

Why Commodity Booms Have Not (Yet?) Boosted Human Capital: Bolivia's Struggle to Create a Skilled Workforce

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Abstract

Do windfalls from the extractive sector help developing countries invest in human capital? To date, empirical studies remain inconclusive. Using Bolivia as a case study, this chapter examines the specific political-economic dynamics that led the country to increase spending on education yet at the same time failed to build a skilled workforce. Overall, the study finds that while the mining sector continued to seek unskilled, cheap labour, the capital-intensive hydrocarbon sector, for its part, developed on-the-job training programmes. Meanwhile, education policies failed to anticipate evolving demand from the labour market. As a result, vocational training suffered, a situation further compounded by efforts of powerful groups in the education sector to protect their own, somewhat narrow interests, at the expense of educational achievements. It concludes that the rise of private education and popular skills-based training programmes cannot substitute for development of a functional vocational training system, capable of supporting the country's ambition to develop a world-class lithium processing industry with linkages in strategic sectors.

1 Introduction

Bolivia flooded the Spanish crown with silver, and later supplied the minerals that fuelled the Industrial Revolution. Today, Bolivia has the world's largest lithium reserves, which may be critical to the green, low-carbon economy. Bolivia's President Evo Morales wants this looming extractive boom to differ from those of the past. Rather than exporting the primary commodity, Morales seeks to develop strong downstream linkages by manufacturing lithium batteries domestically; he has even expressed a desire to assemble battery-powered cars in Bolivia (Bajak and Valdez, 2009). The government intends to invest USD 902 million, of which USD 485 million would be earmarked for the

industrialisation of lithium (Stroebele, 2012). In 2013, Morales inaugurated a USD 19 million lithium carbonate pilot plant in the Uyuni salt flat. In February 2014, a USD 3.7 million pilot plant for the production of lithium batteries followed, built by the Chinese company Lin Yi Dake Trade Co. Ltd. Once running at full capacity, the plant is expected to produce 1,000 mobile phone batteries daily, as well as 40 batteries for electric vehicles (Agencia EFE, 2014; BNA, 2014). Recently, a declaration of intent with a Dutch consortium and a joint venture contract with a South Korean consortium have also been signed, South Korea being the world's largest manufacturer of rechargeable lithium batteries (GoN, 2013; Dyson, 2012).

Will Bolivia live up to these ambitious objectives? Does the country have the skilled workforce required to jumpstart such an industrialisation process? Endogenous growth theory posits that investment in human capital and innovation and technology is instrumental to promoting economic development. History shows, however, that resource-dependent developing countries often do not allocate extractive revenues to the development of human capital. Gylfason (2001), for instance, finds that natural resource extraction negatively affects human capital, as measured by education expenditure as a share of national income, secondary school enrolment and total years of girls' schooling. He concludes that the neglect of education is one mechanism by which natural resource abundance slows economic development. Stijns (2006), on the other hand, finds subsoil wealth to be significantly correlated with human capital accumulation. The discrepancy between the findings of the two is primarily due to the indicators used to measure natural capital: Stijns employs subsoil wealth per capita and resource rent per capita, while Gylfason considers the share of natural capital in total national wealth (i.e. as a portion of total physical, human and natural capital, wherein natural capital is the sum of subsoil wealth, timber, non-timber forest benefits/products, cropland, pastureland and the opportunity cost inherent to protected areas).

Bolivia spends around 8.5 per cent of its GDP on education in 2011—more than most other Latin American state. A closer look at the Bolivian labour market, however, reveals that despite this significant investment in education, Bolivia has a smaller middle class and higher youth unemployment rate than the Latin American average. The informal sector absorbs 75 per cent of the non-agricultural workforce, compared to an average of 50 per cent across the region (LO/FTF, 2013). In addition, over 67 per cent of the working population between 24 and 65 have no vocational training (INE, 2011). As this data demonstrates, the Bolivian case clearly illustrates that allocating extractive revenues to education does not necessarily translate into a skilled workforce. Export statistics mirror this finding, as Bolivia's economy has one of the world's

lowest shares of manufactured (7 per cent) and high-tech (4 per cent) exports (World Bank, 2009).

The interaction between political imperatives, the vagaries of the extractive economy, and the co-option of the education sector by powerful stakeholders resulted in a dysfunctional system unable to produce the skills required by the Bolivian economy. On the contrary, this situation has served to sharpen inequality:

- 56 per cent of 19–24 year-olds are excluded from tertiary education.
- 38 per cent attend public universities at no cost. Given that the vast majority of this group belongs to the upper income quintile, the public education system largely finances the professional education of the wealthy.
- A mere 3 per cent of 19–24 year-olds attend technical or vocational training; they belong to the second, third and fourth income quintiles (INE, 2011; UNDP, 2011). Hence, the 77 per cent of Bolivians living in moderate or extreme poverty scarcely benefit from tertiary education, where per student spending is typically much higher than that of primary and secondary education.

How can the current stalemate and lack of consistent strategic interplay between education, industrial and scientific policies in Bolivia be explained? Our analytical framework examines three key factors, the first of which is the *political pattern* reflecting the political orthodoxy of the time. The second factor, referred to here as the *education governance pattern*, represents the dominant political discourse's influence on education policy and its corresponding influence on the state's vision and actions in building an educated society and skilled workforce. Finally, *principal-agent dynamics* highlight the challenges of motivating operational actors (the 'agent') to act in the best interests of the 'principal', in this case, the Ministry of Education. The existence of asymmetric information distribution, conflicts of interest or moral hazards may cause the agent to prioritise his own interests.

2 The Emergence of Contemporary Education Power Brokers

Bolivia's economic status as a single-commodity exporter dates back to early colonial times, when the Spanish crown extracted silver to expand and maintain its empire. At the time, the ready availability of cheap, unskilled labour was by far the most critical production factor. The Spaniards instrumentalised

pre-colonial models of community organisation. *La mita*, a social institution that required each household to contribute labour to communal projects (e.g. building and repairing roads or bridges), was transformed into a colonial system of forced labour quotas that benefitted private mining interests and the Spanish crown (Acemoglu and Robinson, 2005 and 2012). By 1825, independence and the rise of the Republic saw the emergence of a new economic and political elite: the *criollos* (locally born people of 'pure' Spanish ancestry) and the *mestizos* (people of mixed Spanish and indigenous descent). They took ownership of the mines and confiscated the land of indigenous people (Gray-Molina, 2009).

Bolivia's economic dependence on commodity export became even more pronounced when the incipient Industrial Revolution in Europe triggered a sharp increase in demand for minerals and metals. During the First World War, moreover, Bolivia emerged as one of the foremost producers of tin, a vitally important war materiel. A host of unskilled labour, working in precarious conditions and under tight control, facilitated capital accumulation, but acted as a disincentive to the development of an employment-oriented youth education system. In 1900, 81.5 per cent of the population was illiterate and only 2 per cent attended primary school. The illiteracy rate decreased to 77.5 per cent in 1920 following the founding of the first teacher training college in Sucre by the Belgian missionary in 1909 (Contreras, 1999).

When the onset of capital-intensive oil extraction in the early twentieth century suddenly required qualified skilled workers, Bolivian companies sent employees on scholarships to Argentina and Mexico rather than training them domestically due to a lack of adequate education facilities (Miranda, 1999). Hence, the demand and need for an adequate education system in Bolivia grew.

As such, the institutional dynamics present at the inception of the formal education system have had far-reaching consequences. Teachers began to organise in the early 1920s and were granted labour union status in 1936. Ideological disagreements between rural and urban teachers resulted in the creation of separate urban and rural teachers' unions, both of which still exist as distinct and influential entities. At the same time, the government of Bolivia made two important educational governance decisions. The first was to set up independent commissions tasked with developing an organisational and administrative model for national education. The commissions were to act as education trustees, while the state was to provide the resources necessary to fund the system without exerting political influence. The second key decision was to grant autonomy to public universities (Lizárraga, 2002).

From a principal-agent perspective, this reform set out the basic educational governance structures that inform the system's evolution until today. The state,

as the principal, placed itself in a weak position by granting independence to the commissions and refraining from the exertion of strong political influence. This allowed the agents, particularly the teachers' unions and autonomous universities, to grow stronger. The former were able to influence the independent commissions' work from the outset. The latter managed to bolster their autonomy by securing independent funding guaranteed by law. Universities receive 5 per cent of overall tax revenue, 8 per cent of tax revenue collected on hydrocarbon production, in addition to royalty participation devolved to the department level (UDAPE, 2013).

3 The Nationalist Project

3.1 *Putting Unions in the Driver's Seat*

The next phase of the cycle began in 1952 with the political project of the national revolution, led by the unions and the *Movimiento Nacionalista Revolucionario* (MNR), a political party that united the demands of interest groups and a society weary of the elite's privileges. On the economic front, the state nationalised the most important mining companies and took control of the production and sale of minerals. While, as owner, the state did nothing to upgrade and improve the means of production, it did grant concessions to the unions in return for their role in leading the revolution: Mining unions were granted job guarantees until retirement, the availability of small shops and social services at the mines, and an 8-hour work day. In the hydrocarbon sector, children retained the right to their parents' jobs (Lizárraga and Neidhold, 2011). In this context of excessive job protection and poorly developed means of production, union membership was more important than qualifications or skills in gaining and keeping employment. As a result, neither the workers nor the government perceived a need for technical training.

The revolution also rewarded the teachers' unions for their active support with a dramatic change in education governance. The organisation and administration of the education system (with the exception of the already autonomous universities) was, for all intents and purposes, handed over to the *Sindicato de Maestros*, or teachers' unions. The power of the unions was legitimised in the Education Code of 1955, which granted them major decision-making authority in the Ministry of Education, including, notably, the right to appoint all undersecretaries. Only the nomination of the minister was left to the incumbent government (Contreras, 2004).

This take-over of the Ministry of Education by the teachers' unions weakened the position of the principal—the state—and reinforced the influence of a key agent in the educational system, with far-reaching consequences.

First, in primary and secondary school, the teachers' unions gave priority to the humanistic teachings inherited from the colonial system, thereby neglecting technical and vocational training. Second, they promoted their members' interests through the codification of a number of privileges in the regulations governing job promotion (*Escalafón Docente*). The unions were successful in securing, for instance, a monopoly on teaching for graduates of the teacher training colleges, a guaranteed job for all graduates upon completion of their studies, and a system of promotion based on seniority rather than merit or education (Ministerio de Educación, 1964). As indicated by the concession described above, the *Sindicato de Maestros* became a powerful agent of the education system. It sought less to ensure the quality of education than to protect the groups' privileges and gain economic independence in resource allocation and expenditure. The teachers' unions requested more and more money while the state, as principal, struggled to exercise control within the education system, leaving little room to craft clear policies, let alone develop vocational and technical education (see Lizárraga, 2002).

3.2 *Building a National Workforce to Curb Imports*

The prospects for vocational and technical training changed when dependency theory began to dominate the political thinking of leaders in the developing world, and Latin America in particular. They began to place greater emphasis on industrialisation and foster domestic production to curb imports. The import substitution development model demanded strong state intervention in domestic markets ('state capitalism'), as well as policies to protect national production. As successful industrialisation required skilled labour, in the early 1970s this new ideology both prompted and required innovation in the education governance system. The government created the *Servicio Nacional de Formación de Mano de Obra* (or FOMO, the national labour training service) as a decentralised institution, modelled on those of other Latin American countries, to promote vocational training (Jacinto, 2013). In order to finance the operations of the FOMO training institutions, the government introduced a 1 per cent payroll tax on private, public and mixed companies. Notably, mining companies were exempted from this tax. Overall, industrialisation policy was aimed almost exclusively at import substitution rather than developing the capacity to process and add value to minerals prior to export (Jordán, 1999).

Institutionally, the FOMO branches were not placed under the supervision of the Ministry of Education, as one might expect, but under the Ministry of Labour. On the one hand, this has insulated the FOMO branches from the power dynamics of the established education sector and the influence of the teachers' unions. On the other hand, it has also resulted in the creation of two

parallel education systems with no opportunity to navigate between them. Despite this isolation, or perhaps enabled by it, the FOMOs increased the skills and knowledge of metalworkers, lathe operators, automobile mechanics, carpenters and other tradespeople and enjoyed broad social acceptance throughout the 1970s and early 1980s (Lizárraga and Neidhold, 2011). Many of the trained professionals entered the petroleum and gas sector, especially the construction of gas pipelines. Integration with the mining sector never developed, however, as the industry maintained simple methods of production, for which on-the-job training was sufficient, and refused to participate in the FOMO system.

The creation of the FOMOs, therefore, left the traditional configuration of the education sector untouched and, instead, added a second principal-agent pattern with the Ministry of Labour as principal and the FOMOs as agents. In this case, it appears that the principal has been more successful in aligning the interests of the agent with its mission. This may be at least partially due to the fact that the special-purpose tax paid by the future employers of the trainees created a more stringent feedback loop, thus strengthening the principal's position. The promotion of vocational training was also facilitated by the affinity between nationalist industrialisation policies and those aimed at upgrading human capital as a factor of production.

For their part, the universities expanded tremendously during the 1970s and 1980s. This surge was partially driven by changes in class structure, wherein a university degree was a near-guarantee of social mobility, and was enabled by the robust funding from extractive activities and tax revenue. The downside of this rapid growth, however, was a decline in the universities' internal efficiency, and correspondingly in their external value, institutional reputation, and degree valuation (Lizárraga, 2002).

4 The Privatisation of Vocational Education?

4.1 *Addressing Structural Deficits in Education Governance*

State capitalism had accumulated a significant debt burden by the mid-1980s. At the same time, the country's export-based economic model was thrown into crisis when the prices for tin, silver and natural gas—which together accounted for more than 50 per cent of total Bolivian exports—fell dramatically. Most of the state-owned mines were forced to close. As a result, Bolivia implemented its first structural adjustment programme in order to stabilise the economy. This marked the beginning of the next political cycle, dominated by aggressive reform policies intended to liberalise prices, exchange rates and interest rates;

abolish export and import controls; and reduce public sector deficit by cutting spending and increasing tax revenue.

The austerity measures also abolished job protection for workers and relentlessly exposed the limits of the mining industry's learn-by-doing approach to training. Out of work miners were unable to get new jobs in different sectors due to their lack of formal qualifications and transferrable skills. Workers were relocated to lower lands and given a small amount of seed money, which they often used to relocate to the major cities (Milenio, 1998). The former labourers had little choice but to join the informal economy and try to make a living through petty trade and commerce. Others were given land in the headlands of the Amazon, where they practiced farming and later grew coca leaves.

The structural adjustment package also affected the education system, as tax expenditure on basic education temporarily fell to 2.5 per cent of GDP. This tax reform also cut off the FOMOs' sole source of funding. As a result, it was privatised and moved to the Confederation of Private Businesses (under the name INFOCAL). The infrastructure and workshops were transferred as loans. To run INFOCAL, private businesses were asked for voluntary contributions towards equipment and monthly student fees were introduced. Over time, the contributions from the *Confederación de Empresarios* became minimal and INFOCAL was transformed into a fully private institution.

Third, as response to the transfer of FOMO to the private sector, until the mid-1990s universities offered a number of professional training programmes. From 1985 to 1996, enrolment in vocational training programmes accounted for 13.5 per cent of total university enrolment. Later, the widespread desire for upward social mobility, combined with a glut of university graduates applying for jobs traditionally reserved to technical school graduates, resulted in the devaluation of technical certificates, and the transformation of many vocational programmes into full university degree programmes. Today, enrolment in university technical education courses is only about 5 per cent (CEUB, 2013). At the same time, the ITC and services age created new professions and demanded new skills, inspiring a surge of private universities and vocational institutes. Due to a lack of regulation, these institutions spread in a haphazard fashion, often failing to provide the quality of education required by industry standards (Lizárraga and Neidhold, 2011).

The education system thus saw the disappearance of the principal-agent structure in vocational training. Public universities, on the other hand, were strengthened, as their legislated participation in tax revenue protected them from austerity measures. These concessions were maintained by the universities' autonomous status and the state's inability to carry out substantive reforms

within the education system. The same was true of the teachers' unions, which also managed to protect their interests from potential intervention or reform.

As Bolivia entered the 1990s, its primary education system was vast but weak, and educational quality was poor. It encompassed some 12,000 schools, 1.5 million students and 90,000 teachers. Only three-quarters of teachers, however, had completed some form of teacher training. Of the remaining teachers, particularly those in rural areas, few had finished secondary school. Although the budget allocated to education had recovered to 4 per cent of GDP, and represented the largest single category of public spending, over 95 per cent went to salaries. The absence of a reliable, timely reporting system for the number of teachers or schools eligible for, and receiving, funding illustrates the weakness of the Ministry's control over the sector. Innumerable pay cheques were cashed by 'ghost teachers' under false names, a reflection of the often-rampant political graft that characterised the educational sector (Contreras, 2004).

4.2 *Undermining Foreign Direct Investments Impact by Failing to Invest in Skills Education*

The 1990s saw a second package of structural adjustment reforms focusing on privatisation, increasing foreign direct investment (FDI) and the decentralisation of state power to municipalities and their elected mayors.

As part of the move towards the privatisation of state-owned enterprises (referred to in Bolivia as 'capitalisation') the national oil company YPFB (*Yacimientos Petroliferos Fiscales Bolivianos*) was put up for sale. Investment-friendly policy frameworks gave foreign companies the opportunity to access Bolivia's oil, gas and mineral reserves. Correspondingly, between 1996 and 2001, over 40 per cent of all FDI went into the extractive sector (Andersen et al., 2004); the companies recruited university graduates and trained them according to their needs. The discovery of large natural gas reserves at the end of the 1990s and the resurgence of the mining industry, driven by soaring mineral prices, have restored extractive activities to their former status as pillars of the economy. Many of the previously shuttered, state-owned mines were reopened by cooperatives, but did receive FDI and continued to rely on primitive extraction methods and unskilled labour.

FDI is generally promoted as a means of encouraging economic growth through the introduction of, among others, an influx of capital, new technologies and better management practices. The realisation of these benefits, however, is dependent upon the existence of certain channels through which these positive effects can be generated, such as backward-forward linkages between local companies and education and training. The educational reform of 1994,

therefore, was, and continues to be, a critical factor in the success (of failure) of economic reform.

In terms of education governance, the reform of 1994 represented the most decisive attempt to date to reorganise the system. It was supported by the international donor community, which once again began to place greater emphasis on education (see the 1990 Jomtien Declaration of Education for All, for instance) and agreed to resume funding Bolivia's education sector, subject to credible reform plans, for the first time since suspending their support in the late 1970s (Contreras, 2004). Overall, the reforms were aimed at increasing the primary school enrolment rate, improving the quality of education, and introducing technical and vocational training. At the organisational level, the reform programme sought to strengthen the position of the Ministry of Education. Municipalities were given the responsibility and resources to run the infrastructure of primary schools.

The reform succeeded in increasing the enrolment rate, as funds from HIPC and HIPC II, the debt relief initiative targeted at Heavily-Indebted Poor Countries, supported the launch of programmes such as school breakfasts. Similarly, in 2006, the Juacinto Pinto school voucher system was created to strengthen the incentives to attend school. Provided he or she attended at least 90 per cent of school days, each child received BOB 200 (approx. USD 29) at the end of the calendar year. Government-issued bonds financed the programme. Municipalities spent a large percentage of their resources upgrading primary school infrastructure and supported an increase in public spending on teachers' salaries. As a result, the net primary school enrolment rate rose to 93 per cent by 2006, though according to World Bank data, it dropped to 83 per cent between 2006 and 2011. This focus on access, however, once again overshadowed the question of the quality of education, where once again little progress was made.

At the time of educational reform, the ambitions for improvements in technical education were also high and policy coherence was achieved between the promotion of FDI and increasing human capital. Originally, the government planned to introduce technological apprenticeships in grades 9 and 10, which would result in a Basic Technical Certificate and thus enhance graduates' employment prospects. Two different types of secondary school programmes were also considered: a humanistic and a technical programme, each designed to help students enter the labour market with certified skills (República de Bolivia, 1994). In the end, however, for a number of reasons, this technical training scheme was never developed, let alone implemented. First, the Ministry of Education did not have the expertise and resources to tailor its work to the needs of both the productive and services sectors, as had been the

case with FOMO and the Ministry of Labour. Second, all three vice-ministries (for formal, alternative and higher education respectively) were authorised to teach vocational training at each level and according to their own philosophy. This resulted in different entrance conditions, unequal lengths of study and varying approaches to the curriculum in each system, preventing the development of a strong, unified technical education system. Third, there was no teachers' vocational education college and thus, no trained teachers. Most vocational education instructors are normal teachers who have done some vocational coursework, but lack practical work experience. The hiring of other types of teachers, such as university professionals or practitioners, was prohibited by job hierarchy, which only allows hiring graduates from teacher training colleges (proCap, 2011).

Given the fate of the proposed technical and vocational training reform, it comes as no surprise that the evaluation of FDI promotion in Bolivia does not find any complementary effects between FDI and education (Andersen, 2004). This failure to realise spill-over effects is compounded by the fact that only 8 per cent of all FDI between 1996 and 2001 went into manufacturing, while over 50 per cent went to sectors with few linkages with the local economy (i.e. 40 per cent to the extractive sector and 14 per cent to telecommunications). This is in stark contrast to the drive for industrialisation in the 1970s.

In light of the continued lack of vocational training, the 'skills-based training' concept proffered by organisations of international cooperation gained importance. Many municipalities started investing in technical skills-based training education centres, where courses and topics are determined based on local needs. This approach responds to both regional industry demand for skilled workers and public demand for further education (Lizárraga and Neidhold, 2011). Although this alternative form of education has demonstrated some worthwhile results, particularly in terms of public perception, it is not a systemic approach capable of producing effective vocational training at national level. It also depends on the support of whoever happens to be mayor at the time. Moreover, due to the lack of independent funding, the costs between centres differ significantly. A 2004 analysis indicates that the cost can range from between USD 114 and 534 per year per training for the same course (CIESS-Econométrica, 2004).

The 1994 education reform also attempted to change the existing principal-agent relationship by strengthening the position of the Ministry of Education and removing some of the agents' power base. As we will see, the agents' engrained position allowed them to successfully defend their interests and maintain the previous pattern. At first glance, the Ministry of Education appeared to strengthen its position as the governing body of education in

Bolivia. Processes were modernised and a system was put in place for collecting and managing statistical data. The hiring of teachers was now done in coordination with municipalities, in keeping with their new functions following decentralisation. The reform process stalled, however, with the attempt to shift resources from higher to primary education. There was a fear that as this appeared to alter their codified financing mechanism, this would weaken the universities' autonomy. Despite the fact that as universities were already overfunded, the redistribution of funds would have not diminished their capacity, the universities completely resisted any movement in this direction and the original text of the reform had to be modified.

The universities also managed to fend off impending regulation and oversight by a new Vice-Ministry for Higher Education, which was to regulate public and private universities, determine curricula and establish degree programmes. Shielded by their historical autonomy, the public universities successfully opposed the new body and retained their independence. The Vice-Ministry of Higher Education was thus left in charge of regulating the work of the private universities alone.

The teachers' unions, for their part, have been extremely successful in protecting their control over public education. For example, proposals for parental control of attendance and input on teacher quality by means of a School Board, as granted in the Reform Act, were vehemently resisted by the unions and not put into practice. The teachers' unions, and the urban organisations in particular, claimed the reform process lacked teacher participation and was imposed by neo-liberal actors (Contreras and Talavera, 2005).

5 Remaking the Nationalist Project

5.1 *Meeting the Innovation Demands of the National Lithium Industry*

The current political cycle is determined by the incumbent president's ideology of indigenisation, nationalisation and anti-imperialism. In accordance with these ideological commitments and delivering on his election campaign promise, Evo Morales nationalised the hydrocarbon industry on his hundredth day in office. The technology- and capital-intensive, externally-backed mining companies San Cristobal and San Bartolomé, in contrast, have remained in private hands. This change in ownership, however, has not made a difference to Bolivia's resource-dependency, nor has it changed the incentives for vocational training. Capital-intensive businesses maintain their own job training programmes, and small- and medium-sized cooperative mines continue to work with traditional methods, i.e. unskilled labour.

With the dawning of the lithium age, this should change. Morales' goal of not only maintaining control of at least 60 per cent of the sector's earnings, but also of creating an industrial economy (Bajak and Valdez, 2009) has changed the demand for skilled professionals. The lithium mining process is complex and requires advanced technology, as does the production of batteries and, eventually, electrical vehicles. To manage this growing industry, the President created the National Bureau of Evaporative Resources in 2008 (Decreto Supremo no. 29496), which is responsible for facilitating the lithium project, including ensuring the proper education and training of engineers, chemists and technicians.

As Bolivia is currently unable to draw on domestic expertise, it must rely on foreign partners in the pursuit of 'know-how', or technical competence, and technology transfer. The keen interest in Bolivia's lithium certainly helps, as about ten countries are actively competing to partner with Bolivia, including the US, Japan, France and Brazil. The partnerships drafted thus far make for a mixed picture regarding the extent of training and technology sharing. The deal closed with China's LinYi Dake Company for the pilot battery production project, for instance, mimics the approach of the hydrocarbon industry, as training is practically oriented and aimed at qualifying operators to run the plant. The agreement therefore provides for the training of two Bolivian engineers through a one-month internship in China. Further, during the first four months of operations, two Chinese experts will train the 21 Bolivian technicians in understanding and operating the relevant technology (Agencia EFE, 2014).

The cooperation with South Korea has two components, wherein the extent of knowledge transfer remains unclear. A 2010 Memorandum of Understanding covers joint exploration and production. The state-owned mining company KORES is intended to provide lithium expertise while, at the same time, Bolivia will be included in Korea's Knowledge Sharing Programme, designed to help Korea's trade and investment partners strengthen their capability for poverty reduction and economic development (Frank et al., 2010). That said, though Bolivia claims its National Bureau of Evaporative Resources (GNRE) has developed a technological lithium extraction process suitable for the particular conditions of the *Salar de Uyuni*, the only scientific paper on the subject was written by Korean researchers (some working for KORES) without participation of Bolivian scientists (Dyson, 2012; Woong et al., 2012). Moreover, the Korean consortium is said to have patented the methodology in such a way that excludes Bolivia from participating in any associated profits (Metals Pages, 2012). The second part of the partnership, an agreement signed in 2012, is a joint venture with a South Korean public-private consortium for

the pilot production of lithium cathodes, a key component of lithium-ion batteries. The Korean consortium will provide applied training to Bolivian personnel in the processes and technology required to produce cathode materials (Latinomineria, 2012).

Finally, Bolivian cooperation with a public-private Dutch consortium has a scientific focus, with most of the training provided by the public partner. The declaration of intent includes plans for establishing a company to produce lithium-ion batteries (led by the Dutch company BTI Technical Support & Innovations) and a state-of-the-art research centre (set up by Da Vinci Laboratory Solutions). The Delft University of Technology will be responsible for training of most of the staff. In addition, Delft University will create research positions for 40 Bolivian Masters students, and Bolivian PhD students will have an opportunity to deepen their knowledge of lithium batteries in Delft over a four-year period. To this end, Delft University has partnered with universities in La Paz, Potosi, Oruru and Cochabamba, where Delft staff will also give lectures (GoN, 2013). The Dutch consortium is also intended to provide technical support for the development of a lithium industrialisation master plan (GNRE, 2013).

5.2 *Seeking to Recover Traditional Knowledge*

Contemporary discussions of education governance juxtapose the existing educational system, often unfavourably, with the country's lithium ambitions. The current educational system, which is still based on the European tradition of humanistic and integral teaching, has been harshly criticised by the government for its 'colonial' and 'classist' curriculum. The 2010 law on education (*Ley de Educación Avelino Siñani—Elizardo Pérez*) calls for the 'recovery of traditional knowledge' and the development of curricula in coordination with the community. These precepts have yet to be implemented, however, and are fraught with challenges. Improvements in primary and secondary school enrolment, in conjunction with reduced dropout rates, are putting pressure on higher education. 77.3 per cent of all pupils finish primary school, and the percentage of students completing secondary education rose from 46.7 per cent in 2001 to 54.7 per cent in 2008 (UNDP, 2011). Since the tertiary sector cannot keep up with demand, university admission is becoming increasingly demanding. This, in turn, unmaskes the persistence of the poor quality of primary and secondary education. Many young people find themselves ill-prepared and unable to go on to university, especially public institutions.

The supply of vocational training remains minimal while the proliferation of information and communication technologies has created increased

demand for qualified professionals. The gap in technical and vocational training continues to be partially addressed by skills-based training programmes, designed to help people develop the skills they need to find a job or start a business, rather than offering a generic certificate. The two largest programmes are offered by the Bolivian foundation Autapo (FAUTAPO) and the Catholic Church's Episcopal Commission on Education, both of which collaborate with international cooperation agencies. Instead of creating new training avenues, they strengthen existing public and private centres at the municipal level to improve the quality of courses offered. Their support consists of upgrading the centres' infrastructure and equipment, providing supplies and training and (in part) paying teachers and other staff. They also support municipalities as a strategic partner and co-funder independent of the usual interest groups.

The skills-based training model has helped to reach 50 per cent of rural municipalities and caters to a population otherwise traditionally excluded from education. In the larger cities, technical education is also provided for other students, such as Vocational Training for Young Baccalaureates (FAUTAPO, 2010). Unfortunately, the expectations of the target group do not correspond with a technical profession. As a result, the students demand and pursue courses while they wait for admittance to university, rendering the resources put into these programmes useless for the productive sector.

The limited navigability and recognition of skills-based training diplomas has now been addressed by the Bolivian System of Skills Certification (BSSC), created to certify people's skills regardless of where they were acquired, as a way of acknowledging and valuing traditional and empirical knowledge. As of yet, however, a system capable of integrating all the programmes and setting a universal technical training curriculum does not exist. This prevents the existing endeavours from making full use of the potential synergy amongst them.

In this phase, innovations in tertiary education continue to be outside the traditional principal-agent pattern. On a positive note, skills-based training is not co-opted by traditional agents' interests. At the same time, however, as they operate outside the existing formal education structure and the skills-based training system does not produce the forward-looking skills required by the economy, skills-based training agents lack influence over education governance. The original principal—the government—still suffers from a lack of competence and vision, unable to develop (or implement) sound policies for either the second and third sectors of the economy or corresponding policies for education and science and technology. Correspondingly, a piecemeal vocational educational system has developed, as exemplified by the devolution of responsibility to municipalities in the case of skills-based training. The provision

of skills-based training by municipalities on a voluntary basis renders the vocational training system both limited and vulnerable, at the mercy of the local mayor's foresight.

Meanwhile, the teachers' unions and autonomous public universities still enjoy considerable power and influence over the education system. As previously discussed, the financial situation of public universities is a case in point, as the legislatively-mandated flow of funding is significantly higher than the universities' capacity to spend. In 2012, they only managed to spend 60 per cent of the official budget. This not an exception; in 2012, the unused resources from previous budgets reached BOB 2.6 billion, or 7.2 per cent of GDP (Ministry of Economy, 2013). In light of this wealth, unlike many of their counterparts in other states, universities can afford not to engage in research and development and refuse to agree to improve their technical education programmes in coordination with the productive sector. Their autonomy also allows them to refuse to transfer a fraction of their unused resources to other levels of education.

The state, and Ministry of Education in particular, continue to be co-opted by the universities and teachers' interests, rendering the government unable to enforce quality standards or to set its own policies for technical education. As a result, industry's demand for skilled, qualified labour often goes unanswered.

6 Conclusion

Our analysis reveals that the principal-agent dynamics established in the first half of the 20th century have prevented Bolivia from developing a comprehensive and effective education governance system. Despite allocating significant resources to education, the country did not succeed in developing its human capital. The universities' autonomy, together with their ring-fenced funding sources, allowed them to fend off potential challenges from vocational training. The extractive sector, moreover, failed to provide an incentive for the promotion of vocational and technical training. Similarly, the mining sector did not spur demand for a skilled workforce, and its absence from the FOMO initiative speaks for itself. Needless to say, investment in the human capital required to support backward or forward linkages and further economic diversification requires a political will that, thus far, has been sorely lacking.

Human capital indicators are biased towards a focus on primary and secondary education enrolment rates. To better capture human capital accumulation in resource-rich economies, indicators should prioritise educational attainments, particularly vocational training and the overall level of training in the workforce. Additionally, without significant improvements in the quality

of primary education, increased primary enrolment rates are poised to result in higher, not lower, inequality, as has been witnessed in many developing countries (Gruber et al., 2014). Overcoming co-optation mechanisms, deeply entrenched teachers' privileges and university insensitivity to future labour market demand remains a formidable challenge.

Principal-agent dynamics emerged as one of the most important structural determinants preventing the development of a suitable vocational training system. The relative success of vocational education during the 1970s, however, suggests that developing a system isolated from existing power dynamics might be a more promising, pragmatic approach than fighting the entrenched interests, such as the unions, that represent an important electoral base the Morales regime.

Bolivia's approach to acquiring the skills and expertise required for the development of a lithium-based industry reflects this pragmatic mind-set. Capitalising on worldwide competition for access to Bolivia's lithium reserves, Morales sought to secure strategic FDI and conclude scientific cooperation agreements incorporating strong research and training components with knowledgeable foreign partners. The diversification of partners aims at reducing the possibility and risks of dependency. Within this framework, the first steps towards addressing the technological and human capital challenges related to the development of a world-class lithium industry have already been taken. Paradoxically, however, even within this context, limited attention is paid to vocational training, reflecting the extent to which the lack of progress in Bolivia's vocational training policy remains an obstacle.

The exclusive promotion of lithium also raises concerns. Unresolved technical and environmental extraction challenges could make it cheaper to expand on-going operations in Chile, Argentina and Australia, lowering demand for Bolivia's lithium (Brown, 2011; Tegel, 2013). Similarly, the discovery of a substitute material or method for powering electric vehicles may yet counter Bolivia's dramatic bet on lithium. The ensuing bust in lithium prices would recall dramatically past experiences of commodity booms in Bolivia and, correspondingly, bring the wisdom of the thus far substantial investment in battery plants into question. Even if the lithium boom materialises, it may be too limited a basis for the industrialisation of Bolivia. Battery production is capital-intensive, highly automatised and may not offer many jobs (Mares, 2010). It risks creating another enclave industry with few linkages to the rest of the economy and a limited impact on poverty.

Under such circumstances, sustaining economic diversification would, and does, require a broader, complementary vocational and tertiary education policy to nurture a skilled workforce. Forward linkages should go beyond those

that are currently envisioned and enable the domestic industry to create clusters around the lithium and e-vehicle manufacturing industry. Matching the projected demand for particular skills with training must be a priority. This requires anticipating future labour market requirements and proactively assessing the quality and relevance of existing training programmes, in a collective effort involving government ministries, public and private training providers, and employers' and workers' representatives. Such a broadened skills-initiative would be complementary to the on-going scientific collaboration and training plans in the lithium sector. It is time to start enabling the Bolivian working and middle classes to buy electric cars, if and when the country succeeds in its ambitions to become a world-class producer.

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