[6] C. E. Evans, *Hints to Coal Buyers* (Cardiff: Business Statistics Publishing Co., 1909), 19.
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[8] *The Newport Trade Directory* (Newport, 1918), 94.
[9] Anon., 'The Tredegar Iron and Coal Company Limited', *Syren and Shipping,* 2 (1918).

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[13] J. H. Morris and L. J. Williams, *The South Wales Coal Industry 1841–1875* (Cardiff: University of Wales Press, 1958), 8.
[14] *MM* (29 August 1840).
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[16] Ibid., 86.
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[21] PRO, BT 1.470.
[22] A. Bassett, 'The Port of Newport and its coalfield', *Transactions, South Wales Institute of Engineers*, vol. 5 (1886–7), 153.
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[26] D. Howarth and S. Howarth, *The Story of the P and O* (London: Weidenfeld and Nicolson, 1980), 15.
[27] Morris and Williams, *South Wales Coal Industry*, 35.
[28] *MM* (17 March 1848).
[29] C. E. Evans, *Hints to Coal Buyers,* List of British Admiralty Coals.
[30] Morris and Williams, *South Wales Coal Industry*, 5.
[31] *MM* (14 March 1840).
[32] *MM* (29 February 1840).
[33] *MM* (20 February 1841).
[34] *MM* (11 May 1894).
[35] *South Wales Times* (10 March 1899).
[36] *South Wales Weekly Argus* (25 March 1908).
[37] *South Wales Weekly Argus* (11 January 1907).
[38] *MM* (7 March 1835) in an advertisement for capital for proposed Newport Dock.
[39] *MM* (12 February 1859).
[40] W. M. Acworth, *The Railways of England* (London: John Murray, 1900), 295.
[41] *MM* (26 February 1896).
[42] *Royal Commission on Coal Supplies*, BPP XVI (1905), part 10, paras 19483–9.
[43] Church, *History of Coal Industry,* vol. 3, *1830–1913*, 18.
[44] See Chapter 6 below.
[45] *Report of Commissioners Relating to Coal*, BPP XVIII (1871), vol. 1, 10.
[46] *South Wales Times* (23 June 1896).
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[48] BPP XVI (1905), paras 19792–19814.

5 Iron and steel

[1] The British iron and steel industry has received much less academic attention than that of coal and there is little material to compensate for this disadvantage from primary sources. Most notably, there are few sets of annual accounts, they differentiate little between the trading of coal and iron and steel, and there is very little information on marketing and costs. Contemporary descriptions of the industry, particularly A. Percy, *Percy's Metallurgy* (London: John Murray, 1864) and Col. T. Mitchell's *Monmouthshire Iron and Steel Trade* (Newport: J. Southall, 1904) hardly engage with these business activities. The same problem is evident in the specific contemporary accounts of the Ebbw Vale company: Indeed, for the period 1880 to 1914, it was fortunate that the recently opened and remarkable Ebbw Vale works archive gives access to historians.

A survey of more recent publications confirms the problem. The massive and recent publication in five volumes of the history of British coal industry has no analogy in iron and steel. The British contribution, apart from Burnham and Hoskins's *The British Steel Industry 1870–1930* (1943), is almost completely restricted to the period ending in 1880. The standard economic history, A. Birch, *The Economic History of the British Iron and Steel Industry 1780–1879* (London: Frank Cass, 1967), ends in 1879. The most important recent advance has been the publication of P. Riden and J. G. Owen, *British Blast Furnace Statistics 1790–1980* (Cardiff: Merton Priory Press, 1993) and C. Bodsworth (ed.), *British Iron and Steel: A. D. 1800–2000 and Beyond* (London: IOM Communications, 1990), both of which are primarily technical studies. The Welsh dimension is similarly neglected. Apart from M. Atkinson and C. Baber, *The Growth and Decline of the South Wales Iron Industry 1760–1880*, (Cardiff: University of Wales Press, 1987), the chapter in the Glamorgan county history by Boyns, Thomas and Baber and L. Ince, *The South Wales Iron Industry, 1750–1885* (Cardiff: Merton Priory Press, 1993), there has been little work since 1950. There have been a few chronological descriptive studies such as that of Robert Protheroe-Jones, *Welsh Steel* (Cardiff: National Museum of Wales, 1995), and social studies, notably, Gwyn. A. Williams's *The Merthyr Rising* (Cardiff: University of Wales Press, 1988), and Chris Evans's study of the early social history of Merthyr, *The Labyrinth of Flames* (Cardiff: University of Wales Press, 1993), but these are very limited in terms of their contribution to industrial history over the totality of the period 1780 to 1914.

Author unknown, but probably F. Mills and J. Tallis, *The Ebbw Vale Steel, Iron and Coal Company* (privately published 1907), Welsh Industrial Maritime Museum, 87.1391/3; F. Hilton and H. Phillips, *The Story of the Ebbw Vale Works* (privately published 1894 and later incorporated into a publication dated 1925), private papers.

(This archive of the succession of companies on the Ebbw Vale site and its companies in Monmouthshire, together with some other valuable source material, is located in the Board Room of the Ebbw Vale Works. There is not a permanent archivist.)

[2] The National Council of Iron Ore Producers, *The Iron Ore Industry of Great Britain* (Kettering: East Midland Printing Co., 1960).

[3] *Information Blue Book* (British Steel, 1996). For numbers employed from Ebbw valleys at Llanwern, oral evidence at Ebbw Vale and Llanwern, February 1997.

[4] Atkinson and Baber, *Growth and Decline,* 8.
[5] T. Boyns, 'Growth in the coal industry: the cases of Powell Duffryn and the Ocean Coal Company 1864–1913', in Klaus Tenfelde (ed.), *Towards a Social History of Mining in the Nineteenth and Twentieth Centuries* (Munich: International Mining Congress, 1992), 155.
[6] J. Lloyd, *Old South Wales Iron Works* (London: Bedford Press, 1906), 157.
[7] Ibid., 187.
[8] Atkinson and Baber, *Growth and Decline,* 6.
[9] *MM* (29 August 1840).
[10] E. Rogers, 'On the manufacture of tin plates and the use of a substitute for charcoal as a fuel in the finery', *Transactions, South Wales Institute of Engineers,* 1 (1857–9), 19.
[11] Atkinson and Baber, *Growth and Decline,* 16.
[12] J. Hilton and F. Phillips, *The Story of the Ebbw Vale Works*, private papers (1925), 32.
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[14] Atkinson and Baber, *Growth and Decline,* 39.
[15] *Monmouthshire Beacon* (9 July 1839).
[16] Wren Library, Trinity College, Cambridge, A. J. Munby, Diary, not catalogued, 21 September 1865.
[17] Hilton and Phillips, *Story of Ebbw Vale,* 40.
[18] Ibid., 5.
[19] Gw. RO, Auction Notice Ebbw Vale and Sirhowy Ironworks, 749.508.
[20] W. Coxe, *Historical Tour in Monmouthshire,* vol. 2, (London, 1801), 257.
[21] R. Pugh, *History of the Baptist Church Abercarn* (Newport: R. H. Johns, 1932), 20.
[22] *Monmouthshire Beacon* (9 July 1839).
[23] Ince, *South Wales Iron Industry,* appendix 4. See also Figs 4.1 and 4.2.
[24] See Table 4.1.
[25] Ince, *South Wales Iron Industry,* appendix 5.
[26] J. C. Carr and W. Taplin, assisted by A. E. G. Wright, *History of the British Steel Industry* (Oxford: Blackwell, 1962), 9.
[27] Lloyd, *Old Iron Works*, 169.
[28] Ince, *South Wales Iron Industry,* 9, 10.
[29] M. Elsas (ed.), *Iron in the Making: Dowlais Company Letters 1782–1860* (Cardiff: County Records Committee, 1985), 200.
[30] Phillips and Hilton, *Story of Ebbw Vale*, 5.
[31] Elsas, *Iron in the Making,* 201.
[32] R. Hunt, *Mineral Statistics* (London: Geological Survey, 1857), 89.
[33] *MM* (1 January 1875).
[34] Carr et al., *British Steel*, 8.
[35] Ibid., 10.
[36] Ince, *South Wales Iron Industry*, chapter 11, for a good description of these changes.
[37] Ibid., 106, and appendix 1, table 1.
[38] A. Gray-Jones, *A History of Ebbw Vale* (Newport: Gwent CC 1992), 87.
[39] Phillips and Hilton, *Story of Ebbw Vale*, 8.
[40] *Merlin and Silurian* (8 November 1856).
[41] Phillips and Hilton, *Story of Ebbw Vale*, 10.
[42] F. Mills and J. Tallis, *The Ebbw Vale Steel, Iron and Coal Company* (Welsh Industrial Maritime Museum), 87.1391/3, 8.

[43] Ibid.
[44] *The Engineer* (3 November 1876), 319.
[45] *Monmouthshire Beacon* (6 July 1839).
[46] Riden and Owen, *Blast Furnace Statistics*, section on local statistics for Nantyglo and Beaufort.
[47] Gw. RO Letter to Shareholders 1874, Nantyglo and Blaina papers, D 309/1.
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[49] *Monmouthshire Merlin and South Wales Advertiser* (12 December 1873).
[50] Ibid.
[51] Gw. RO, Proceedings AGM, 10 December 1877, Nantyglo and Blaina papers, D 396.3.
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[54] *Stock Exchange Year Book* (1911).
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[58] *Mineral Statistics of the UK and Ireland*, HM Inspector of Mines 1896. See also Table 5.2.
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[60] Ebbw Vale Works archive, Annual Report 1891, 8, not catalogued.
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[62] Phillips and Hilton, *Story of Ebbw Vale*, 12.
[63] *South Wales Times and Star of Gwent* (19 January 1894).
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[65] *WA* (15 June 1912) and Table 3.6.
[66] *South Wales Times* (22 June 1900).
[67] D. L. Burn, *An Economic History of Steelmaking 1867–1939* (Cambridge: Cambridge University Press, 1940), 187.
[68] *The Times* (10 June 1907).
[69] Carr et al., *British Steel*, 292.
[70] BL, Souvenir Programme, Opening of the New Lock Entrance, 14 July 1914, 08235 156.
[71] See Tables 3.5 and 3.6.
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[78] Gw. RO, The Ebbw Vale Iron and Steel Company, D 394.
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