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CCSI Policy Paper

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Key Points

- 1 Location and access to raw materials played a key role when the steel industry was established to supply the domestic market.
- 2 Australia was successful in establishing a steel industry that fully met the domestic demand for steel for well over 80 years. This was aided by strong government intervention throughout the history of Australia's steel industry.
- 3 Recent efforts by the government to force BHP Billiton and Rio Tinto to move downstream have failed. While government intervention worked well early on, the steel export market never really took off in Australia, due in part to the protections afforded to the steel industry.
- 4 The increasingly globalized steel market, global over capacity, and the financial crisis have all dealt the death knell to the Australian steel industry.

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Downstream Beneficiation Case Study: Australia

Introduction

Australia was chosen as a downstream beneficiation case study because it has significant reserves of both coking coal and iron ore, as well as evidence of beneficiation activities dating back to the beginning of the 20th century. What also makes Australia such an interesting case study, with regard to beneficiation activities, is that, despite the great abundance of raw inputs that are considered key ingredients to steel production, Australia did not develop its steel production capacity much beyond that needed to service the domestic demand. However, it has been able to fully develop as a nation on a commodity based economy without experiencing the “resource curse”, and today is considered one of the more advanced countries in the world. Australia’s lack of further downstream activities is not for a lack of trying and the government has taken a significant number of legislative and policy based approaches in order to foster greater beneficiation of iron ore. In spite of these efforts, the government interventions appear to be a bust, with Australia’s share of the world crude steel market expected to further shrink by 20% by 2018.¹ The story of Australia begs the practitioner to ask the question, “do countries need to pursue downstream activities to develop?”

For the purpose of this case study, a historical overview of the steel industry will be conducted with a lens on iron ore beneficiation activities. Special attention will be paid to government interventions that have been aimed at increasing beneficiation activities.

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Steel Industry 1915-1945

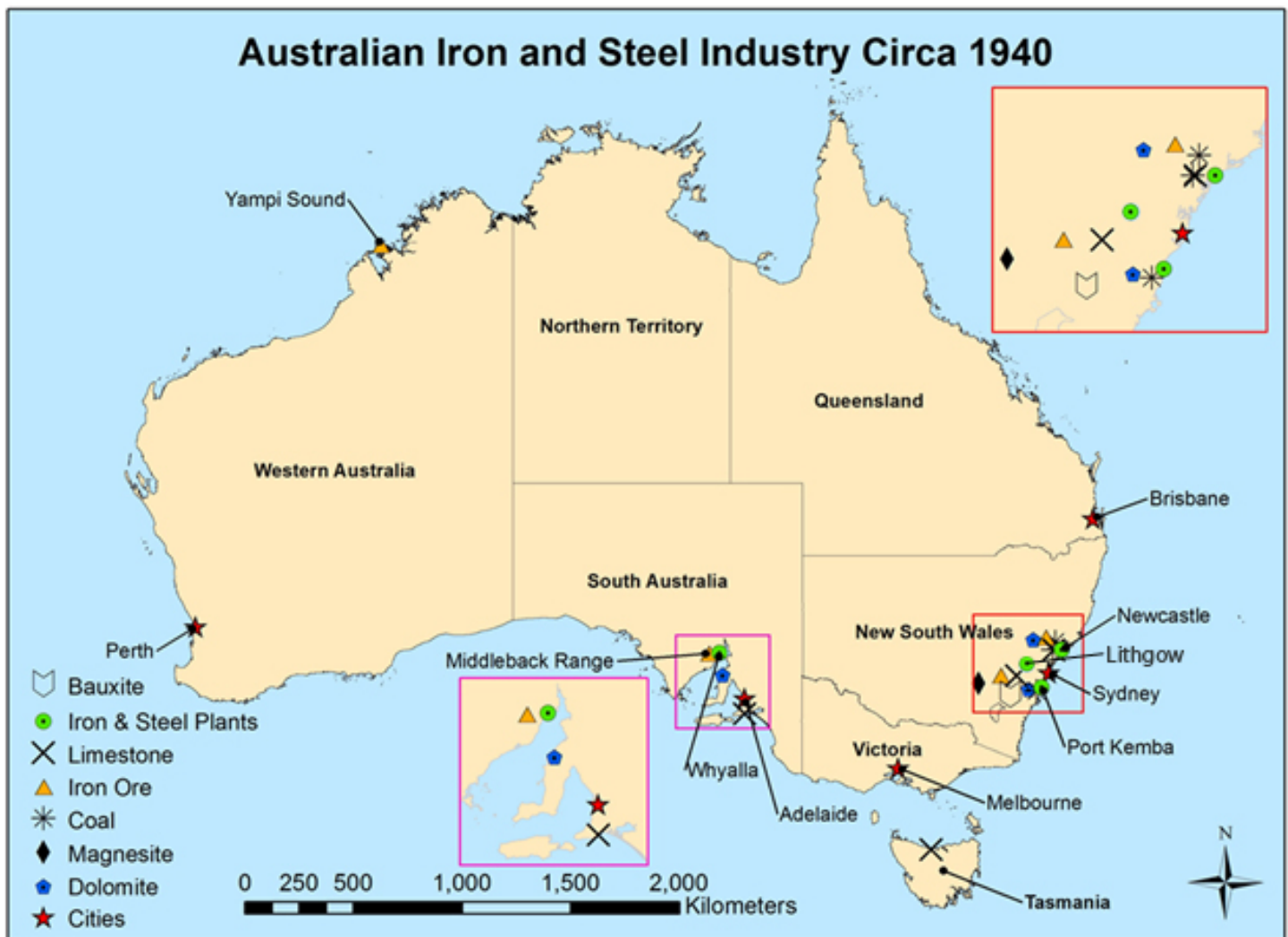
The roots of the Australian iron and steel industry can be traced back to the beginning of the 20th century. In 1915, Broken Hill Proprietary's (BHP) Newcastle iron works began production, marking the start of the modern phase of the Australian iron and steel industry.ⁱ Prior to the commissioning of the Newcastle plant, the only significant iron ore beneficiation occurring in Australia was concentrated in the Lithgow valley. The valley was found to have deposits of coal in the 1800's, easily accessible through short shafts or tunnels. To exploit the coalfields, a railway line was established there in 1869 connecting Sydney to Lithgow. The steel industry soon followed due to the fact that there was a readily available supply of coal and adequate access to transportation from the railroad providing access to markets for the finished products. This is a familiar story that has been repeated over and over in the histories of industrial revolutions experienced by many countries during this time period.

In addition to the rapid industrialization that was occurring in Lithgow as a result of the rail road infrastructure and presence of coal deposits, the government initiated two schemes that helped to catalyze the development of the iron and steel industry. First, in 1905 a contract was obtained from the New South Wales government by the Lithgow steel works for the supply of its iron and steel needs for a period of seven years, which resulted in a new blast furnace being erected and the commencement of pig iron production in 1907 (**Appendix 1**).ⁱⁱ Then, in 1909 the government passed an act to encourage manufacturing in New South Wales, which further catalyzed the expansion of the steel industry there. Under this act, contractors that supplied steel to the government were eligible to receive generous bounties on iron and steel made from Australian ores (**Appendix 1**).ⁱⁱⁱ This led to the Lithgow plant, owned by Hoskins Iron and Steel, to be modernized and expanded in order to take advantage of the new state implemented bounty system. In order to support the increased production at Lithgow, new iron ore deposits were opened up along with new collieries to supply coking coal. This illustrates how the creation of a guaranteed market for steel at a set price to domestic producers helped to grow and modernize the mining and steel sector. Despite the initial industrial growth that Lithgow experienced, its distance to the ports (nearly 300 km), low capacity, and rudimentary smelting operations paled in comparison to the newly established plant in Newcastle.

The Newcastle plant was a large-scale operation built using American designs and was sited based on its accessibility to markets, proximity to raw materials, availability of labor, and costs of transport.^{iv} While coking coal was available locally, iron ore was being shipped via marine transport over 1500 miles from the Middleback Range in South Australia (see **Map 1** below). This negated the need to transport the ore via costly rail infrastructure. Marine transport was cheaper than rail due to the costs associated with capital investment that goes into building rail infrastructure. The Newcastle plant was opened at an opportune time, as World War 1 had just begun, which resulted in greatly restricted imports of steel while at the same time there was a domestic demand for steel inputs created by the local armaments industry. The end of the war (in 1918) brought the resumption of steel imports (in 1919) back into the Australian market, at which point the government stepped in and imposed high protective tariffs on imports of iron and steel. The Tariff Act of 1921 (**Appendix 1**) was passed by the government to, not only protect the larger steel producers in Newcastle and Lithgow, but to also ensure the continued existence of the numerous secondary industries that had been established during the war years, many of which were established as subsidiaries of BHP or through agreements with the steel maker.^v This protectionist action by the government allowed the iron and steel industry to survive meekly during the 1920's and further rationalize their operations.^{vi} In addition to the implementation of the Tariff Act of 1921, the government also passed the "Iron and Steel Products Bounty Act of 1922," with bounties being paid on fencing wire, galvanized sheets, wire-netting, and traction

engines made in Australia.^{vii} This was aimed at further protecting the secondary industries that had been established during the war years.

Map 1. Significant of Sites for Iron and Steel Industry Circa 1940



This map depicts key sites associated with iron and steel industry of Australia circa 1940.

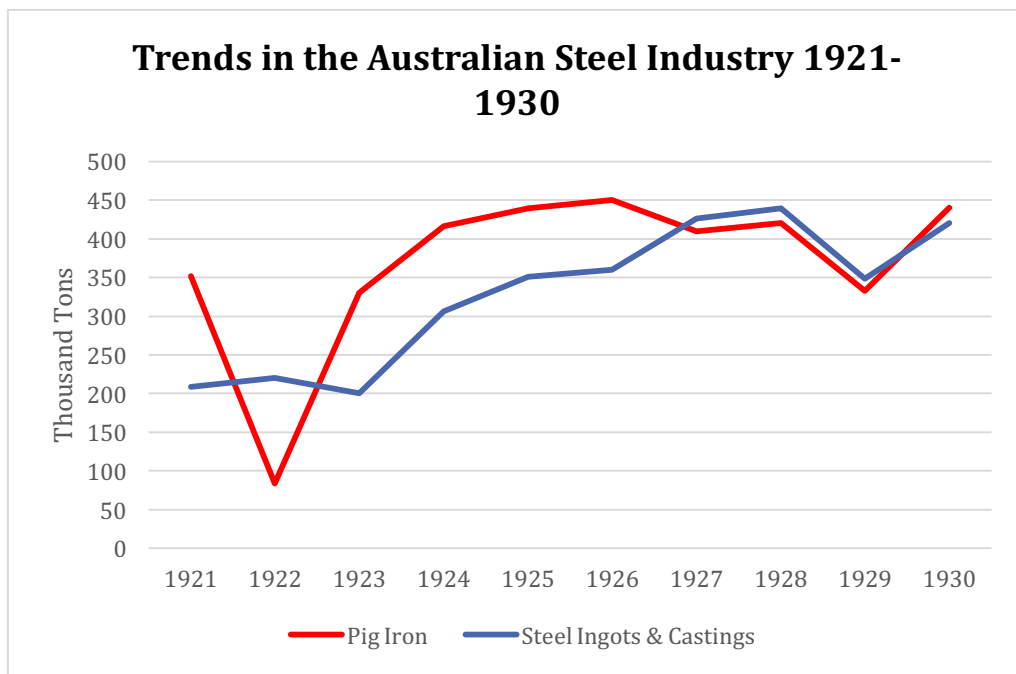
By 1927, the total annual output of iron and steel at Lithgow had only reached a maximum of 120,000 tons; this paled in comparison with Newcastle's production of 416,533 tons of pig iron and 387,929 tons of steel ingots for the same year.^{viii} By this point, Hoskin Iron and Steel had decided to erect a new plant at Port Kembla that could rival BHP's Newcastle plant, its sole domestic competitor. Hoskin Iron and Steel formed Australian Iron and Steel in order to establish the iron and steel works at Port Kembla.

Port Kembla was chosen as the location for the new Australian Iron and Steel plant for the same reasons that BHP chose Newcastle. The location had easy access to markets, close proximity to raw materials, availability of labor, and relatively low transport costs. It was sited less than 10 miles from extensive coalfields, already a deep-sea port able to handle an import and export trade, and within reach of the chief markets of Australia. Port Kembla had advantages over Newcastle in other aspects. The company owned

Illawarra coal mine, which produces a better blast furnace coke than that of Newcastle's, the completion of the railway to Moss Vale meant it had access to an excellent deposit of limestone flux, and there were large reserves of land adjacent to the site for future expansion.^{ix} The Port Kemba plant was commissioned in 1928 and the works at Lithgow were shut down as they were obsolete and in need of repairs.

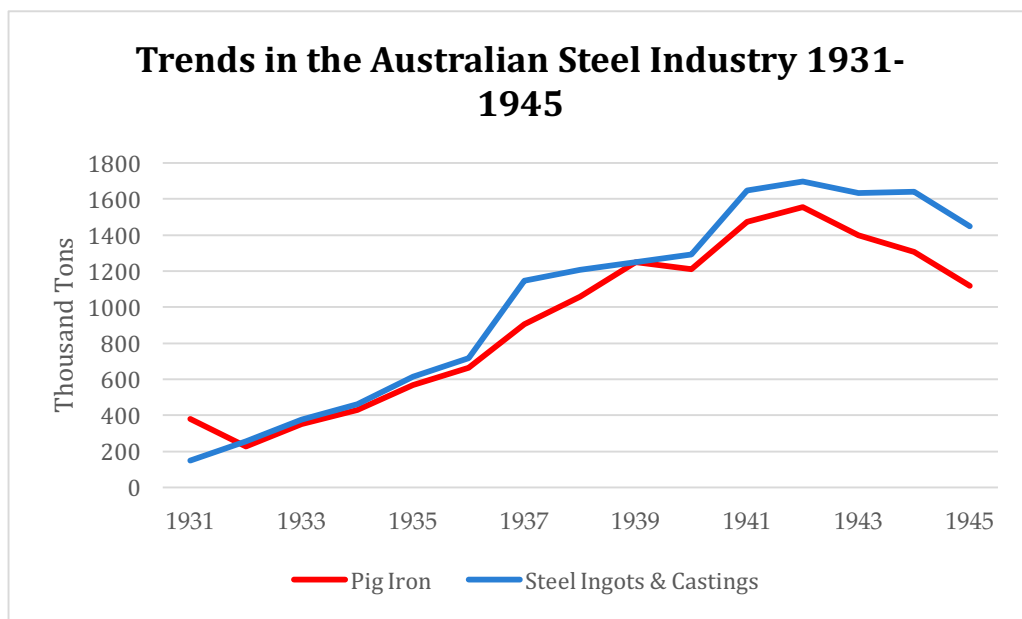
Conditions during the 1930's were characterized by a decline in labor costs, depreciated currency, high tariff barriers, and a reduction in the cost of coal.^x These conditions were in the favor of the established domestic producer, BHP. BHP became the dominant player in the iron and steel industry during the 1930's through takeovers, vertical integration, rationalization, and modernization. The conditions were ripe for the established and well-funded BHP to flourish during this period. The newly established and undercapitalized Australian Iron and Steel, and its Port Kemba steel mill, were unable to weather the effects of the Great Depression (1930-1933) and was acquired by BHP in 1935. This essentially marked the point where BHP became a monopoly in domestic steel production for the next 6 decades. In 1938, government imposed the **Iron Ore Export Embargo (Appendix 1)** on the eve of World War II. The motivating factor for this was to prevent the Japanese from importing ore from Yampi Sound in Western Australia.^{xi} Another consideration, which underpinned the retention of

Graph 1. Trends in the Iron and Steel Industry 1921-1930



This graph was created from data sourced from the Australian Bureau of Statistics

Graph 2. Trends in the Iron and Steel Industry 1931-1945



This graph was created from data sourced from the Australian Bureau of Statistics

the ban for more than two decades, was the government's perception that Australia's iron ore reserves were limited. This embargo remained in place until the easing of restrictions began in 1960. By 1939, the industry was vertically integrated, as BHP had secured coalmines close to its Newcastle plant. It is important to note that BHP had owned the rights to the iron ore deposits that supplied its operations since the late 1800's, when its primary business was mining lead, zinc, and silver.

In response to World War II, the BHP diversified its production capacity to include ferroalloys, tungsten carbide, and a wide range of alloy steels, in order to supply the war efforts on behalf of the British Empire. The year 1941 marked a peak in production of 1.54 million tons of pig iron and 1.62 million tons of steel ingots. The level of production was not reached again until 1952, the year that BHP established a third center of iron smelting through erection of a blast furnace at Whyalla. In addition to the blast furnace, BHP also established ship-building yards.^{xii} War acted as a main driver for expansion to Whyalla, as it was not on the exposed eastern coast and it was next to the Mibleback iron ore deposits. It did have disadvantages, such as it was situated on the edge of a desert, thus lacking fresh water, and coal and coking coal would have to be shipped to fuel the operation.

Steel Industry 1945-1960

During the post war period, the steel industry fell into a slump due to labor disputes, which hampered the ability of BHP to capitalize off of the increasing demands for iron and steel domestically or produce for the international markets that were being stimulated by post-war reconstruction efforts. However, by 1950 the labor disputes had been most resolved and the 1950's marked a period of expansion for BHP.

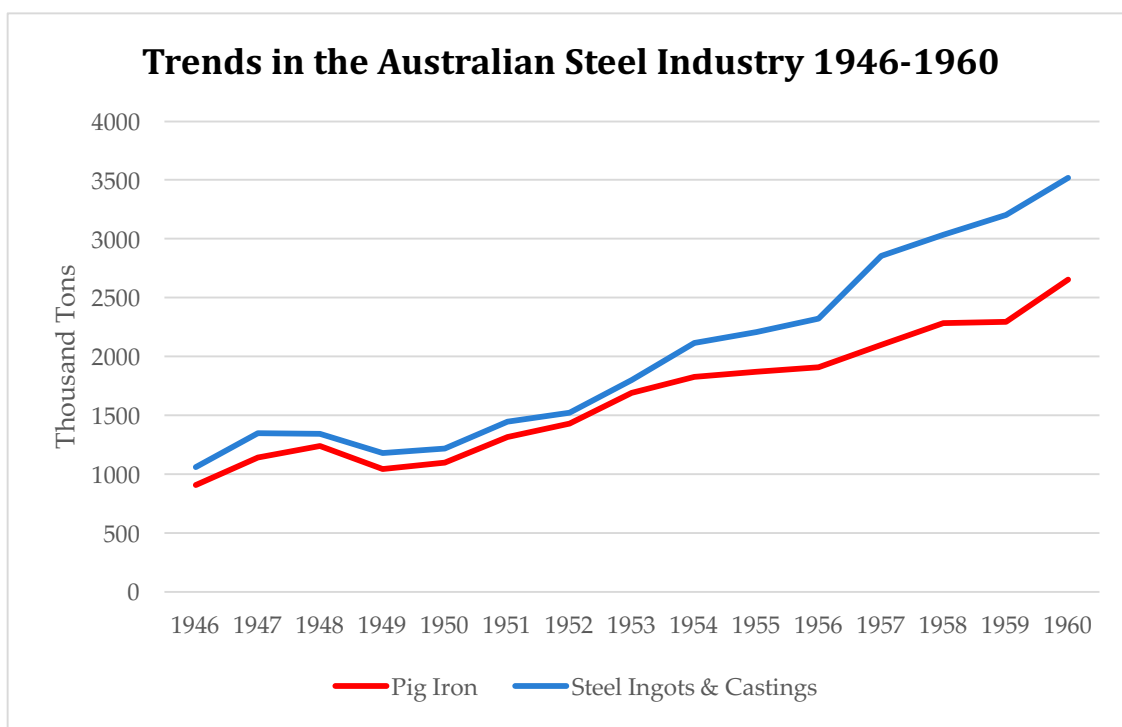
Following the war, BHP began to grow its operations at Port Kembla in order to provide iron and steel as feedstock for processing in its newly planned flat products division. The Port Kembla flat products plant was commissioned in February 1954 with the manufacture of steel plates, and the first run of hot strip steel was produced in May 1955.^{xiii} In addition to upgrading the existing operations at Port Kembla, BHP decided to build another integrated steel works on the site in 1954 with the plan to include expanding the existing harbor facilities. The primary objective of the production increase was to produce raw steel for the rapidly expanding flat products division that was in operation. In advance of the 2nd integrated steel mill at Kembla, it was determined that the port would need upgrades to service the additional mill there. The Port Kembla harbor enlargement project, which was commenced in 1954, was undertaken through the joint effort of BHP and the New South Wales Government.^{xiv}

This is an excellent example of how a public/private partnership can help foster growth of downstream beneficiation. In order to supply the new integrated steel works, extensive ore storage bins and a new ore bridge were constructed. The new harbor was designed to accommodate the anchorage of up to thirty-seven ships simultaneously, with its wharf being designed specifically for ore and steel logistics. The New South Wales Government provided initial capital investment of £32 million, with BPH providing the remaining £80 million required to fund the project. The expansion of the steelworks at Port Kembla continued in October 1956, with two new open-hearth steel furnaces brought into operation. In addition to the new furnaces, in 1957 an iron ore sintering plant was built to handle the fine iron ore that was being extracted at Yampi Sound in Western Australia. Also in 1957, work commenced on the building of coke manufacturing plant, which included a battery of ninety-six coke ovens. On top of all of these expansions in capacity, a hot-dip tinplate mill at Port Kembla began production in late 1957, which was to provide tin-plated steel for the domestic canning industry. Port Kembla was not the sole beneficiary of improvements during this period, however. Newcastle brought a new smelter online in 1958, which was designed to produce high quality

steel strip for processing into tubes. Finally, in 1960 the 2nd integrated steel mill at Port Kembla was commissioned, and later that year the new harbor was officially opened with the first ship making delivery of iron ore from Yampi Sound, Western Australia. The new integrated mill at Kembla had the capacity to produce 600,000 tons of pig iron annually and equaled the output of the world's operational largest blast furnace at the time.^{xv,xvi} The commissioning of the new plant at Port Kembla raised Australia's steel-making capacity to ~4 MMT/year.

The new addition brought Kembla's output capacity to 2.6 MMT of steel ingots per/year, surpassing Newcastle as Australia's largest integrated steel mill.^{xvii} Beyond the investment that was occurring around Australia's steel hub on the east coast, in 1960 BHP moved to begin decentralizing its operations through the investment of 34 million towards the building a basic oxygen steel-making plant at Whyalla. Extensions to the existing blast furnace began in February 1960, and in order to meet the greater demands of the enlarged furnace, the steel wharf was lengthened.^{xviii} By 1963, eleven blast furnaces were operating in Australia; four at Port Kembla and four at Newcastle in New South Wales, two at Wundowie in Western Australia, and one at Whyalla, South Australia. In 1963, production of pig-iron reached record levels and the annual steel-making capacity was in excess of 5 million tons.

Graph 3. Trends in the Iron and Steel Industry 1946-1960



This graph was created from data sourced from the Australian Bureau of Statistics

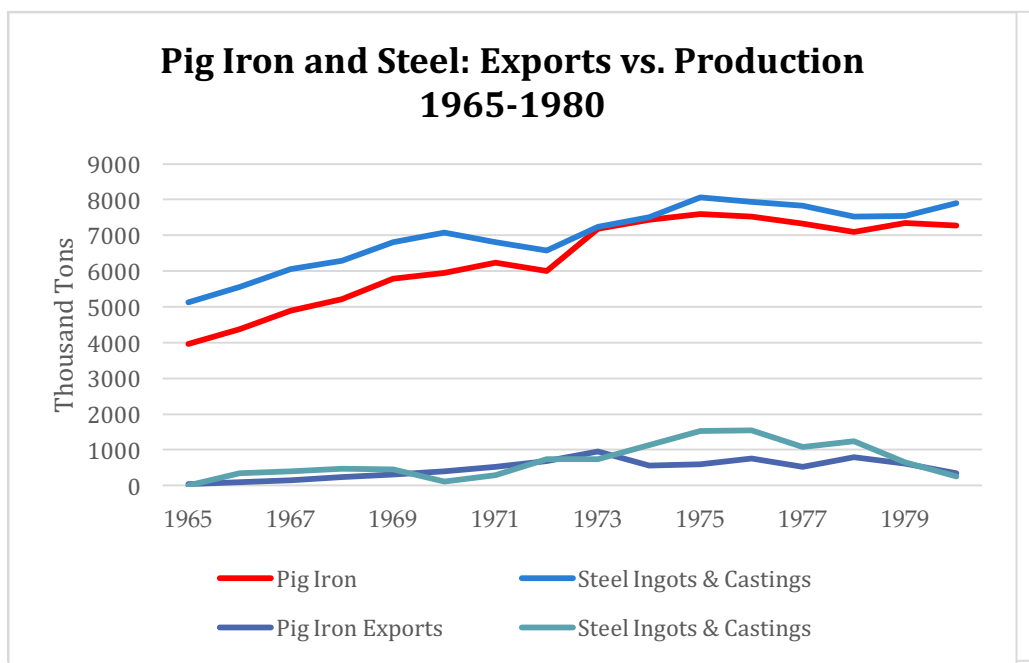
Iron Ore Exploration and Production 1960-1970

The postwar period leading up to 1960 was marked by few new discoveries or exploitation of deposits of iron ore.^{xix} In the 1960s, however, the picture changed dramatically. A succession of new, commercially viable deposits of minerals began to be exploited, which placed Australia among the world's most important sources of basic metals and, internally, has led to the growth of upstream industries and the development of uninhabited regions.^{xx} The beginning of the 1960's was marked by a shift in government policy that significantly altered the trajectories of Australia's iron ore sector and steel industry, as depicted in **Graph 4** below. In December of 1960, the government announced a partial relaxation of the embargo on the export of iron ore which had been in force since 1938, permitting exports from some deposits on a controlled basis. Following this decision, tenders were called upon for the mining and export of iron ore from two known deposits in Western Australia: Tailoring Creek and Mount Goldsworthy. With the embargo being further

relaxed in June of 1963, the exploration for iron ore increased. Of particular importance was the discovery in late 1961 of extensive deposits in the Pilbara district in the north-western region of the State of Western Australia.^{xxi}

By 1965, considerable interest was being focused on the development of the extensive resources of iron ore that had been revealed in Australia during the first half of the decade. In 1965, a number of iron ore exploitation and export contracts were negotiated. For example, in August of 1965 a contract was signed with the Japanese steel industry to supply 71.4 million tons of pellets (64% iron content) over twenty-one years starting in April 1968 from the Robe River iron ore deposits, which was approved by the governments. Between 1965 and 1967, the

Graph 4. Production: Iron Ore vs. Pig Iron and Steel 1960-1970



This graph was created from data sourced from the Australian Bureau of Statistics

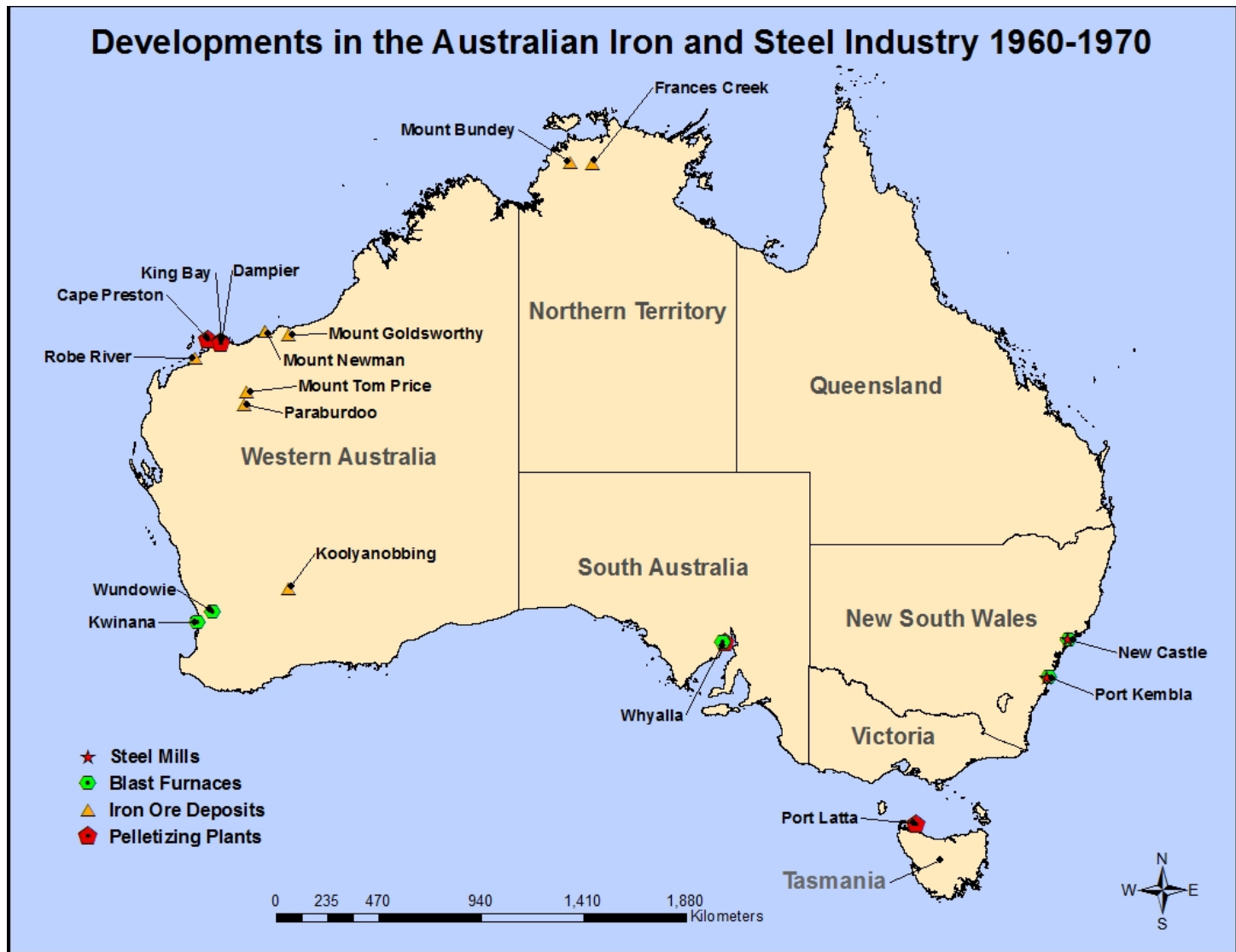
government approved contracts for the export of iron ore pellets from the Mount Tom Price and Mount Bunday deposits in excess of 18 MMT, with the bulk of this destined for Japan. In January 1966, however, the government refused to grant an export license for the export of a further 8.6 million tons of pellets to Japan from the Mount Torn Price deposit on the basis that the price was too low. In order to service these contacts, plans were solidified for the establishment of a pelletizing plant at King Bay with an annual capacity of 2 million tons. The projects that were undertaken as a result of these export contracts required a capital investment in excess of A\$500 million and involved the construction of about 625 miles of standard gauge railway and the development of four new ports for vessels 60,000 tons and larger. Deliveries established under the contracts noted above spanned from 1966-1991.^{xxii}

During 1967, iron ore output expanded by 60%, with production doubling in Western Australia. Iron ore mined at Frances Creek, Northern Territory was exported through Darwin, commencing in June 1967. Large scale production began during 1967 from deposits at Koolyanobbing, Western Australia. Ore was transported via railway 304 miles to the coast at Kwinana, where a 600,000 metric tons per annum pig iron producing blast furnace was commissioned in May 1968. Pelletising plants were established at Dampier and Whyalla in South Australia and Port Latta in Tasmania, with a combined rated capacity of 5.75 million tons per annum (See **Map 2**). Pellets from these plants were mostly destined for export to Japan with shipment of pellets from these plants beginning in 1968. In March 1968, plans for a 'metallized agglomerates' plant at Dampier were announced. The product would bypass the conventional blast furnace method of iron smelting and would be utilized directly in the making of steel. In mid-1967, plans were announced for the development of deposits at Mount Newman, Western Australia by a consortium of companies from

Australia, the United States of America, Japan, and the United Kingdom. Contracts were signed to supply 100 MMT of ore to Japan over fifteen years at an approximate value of \$820 million. The project involved the construction of a 265-mile railway from Mount Newman to Port Hedland together with associated loading and port facilities. Negotiations for export contracts continued with respect to deposits at Robe River and Nimingarra in Western Australia. Deposits were also being explored in Western Australia at Mount Gibson, Northam, in the Robinson Ranges, and near Wittenoom.^{xxiii}

When examining **Map 2** below, it is important to note that the ore pelletizing plants are not located at the mine heads, but at the ports of exports. There are a number of reasons why these pelletizing plants were cited at the ports instead of at the mine heads. Being located at the ports allows for ores from multiple mines to be aggregated for blending to facilitate quality control, while ensuring a specific ore content. The siting of pelletizing plants at the port also reduces capital costs because it allows multiple mines to utilize a single plant for pelletization.^{xxiv} Furthermore, some of the mines are located in remote areas with limited access to infrastructure, such as electricity, which is most needed for these plants.

Map 2. Developments in the Australian Iron and Steel Industry 1960 - 1970



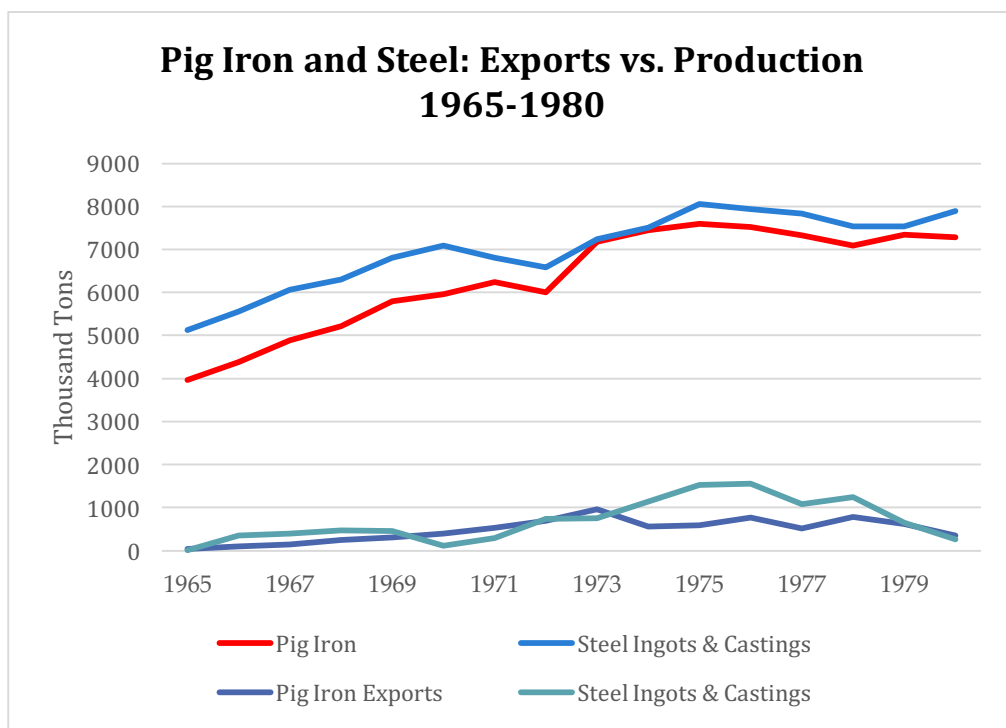
The effects on the economy between 1960 and 1970 were significant with the value of the mineral output more than quadrupling. These events had profound effects upon the Australian economy as a whole. Although the mineral and mineral processing sector remained a small contributor to employment (4%) and GDP (5%), the indirect effects were considerable. First, the spending of vast amounts of capital locally stimulated industry and created employment opportunities in the construction sector. Second, the local labor force was introduced to new skills and techniques. Third, previously uninhabited and inhospitable areas of the country were opened up for development. Fourth, important new industrial complexes associated with mineral processing, particularly around Perth, Gladstone and Melbourne, were established. Fifth, the balance of payments situation has been beneficially affected as the export of minerals was to a considerable extent responsible for a record surplus in the fiscal year ending in June.^{xxv}

Steel Industry 1970-1990

The 1970's continued to be a prosperous period for the Australian steel industry, being characterized by both increased capacity and production, with the excess steel designated for the export market. While exports accounted for approximately 13% of steel sales in 1970, that figure had risen to 42% by 1977.^{xxvi} While most other OECD countries reported a drop in steel consumption during this time period, Australia was actually experiencing an increase due to the capital equipment requirements tied to the expansion of the extractive industries there.^{xxvii} This gave BHP false optimism, resulting in a projected demand of 9.9 MMT in 1983, which proved to be near fatal for the Australian steel industry just a few years later. Despite the initial growth of Australia's steel export market share during the 1970's, by the period of 1979-80 it had constricted to just 15% of total sales.

The year 1981 marked the end of Australia's commodity boom, thus directly impacting the demand for steel. Left in the wake of this commodities bust, construction projects were deferred or canceled, which further exacerbated the ensuing steel crisis. The reduced domestic demand for steel combined with the slump in the global steel market resulted in BHP reporting its first losses since 1923.^{xxviii} BHP attributed these losses to a number of factors, including a downturn in both the domestic and international markets, increases in government taxes, and low productivity along with rising input costs. In addition to these factors, BHP also attributed a significant portion of the blame to rising steel imports penetrating the domestic

Graph 5. Pig Iron Ore and Steel: Export vs. Production



This graph was created from data sourced from the Australian Bureau of Statistics

market.^{xxix} BHP's apparent decline in international competitiveness was confirmed when the group reported a net loss of US\$144 million for its steel operations for the period of 1982-1983.^{xxx}

It is significant that, in its steel division during the 1970's leading up the crisis, investments had been in the form of upgrades to existing production methods instead of the adoption of new technologies that were being adopted by international competitors. The main shortcoming of BHP's steel production was its deficit in continuous casting facilities that had begun to characterize the most efficient method of steel production employed internationally.

BHP's response to the mounting losses was to reduce production, cut jobs, and postpone investment. These cutbacks were realized through the closure of a small obsolete production facility at Kianna and layoffs at both Newcastle and Port Kembla totaling ~3,100 jobs. BHP implied that it was unwilling to make any further investments in its production capacity until the Australian government acted to protect the domestic market further from imports. This request would have been a shift in government policy due to the fact that in 1981 tariffs had been reduced to 15% from 35% as result of a seven-year study conducted by Industries Assistance Commission (IAC). Specifically, BHP was requesting import quotas that would guarantee 80-90% of the market share to domestic producers.^{xxxi} BHP's call for additional protective measures did not fall on deaf ears, as they were the second largest employer in the country.

There were many interests opposed to additional protective measures that would result in higher priced steel inputs or the lack of availability of higher quality alternatives. Specifically, downstream users, such as automotive makers Ford and Toyota, identified quality issues and unreliable delivery times as the unacceptable status quo of BHP's operations. The government offered the solution of temporary tariff protection that would have allocated 70% of the market to domestic producers, to which BHP called unacceptable and formally rejected. BHP then announced that unless its demands were met, it would close all steel production in Australia within four years, essentially putting an end to the industry in Australia. This acted to catalyze the search for a solution that would appease all of stakeholders affected, specifically BHP, downstream industries, and the unions.

Out of the ongoing dialogue came the Steel Plan, which was crafted based on recommendations from the IAC, the Steel Industry Advisory Board, steel industry representatives, and the unions. Specifically, the Steel Plan "tied government intervention in the form of a guaranteed market share and bounties to corresponding corporate commitments and union undertakings for industry harmony."^{xxxii} Instead of offering increased protection in the form of tariffs and quotas, the government implemented a safety mechanism for a review of government assistance if the market share of domestic producers fell below 80% or rose above 90%. In addition, there was the inclusion of a mechanism to deal with anti-dumping issue in an expedited manner. Furthermore, bounties were offered by the government for a period of five years for steel used in the production of specific products. Also, the state governments of New South Wales and South Australia, where the works were located, were asked to restrict charges associated with electricity, freight, and payroll taxes.^{xxxiii} In response, BHP promised not to shutter its integrated steel works and limit retrenchments during the five year period of the Steel Plan. BHP also promised to make \$800 million in capital improvements over the course of the next four years to increase productivity and efficiency. In response to the employment guarantee, the unions agreed to negotiate any wage increases in line with the Prices and Incomes Accord that had been established between the Australian Council of Trade Unions and the government. In order to oversee all of implementation and monitoring of the Steel Plan, the Steel Industry Authority (SIA) was established.

The Australian steel industry made a comeback in the 6 months following the implementation of the Steel Plan. However, the Steel Plan had little to do with the initial industry resurgence. Skeptics of the Steel Plan, led by the IAC and Bureau of Industry Economics (BIE), argue that steel consumption and production had already begun to recover in 1983 and BHP had returned to profitability before the plan had been enacted. In 1988, the BIE released a report on the Steel Plan that reiterated these positions with the overall consensus being that the end of the recession and depreciation of the Australian dollar were the most significant factors that led to the rapid rebound of the steel industry. Regardless of the impact of the Steel Plan, by the end of 1983 BHP began reporting profits again and the recovery of the industry continued through the end of the decade, with BHP becoming the third most profitable steel producer globally behind China Steel and Nisshin.^{xxxiv} Furthermore, over the course of the decade BHP enjoyed an average domestic market share of 88% and had increased its productivity by the end of the decade, from 200 to 250 metric tons per employee/year. This level of productivity was, however, still far below the average of 400 metric tons per employee/year that countries such as South Korea had achieved.

BHP held up its end of the deal through the continued operation of its three integrated steel mills. BHP had invested A\$ 2 billion, 1.2 billion more than the A\$800 million it had initially agreed to through the Steel Plan. Despite the overall improvements by BHP, the company still exhibited poor customer service and attention to delivery schedules. The government reneged on its agreement to pay bounties at the established levels, though a 20% cut to bounties was offered and also failed to implement an effective mechanism to address anti-dumping cases in a timely fashion.^{xxxv} The government justified the cut in the bounties based on the quick rebound and return of the steel industry to profitability in 1983. Furthermore, skeptics characterize the capital investments made by BHP as little more than what was necessary to replace depreciated and obsolete equipment. Also, improvements in productivity were attributed mostly to retrenchments and capital investments that occurred prior to the Steel Plan. The plan is perceived to be beneficial in the fact that it created a climate of confidence that led to BHP's capital improvement program and that without the plan it is likely that the company would have shuttered at least one of its integrated mills.^{xxxvi} The Plan met the demands of all the stakeholders involved while also meeting the goal of fostering international competitiveness through the reduction of protection.

Steel Industry 1990-2000

During the 1990's, the Australian steel industry was characterized by minor fluctuations in growth and production. Entering the decade, BHP, the Australian steel monopoly, averaged an annual production of approximately 7.9 million metric tons, accounting for more than 80% of Australia's steel consumption, with the remainder being met by imports. BHP's production capacity continued to be dominated by blast-furnace technology due to the country's abundant supply of iron ore and coal.^{xxxvii} In 1990, BHP Steel announced that they would build a new continuous casting plant at the Long Products division in Whyalla valued in excess of A\$100 million. The plant was commissioned in May 1992 as part of the Whyalla Development Plan at a cost of more than A\$200 million. The project included an upgrade of the existing steelmaking and rolling mills, with the upgrade of Whyalla being the last major modernization project at BHP's Australian operations.^{xxxviii}

In 1991, an ensuing recession in Australia impacted the steel industry. It was a particularly difficult time for BHP, which suffered a 53% drop in year-on-year earnings. If not for exports, BHP steel would have plunged into a loss during the fiscal second half because of a 20% downturn in domestic demand over the year. This was offset by a 60% boost in exports, which at the end of year were running at an annual rate of 2.5 million metric tons, representing about 40% of BHP's steel output. About one-third of exports during

this time period was sold into the U.S. coated steel market, another third went to Asian markets and Iran, while the remainder, representing raw steel and slab products, was sold into the spot market at only marginal profit.^{xxxix} In 1992, BHP reported steel production increased 37.5% compared with a year earlier. Their raw steel production also rose year on year, while domestic steel supply decreased 6.5% and exports increased 7% in the same period.^{xl} By 1993, BHP began looking to expand into international steel production and in 1993, the company established its international division. This marked the beginning of period during which BHP acquired a number of steel assets worldwide, including mills in USA and New Zealand.

In May of 1995, the Kwinana mill near Perth in Western Australia was shut down with BHP's motivation for the closure being that it was no longer economically viable. Kwinana, which was nearly 40 years old at the time, was receiving its feedstock from various company mini-mills in the Easter Australia and was only producing an average of about 50,000 metric tons of products per year, compared with its annual capacity of 250,000 tons. The Kwinana shutdown was part of an overall restructuring at BHP Steel's Rod & Bar Products division, which included the commissioning of a new 250,000-ton-per-year rolling mill in Sydney, Australia and the shutdown of an outdated 130,000-ton mill.^{xli}

In 1996, pressure on steel prices, higher operating costs, and lower Australian demand resulted in a significant deterioration of BHP Steel's for that year.^{xlii} However, in 1997 lower costs and the contribution of newly acquired operations helped boost earnings for BHP Steel of Australia by 63.6% in the third fiscal quarter.^{xliii} This wild fluctuation in the steel sector illustrates the volatility that has plagued the Australian steel industry, complicating the implementation of appropriate capital investments and the launch of new production capacity.

While iron ore production and exports in Australia had been steadily increasing annually since the 1960's, the production of value added ferrous products destined for export, such as pig iron and steel, has not

Government Mandated Beneficiation

In 1996, Boodarie Iron, at the time a subsidiary of BHP, commenced the construction of the Boodarie Iron Plant, which was subsequently commissioned in 1999. The plant was designed with an intended capacity of 2.3 MMT of briquettes per year. The system at the Boodarie Iron Plant employed FINMET technology to convert the iron ore fines into iron briquettes. Given that established technologies for the production of iron were not economically viable to operate in Australia, BHP choose to gamble A\$ 2.6 billion on unproven FINMET technologies in the hopes to meet government requirements for beneficiation while finding an economically viable solution for iron production in Australia. BHP lost that gamble and the plant never became economically viable, with the company considering closing its plant as early as 2001. The plant continued to operate at a loss until 2004, when an explosion damaged the plant during scheduled maintenance. BHP cited "the failure to consistently achieve the financial and technical targets announced in 2000, which left [The Group] with no alternative but to close the facilities permanently."¹ Much like the story of the Boondarie Iron Plant, the Rio Tinto HiSMELT plant also turned out to be an economic boondoggle.

In July of 2001, Rio Tinto announced plans to construct a pig iron plant using Hismelt technology as part of a joint venture in Kwinana, Western Australia.¹ In 2003, at a cost of A\$ 400 million, construction of the first commercial Hismelt plant began in Kwinana, Western Australia with a projected capacity of 800,000 metric tons per year. After multiple setbacks, the plant was commissioned in 2005 and the operated until December 2008. Despite Rio Tinto's initial high hopes for the new technology, the plant never achieved economic viability and the global financial crisis forced the operation to close.

mapped a similar trajectory. Stagnant domestic steel production and declining exports of iron and steel in the 1990's served to act as catalyst for state intervention. In 1996, the State of Western Australia passed two legislative measures with the intention of fostering downstream beneficiation by requiring major exporters of iron ore to engage in beneficiation beyond that of just iron ore concentration and pelletization. The two acts, "*The Iron Ore Beneficiation Agreement Act*" and "*The Iron Ore Direct Reduced Iron Agreement Act*", were passed by the state "for the purpose of promoting employment opportunity and industrial development and in particular the establishment of further processing facilities in Western Australia."^{xliv}

Both of these agreements stipulated that, as a requirement to do business in Western Australia, companies must submit plans for and implement beneficiation projects. Out of these acts were borne two beneficiation projects, the Boodarie hot briquetted iron plant using the FINMET process, and the Hismelt operation in Kwinana, projects undertaken by BHP and Rio Tinto respectively. It is important to note that the processing technologies employed at both plants were new to the market at the time and had yet to be fully developed or widely adopted by the industry.

Both examples show that the governmental attempts at fostering beneficiation through legislative action were a complete failure with regard to iron ore.¹ Neither project reached economic viability, thus prompting their respective closures, despite significant capital expenditures by the companies involved and the deployment of new, potentially more efficient production technologies. As a result of the two beneficiation project failures, in 2011 the Western Australian government moved to repeal the beneficiation acts of 1996 and renegotiated its agreements with Rio Tinto and BHP regarding iron ore extraction. The new agreements left out the requirement for the implementation of beneficiation projects by the two producers, but included higher rates for royalties associated with extraction and export of iron ore.

The most significant feature of the decade came in 1997 when BHP started a major restructuring effort that would, in part result in the closure of Newcastle Plant in New South Wales. A major driving force behind the BHP decision were the mounting losses that the company was incurring because of the mill's loss making operations. In 1996 alone, BHP took an estimated A\$222-million write-off on this facility. BHP executives cited dropping steel prices, cost reduction pressures, and the probability of heightened competition as reasons for the restructuring. In addition, BHP's sales had been flat for the first three quarters of 1996.^{xlv} The plans to phase out steelmaking at the Newcastle Rod, Bar and Wire division would result in the loss of an estimated 2,500 of the division's 4,100 jobs. Newcastle's blast furnace and coke ovens, which produced some 1.7 million metric tons of raw steel per year, were to be phased out over the following two-and-a-half years because those divisions of the steelworks had been experiencing mounting losses and were not internationally competitive. The companywide rationalization was aimed at addressing issues associated with intense international competition and falling prices. The plans allowed for Newcastle's rolling mills to continued to operate, being supplied with semi-finished feedstock from a new 1.8-million-ton-per-year continuous billet caster. The caster was commissioned in 2000 and was located at the Whyalla Works in South Australia. Over 90% of raw steel for rod and bar production by this time was produced in electric furnaces, unlike Newcastle's obsolete and inefficient integrated setup.

¹ While the government-mandated beneficiation through legislative action was a complete failure with regard to iron ore, there are other minerals where this approach has yielded success. There have been successes in beneficiation where there are integrated operations in place. For example, Alcoa with aluminum and Tronox with mineral sands. The problems arise when a mining company is being "forced" to foray outside of their area of expertise and transform their operations. Specifically, the big iron ore companies (BHP, Rio Tinto) have divested over time from their iron and steel production operations and the two businesses are quite different beasts.

By 1998, BHP was facing increasing pressure to reveal its future plans with regard to its restructuring, especially ones that included divesting itself from any of its assets. Shareholders were becoming increasingly concerned about rumors that the company planned to get out of the steel business altogether. In response, the company announced that it was in the process of an across-the-board asset review and no final decision had been made regarding shedding its steel assets. Executives did stress that BHP was continuing to consider "rationalizing" its asset base and made it clear that the entirety of their asset portfolio was up for review. The company had been hit hard by depressed markets for many of its commodities, most significantly steel, and, although the company heads warned of continued turbulence across key commodity markets in the medium term, the company reported a net profit for the year.^{xlvi}

In January of 1999, BHP announced the integration of the Company's steel businesses into a single organization that was comprised of four businesses; BHP Flat Products, BHP Coated Products², BHP Long Products, and BHP Building and Industrial Products. The first two businesses were based in Wollongong, New South Wales and the latter two were based in Newcastle, New South Wales.^{xlvi} In 1999, the Newcastle steelworks were permanently decommissioned. Another feature of that year was BHP cutting the output from its Whyalla steel works in South Australia by 15% in response to weak demand in Asia, with the cutback amounting to approximately 70,000 metric tons of the mill's total annual output of 470,000 metric tons.^{xlvi}

The Australian iron ore market began to experience renewed pressure in 1999 as world crude steel production continued to contract. That, combined with an oversupply of iron ore, set the stage for ore producers scrambling for market share. As a result, internationally iron ore exporters began aggressively discounting prices below already sharply lower benchmark levels in an effort to bolster export volumes, which had eroded during the period of 1998-1999 as a direct result of the Asian economic slump and decreasing world steel demand. Additionally, lower freight rates into Asia had allowed South African and Brazilian exporters to compete with Australia in the Asian market. BHP saw seaborne iron ore volumes constrict due to a decreased demand in Japan, China, and Western Europe. While seaborne iron ore trade hit a record 427 MMT in 1997, the sharp fall in global and especially Asian crude steel production caused seaborne trade to constrict to 415 MMT in 1998 and to shrink again to 400 MMT in 1999 before recovering in 2000.

For exporters to Asia, competition was further intensified through a combination of the fall in Atlantic to Pacific freight rates in conjunction with the devaluation of the Brazilian currency. At the time, Brazil was the largest producer of iron ore in the world and the second largest exporter after Australia. Australia and Brazil together accounted for about 70% of world iron ore exports.

The two most important iron ore importing countries in Asia during this period were China and Japan. China accounted for about 25% of Australia's iron ore exports while Japan accounted for about 45%. The Japanese economy was experiencing its worst recession in 50 years and its lowest steel production in 20 years. In response to the difficult conditions and increasing level of competition in the iron ore market, BHP Iron Ore began restructuring itself again. Its strategy was to improve cost competitiveness, focus on Asia, ensure

² Australia has been a true innovator in the area of coated steel markets. In 1966, BHP began the production of COLORBOND® steel and for many years has had and still has a global competitive advantage. Nearly half of all new homes in Australia have roofs made from COLORBOND® and 9 out of 10 new homes built in Australia feature products made from COLORBOND® steel. While most production has been offshored due to cheaper labor, it is still manufactured in Australia for the domestic market.

supply flexibility, and enhance its technical abilities. Initiatives to reduce costs involved cutting staff by 20% beginning in 1999, optimizing stripping ratios and mine plans, utilizing hydraulic excavators for digging ore, and setting benchmarks based on the best practices of contractors and competitors.^{xlix}

Steel Industry 2000-2015

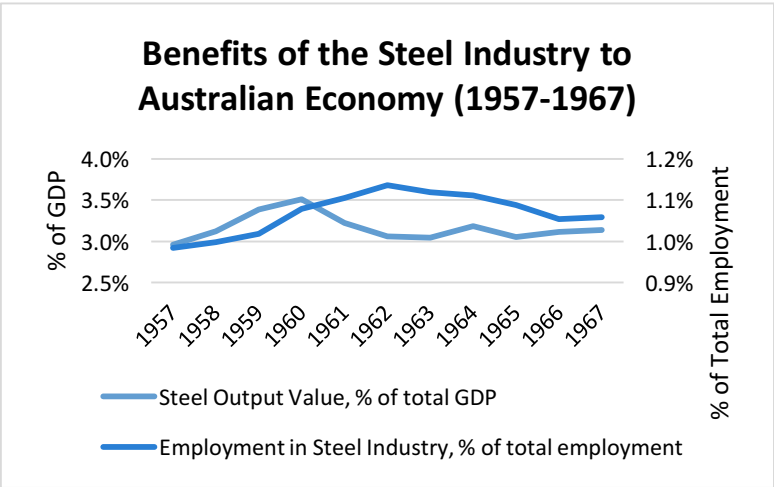
The new millennium was the beginning of a significant restructuring of the Australian steel industry. The work that BHP had undertaken during the mid to late 1990's to position its business away from steel production was solidified. Specifically, in 2000 the BHP steel long products division divested to become OneSteel. BHP continued its drive towards being an extractive industry powerhouse through its merger with Billiton Plc to form the global resources giant, BHP Billiton, in 2001. In 2002, BHP Steel became an independent company from BHP Billiton, marking BHP's exit from steel production in Australia after 87 years, with BHP Steel being renamed BlueScope in 2003 as per the agreement. BHP's exit from the Australian steel business left OneSteel (Renamed Arrium in 2013) and Bluescope as the two primary producers in the country. As is depicted in **Graph 6** above, the restructuring of the Australian steel industry coincided with the beginning of a trend of contraction of domestic steel. While crude steel production remained relatively stable in Australia from the start of the new millennium up until the global financial crisis in 2008, the industry has never fully recovered from the sharp dip in demand that resulted from the crash. The strong Australian dollar, excess global production capacity, and slowing demand have left the domestic steel industry fighting for its survival. The situation has been particularly acute in Australia because the high Australian dollar has put a lot of pressure on the steel producers and, despite their efforts towards improving productivity within their steel plants and the implementation of cost reductions, they continue to struggle, shed jobs, and shutter operations. Members of Australian labor unions have suggested a temporary increase in tariffs on imported steel products, which currently range between 0-5%. In response to the ongoing downturn, in 2011 BlueScope stopped exporting steel and closed some of its production facilities at the Port Kembla Steelworks and Western Port. The industry has continued its downslide and by 2015 the future viability of domestic steel production has been called into question. The situation has become so dire that analysts predict that in the medium term BlueScope will exit from Australian steelmaking all together, retaining their profitable metallic coating and painting business. The future of the Port Kembla Steelworks, the nucleus of Australian steel making, and the lifeblood of thousands of families in the region is uncertain. As of October 2015, BlueScope Steel was in talks with the government and unions to identify ways it can cut A\$200 million annually from its operational costs to avoid closure of the mill. Bluescope claims that the mill will face imminent closure without this reduction in annual operational costs.

Benefits

While the steel industry played a more significant role in the early Australian economy than in later years, it never represented a significant contribution to either GDP or total employment. **Graphs 8** and **9** below illustrate the role that the steel industry has played with regard to the national economy. While direct employment from the sector was only approximately 1% of total employment from 1957 to 1967, the sector accounted for ~3% of total GDP. When examining the contribution of the steel industry to the Australian economy in recent history, direct employment from the sector was less than 1% of total employment from 1996 to 2006, and the sector accounted for less than 1% of total GDP during that period. It is important to note that Australia has robust manufacturing sectors that specialize in structural steels and sheet metal products. When these industries are included in the analysis of their contribution to total GDP and percentage of total employment, the benefits to the Australian economy nearly double as compared

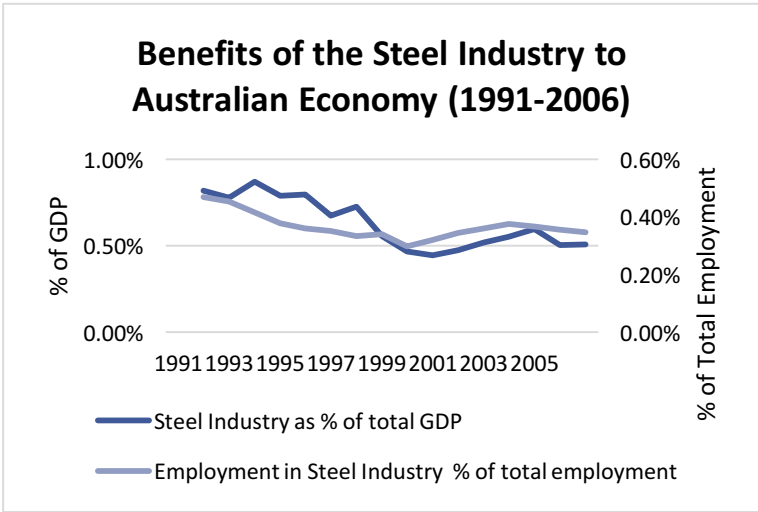
to just that of the iron and steel sector. However, their overall contribiotion is relatively insignificant as shown in **Chart 1** below.

Graph 8. Benefits of the Australian Steel Industry (1957-1967)



This graph was created from data sourced from the Australian Bureau of Statistics

Graph 9. Benefits of the Australian Steel Industry (1991-2006)



This graph was created from data sourced from the Australian Bureau of Statistics

Chart 1. Benefits of the Steel Industry and Value Added Sectors

Benefits of the Steel Industry and Value Added Sectors, Year 2000			
Sector	Employment	Gross Product (Mlns A\$ 2010 Price)	
Iron and Steel	28582	\$	3,564.09
Structural Steel Fabricating	17295	\$	1,257.40
Sheet Metal Products	18262	\$	1,659.68
Totals	64139	\$	6,481.17
Total Employmnt	8951300		
Australian GDP		\$	777,277.88
% of Total Employment	0.72%		
% of GDP			0.834%

Downstream Benefic This graph was created from data sourced from the Australian Bureau of Statistics

Key Conclusions

Australia was successful in establishing a domestic steel industry that fully met the domestic demand for steel for well over 80 years. The birth of the contemporary steel industry occurred first in Lithgow, followed by Newcastle and Port Kembla at the turn of the 20th century. What these three locations had in common was close proximity to inputs, easy access to markets, availability of labor, and relatively low transport costs. However, the mere geographic locations of these production centers were not the only factor that catalyzed investment in the establishment of the domestic iron and steel production in Australia.

Strong government intervention was a theme throughout the history of the Australian Steel Industry. Early on, systems of bounties coupled with government driven domestic steel allocation helped to catalyze the development of the iron and steel industry. This government intervention resulted in the modernization and expansion of existing domestic production capacity while also effecting knock-on growth effects that manifested in the mining and supportive upstream industries. Tariffs played a significant role in the establishment and growth of the steel industry and continued to play a significant role until the late 1970's, when they began to be slowly phased out, with current rates ranging from 0-5% on imported steel products. Also, the government often partnered with steel producers and the iron ore sector as a co-investor on infrastructure projects. Furthermore, the government implemented an export ban on iron ore from 1938 to 1960, and subsequently intervened in deciding whether the prices negotiated for ore exports were acceptable by granting export permits.

In the 1990's, the Australian government decided it would try to foster downstream beneficiation through legislative action with the passing of the Iron Ore Beneficiation Acts of 1996. The two pig iron projects that were borne out of this directive were complete failures. Neither project reached economic viability, thus prompting their respective closures, despite significant capital expenditures by the companies involved and the deployment of new, potentially more efficient production technologies. This suggests that the market forces had created conditions that were not conducive for the economically viable production of pig iron for export in Australia, despite the abundance of inputs and that it is likely the reason why industry was not already engaging in this practice. Forcing iron ore producers to engage in downstream beneficiation did not change this fact.

While government intervention worked well to start with, the steel export market never really took off in Australia. Tariffs are partially to blame for the steel industry's failure to expand its markets outside the country. The protection afforded the steel monopoly, BHP, the luxury of a guaranteed market domestically and reduced the urgency with which BHP had to become internationally competitive and service foreign markets. The lack of innovation then led the steel industry to living a "sheltered life". This was a real detriment to the Australian steel industry when the market began to open up and competition increased. BHP grew its steel production capacity in line with projected increases in domestic demand, with exports not being a major factor in the planning process. As protective barriers to imports began to be reduced and BHP was increasingly forced to compete with other international producers, it became clear that the industry was not competitive enough. Restructuring in the 1980's, which stemmed from a crash in the steel industry in 1983, helped to pave the way for an additional two decades of prosperity. However, the increasingly globalized steel market, global over capacity, and the financial crisis have all dealt the death knell to the industry.

Appendix 1. Government Interventions Significant to Iron and Steel Industry

Name	Year	Description
Government Purchase contract	1905	In 1905, a contract was obtained from the New South Wales government by the Lithgow steel works for the supply of its iron and steel needs for a period of seven years.
Act for the encouragement of manufactures in the Commonwealth	1909	Under this act, contractors that supplied steel to the government were eligible to receive generous bounties on iron and steel made from Australian ores.
Tariff Act of 1921	1921	Implemented Tariffs ranging from 20-25% on steel imports.
The Iron and Steel Products Bounty Act	1922	Bounties are payable on fencing wire, galvanized sheets, wire-netting, and traction engines made in Australia. It is essential that these articles be made from materials produced and manufactured in Australia, unless imported material is authorized after inquiry and report by the Tariff Board. The total payments in any one financial year must not exceed £250,000. Rates of bounty are: for fencing wire and galvanized sheets, £2 12s. per ton; for wire-netting, £3 8s. per ton; and for traction engines from £40 to £90 each, according to capacity. The amounts paid in each case during the year ended 30th June, 1928, were £104,485, £65,128, £73,873, and £140. Under the amending Act of 1927, the bounty on galvanized sheets was increased to £3 12s. per ton and no bounty is payable on traction engines where the cost of materials or parts not produced in Australia amounts to more than 40% of the total cost.
THE IRON ORE EXPORT EMBARGO	1938-1960	The government imposed the ban on the eve of World War II for a strategic reason: to prevent the Japanese from importing ore from Yampi Sound in Western Australia. Another consideration, which underpinned the retention of the ban for more than two decades, was the Commonwealth of Australia's perception that Australia's iron ore reserves were limited.
The Steel Plan	1983	The Steel Plan “tied government intervention in the form of a guaranteed market share and bounties to corresponding corporate commitments and union undertakings for industry harmony.” Instead of offering increased protection in the form of tariffs and quotas, the government implemented a safety mechanism for a review of government assistance if the market share of domestic producers fell below 80% or rose above 90%. In addition, there was the inclusion of a mechanism to deal with anti-dumping issue in an expedited manner.

Iron Ore Beneficiation (BHP) Agreement Act (REPEALED)	1996	In 1996, the State of Western Australia passed two legislative measures with the intention of fostering downstream beneficiation by requiring major exporters of iron ore to engage in beneficiation beyond that of just iron ore concentration and pelletization. The two acts were passed by the state “for the purpose of promoting employment opportunity and industrial development and in particular the establishment of further processing facilities in Western Australia.”
Iron Ore - Direct Reduced Iron (BHP) Agreement Act (REPEALED)	1996	
Steel Industry Protection Bill	2015	The object of this Bill is to ensure, as far as practicable, that all steel used in public works or infrastructure constructed by or on behalf of public authorities is manufactured in Australia.

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