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Sustainable management of natural resources via enhance knowledge base: experiences from four Latin American countries

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Motivation

- How to overcome 'curse' of natural resources?
- How to use NRs to the economic development process?

RQ: What type of institutional design would enable to link NRs to productivity enhancement process?

- Examine attempts made by LA countries in the 2000s in using NR rent to finance Science, Technology and Innovation process to enhance productivity based on knowledge economy



Theory in the context of NRs for productive growth

- **Natural resource curse??: increasingly inconclusive**
(Brunnschweiler, 2008, Cuddington, 1992 among others)
- **Natural resource can be the source of growth with right institutions and policy interventions** (Collier, 2010, Ferranti et al, 2002, Humphreys et al, 2007) especially to:
 - need to deal with volatility of financial flows
 - escaping from dependence on a few commodities (diversification)
 - enhancing productivity via increasing knowledge intensity of NR-based activities
- **Institutions matter—existing institutions to manage NRF for growth?**
 - Natural Resource Fund (SWF type)? Effect in smoothing out volatilities and expenditure over the years but several studies indicate that is not enough for put the country on development pathway.



Importance of Science Technology and Innovation in productive development linking with NR

- **Existing case studies from Australia and Norway demonstrates importance of:**
 - Knowledge, technology and institutions to coordinate these relevant actors enable to diversify NR-based activities, increased knowledge intensity and productivity(Ville& Wicken, 2013, Upstill & Hall, 2006, Urzua, 2011 etc)
- **'Investing in investing': Capacity building necessary before investing (Collier and Laroche, 2015, Collier, 2010 etc).**
 - Long term growth in productivity is tightly related to the capacity to innovate, this also need coordinating across the related stakeholders for certain period of time (Benavente, Crespi, Figal Garone,&Maffioli, 2012).
 - Dealing with market failure that goes beyond macro economic stabilization-industrial policy
- **Institutions matter—but what kind of institutions enable to link NRs to developmental process?**
 - Design principle—to deal with context specificity and path dependency
 - Look at existing & emerging cases in LA



Design Criteria for Institutions to manage NRs for productive development

Static Design Criteria

- **Clear purpose of establishment**
 - *Policy statement clearly stating how NR income is used to invest in STI*
- **Rule based design**
 - *Clear rule exist and leaves limited scope for discretion and corruption*
- **Multiple stakeholder governance**
 - *Decision making is shared among multiple organizations*
- **System to ensure transparency**
 - *Disclosure of information on flow of funds*

Dynamic Design Criteria

- **Develop mechanisms to monitor and evaluate activities**
 - *Correctional mechanism as well as policy learning opportunity*
- **Provision of institutional /managerial capacity**
 - *Whether intended activities were carried out and if so by which organization*
- **NRs are integrated in STI institutions: Policy Mix**
 - *Inter ministerial coordination as well as private-public coordination on using NRs for STI purposes*

Source: Collier & Laroche (2015), Collier & Venables, (2011) , Collier (2010), Hamilton& Ley, (2011), Humphreys and Sandbu(2007)

Source: Crespi et al (2014), Crespi & Dutrenit (2014)



Methodology and information used in this study

- **Using “Design Criteria” for institutions to manage NRs toward productivity building as the reference point to compare following countries which recently introduced such institutions:**
 - *Chile (2005), Colombia (2009), Peru (2004) and Bolivia (2007)*
- **Use of secondary sources:**
 - *Legislations, policy documents, documents from international organizations (i.e. OECD, IADB)*
- **Interviews with key informants:**
 - *Experts working in the area that crosses STI and mining sector*
 - *Interview and follow up questions*
- **Cross check with the informants & external sources**



Cases: general information of 4 countries

<i>2014</i>	Chile	Colombia	Peru	Bolivia
Population (millions)	17.70	48.90	30.80	10.80
GDP growth (annual %)	1.89	4.55	2.35	5.40
GDP per capita (current US\$)	14,520.0	7,720.0	6,594.4	3,150.5
Income group	High income: OECD	Upper middle income	Upper middle income	Lower middle income
Sectoral value added (% GDP)				
Agriculture	3.3	6.7	7.4	13.3
Industry	35.1	38.2	36.8	38.1
Services	61.5	55.1	55.8	48.6
year	<i>2014</i>	<i>2014</i>	<i>2012</i>	<i>2013</i>

Source: World bank Data, 2016



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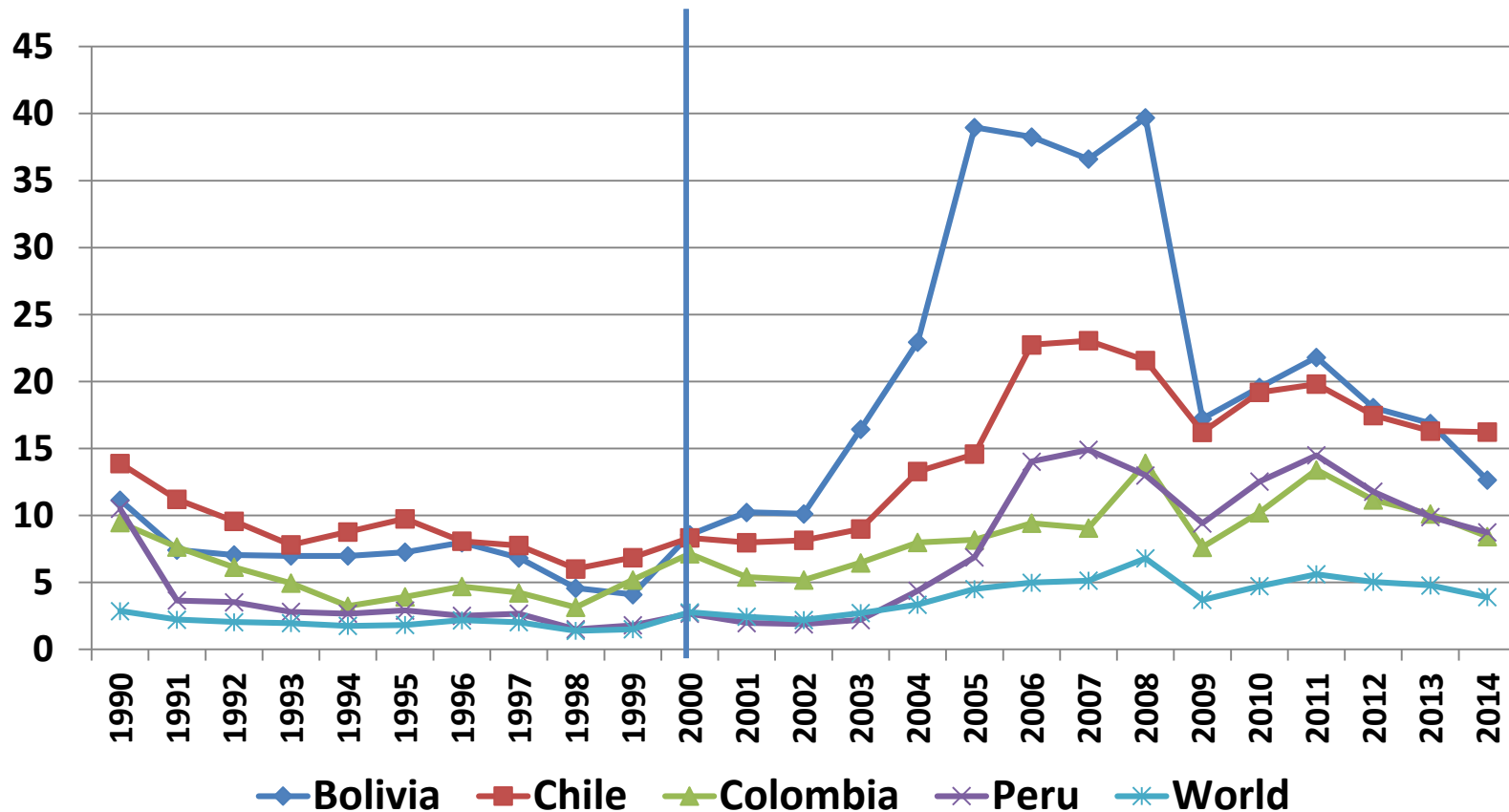
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Cases: general information of 4 countries

Total Natural Resource Rent (% of GDP)



Source: World bank Data, 2016



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Country cases: main diagnosis on Criteria

All countries are influenced by knowledge economy concept and role of innovation in long term growth in the 2000s

- All countries comply with **Static Design Principle** but differs slightly in degree of implementation
 - **Policy statements**: clearly stated all countries examined but implemented differently
 - **Law is used to define use/allocation of NR(all)** but some countries use **presidential decree for STI** (Chile, Peru, Bolivia) to establish STI institutions
 - **Multiple stakeholder governance**: **complex** (Chile and Colombia), **simple** (Peru and Bolivia)
 - **System of transparency**: all publish information on money flows
- **Dynamic design principle shows common problems**
 - **M&E**: Differences in implementation but all countries lacks clear feedback loop to improve policy via learning
 - **Capacity**: Capacity gap exist in the regions—decentralization efforts
- **Degree of integration of NR funds to STI policy**: integrated (Chile & Colombia) not integrated (Peru & Bolivia)



Case 1 : Chile (1)

Background

- **Chile has NRF since 1987: limited impact on productivity**
 - Successful in keeping volatility of NRs away but unsuccessful in creating a ground to diversify economy, enhance productivity & increase knowledge intensity
 - Resource boom actually increased the dependency on copper despite earlier efforts in diversify its economy
- **2000s onwards**
- Economic policy gradually starts to shift towards allowing more policy intervention to take care of market failure and coordination failure in more systemic manner shifting from demand side approach to more supply side approach (Crespi and Dutrenuit, 2014).



Case 1 : Chile (2)

STI-NRs institutions (actors)

- **Law No. 20097 (2006):** takes progressive royalties from copper production(in volume) to be used for innovation.
- **Fund for Innovation for Competitiveness (FIC) (2005)** established by **presidential decree** to received the royalties set by the law
- **National Innovation and Development Council(CNID*)** established by presidential decree no 1408 2005, no. 177, 2015) in 2005 to long-medium term strategic design for STI, monitor and evaluate & private-public platform to advice President
- **CMI (Inter ministerial Council)** chaired by Ministry of Economy established in 2007 to execute over FIC and inter-ministerial coordination
- **Implementation agencies (CORFO, CONACYT etc)** specialized agency to monitor fund applicants
- **Regional Development Agency (ARDP)** regional agency established in 2006-7, responsible for strategic planning at regional level, coordination with other regional and national bodies.



Case 1 : Chile (3)

- **Allocation of FIC: since 2008:**
 - 75% **FIC National** executed by CMI in Santiago chaired by Min Econ
 - 25% **FIC Region** executed by Regional government (ADRP) manage; of which 60 % goes to mining regions and 40% goes to non mining regions.
 - 20% of regional FIC needs are to be allocated to university or research centers in the regions
 - Need to negotiate with Ministry of Economy on disbursement
- **Use of FIC:** Of all implementation agency, two has major proportion CORFO (43.8%) and CONICYT (35.2%). CORFO spends 60% of its fund on innovation (2015)
- **Amount allocated for FIC:** USD 195.1 million (2014)(0.076% of GDP), increased from US\$81.1million (2006)
- **Access to fund:** Private sector and Implementing agency (public agency) prepare proposal and submit to Division of Innovation in Ministry of Economy. This is evaluated by CMI and other related ministries
- Ministry and Economy is in charge of monitoring financial flow



Case 1 : Chile (4)

Challenges identified (dynamic criteria)

- **M&E** has no clear feedback loop for improvement and policy learning
- **Coordination** entity CMI & CNID are not strong enough coordinate/guide ministries with different interests to create consensus on use of FIC.
 - How to strengthen negotiation power without creating concentration of power?
 - Decentralization and **capacity gap** in the regions; Regional administrative capacity require upgrading
 - Especially responsibility of each entity is not clear at regional level (e.g. Regional Government & ARDP monitoring and evaluation difficult)
- Tension between Ministry of Treasury and Ministry of Economy in use of FIC
- **Continuity of policy**: how to avoid political cycle of 'stop and go'
 - Legal status of CNIC, CMI—may make the innovation policy as policy of the 'STATE' not the preference of government



Case 2: Colombia (1)

National Development Plan 2010-2014 states Potential of exploiting NRs to enhance productivity

STI -NR institutions (actors)

- **General System of Participation (SGP) (Law No. 05/Law No. 1530) allocated mining royalties based on formula on basic needs:**
 - **Creation of STI fund: FCTel (10%)**
 - **Creation of NRF** called Saving and stabilization Fund (25% first year, max 30%)
 - Territorial investment projects (50%)
 - Territorial pension savings (10%)
 - Operation, monitoring, evaluation and other costs (max 5.5%)
- **Amount of FCTel:** US\$710.9 million (2015), 0.19% of GDP.
- **Use of FCTel** is decided by Organo Colegiado de Administracion y Decision (OCAD)
 - Consist of representatives of University, Departmental governmental and National government. Requires 2 votes from three sectors for the project to be approve
- **Colciencia** is established by law no. 1286 in 2009. Colciencia design, execute, evaluate and chair the OCAD
- **DNP** will selectively evaluate project approved by OCAD



Case 2: Colombia (2)

STI-NR institutions (actors cont)

- **Monitoring and evaluation system embedded in the system**
- **Regional institutions were established CDECTI (Departmental Council for Sci, Tec & Inno) & PEDCTI (Departmental Strategic Plan for Sci, Tech& Inno)**
 - Strengthened by law no. 1286 (2009), establish the priority to invest STI in department (subnational level)
- **Problems identified:**
 - **Capacity gaps** among department (as can be seen in the spending patterns)
 - **Coordination** is difficult due to limited power of Colciencia over the funds due to multiple governance structure.
 - **Monitoring and evaluation** system do not have feedback loop; not clear



Case 3: Peru (1)

- Amongst existing tax regimes on NR exploitation two has link with financing STI: **Canon law & Mining Royalty**.
 - **Canon law** is established by the law no.28077 in 2003. **Mining royalty** is established by law 29788 in 2011
 - **Canon** is the share of total income and rent obtained by state and this is transferred to the regions. The **Canon law of 2003** oblige regional government allocate **20%** of their proportion to the public universities in their regions.
 - **Mining royalties** are the economic remunerations paid to the state to exploitation of metallic and non metallic mineral resources. All the mining royalty goes to NR producing regions and **5% of mining royalty goes to mining public universities** of producing regions.
 - **Amount of Canon and Mining royalty**: US\$ 42.2 million (Canon in 2014); US\$ 8.1 million (Mining Royalty in 2014). The total of two are 0.025% of GDP.
 - Above are strictly to be used in **research purposes by the public universities in regions**.
- **Conflict** between University& Ministry of Economy and Finance.
 - University as autonomous entity, has ultimate power to decide how to use the funds while MEF put some restrictions in its use via auditing;
 - **M&E** not done by the public sector as yet but there were civil society monitoring the use of these funds



Case 3: Peru (2)

- 2000s onwards, enhancing productivity became critical goal because high economic growth between 2004-2013 did not increase productivity, diversity nor reduce income disparity or the rate of informal economy. Many separate attempts were made to invest in STI --this has been expressed in presidential decree 2016
- **Peru's STI institutions has rather separate development from NRs finances** and disperse efforts were made
 - Presidential decree (2016) allocated design, coordination and monitoring to CONCYTECH: while PRODUCE execute programs/projects with financial mechanisms.



Case 3: Peru (3)

Problem identified:

- **lack of capacity in the public university** to use funds allocated; much of the funding are used for infrastructure not on research nor on training of new researchers.
- **Lack of coordination (until recently) among STI**
- **Lack of linkages between STI institutions with NR-based fundings**
- **Coordination problem:**conflictive relationship between University and Ministry of economies on use of funds from NR tax



Case 4: Bolivia (1)

- Statement linking the use of NR for national development is present and role of STI is state—but emphasis were perhaps placed on poverty reduction in the regions rather than on productivity growth
- Use of NRs changed significantly since 2006. NRs are nationalized
- **8.68% of hydrocarbon tax (IDH)** are allocated to public universities in the regions by supreme decree.
- If there were more than one university in the region, allocation were to be decided by the Ministry of Economy and Finance, Ministry of Education and CEUB (association of universities) and benefiting universities.
- In 2013, much of funds are not spent and if it were spent, spent on public infrastructure due to the lack of capacities at the level of university and Ministry of Economy and finance
- NR allocates US\$ 192 million (2013) this is 0.58% of GDP. The NR fund increased almost 3 times since 2007



Case 4: Bolivia (2)

Problem identified:

- **Capacity gaps** among regional public university to use the funds for STI purposes;
- **STI institutions are weak and link with NRs resources is weak.**
- **Lack integrated design on STI and NRs**
- **Lack of/weak monitoring and evaluation mechanisms**
- **Coordination power of VCyT** weak due to lack of resources and political power



Policy implications

- Complying with Static design criteria may not be sufficient conditions for the implementation. Dynamic criteria focus on effective implementation process.
- Capacity building of public institutions (policy makers and administrators) necessary, especially in regions. This is 'investing in investing'.

Areas of considerations when designing institutions

- **Right balance between rigidity and flexibility of regulations for investing in STI**
 - Having phasing out/in for implementing regulations with capacity building may lead to better implementation outcome in long run;
- **Defining appropriate strength of role of coordinating agency** so that it can negotiate with other ministries as well as private sector
- Appropriate way to let **private sector participate in decision making** while preventing regulatory capture
- **Maintaining continuity of the policy:** legal (hard) vs private sector involvement (soft)
- **M&E with feed back loop** to generate policy learning important in adjusting above in dynamic manner



Other considerations specific to the case

All the LA cases happened with following background

- Sound political economy context; somehow all the actors' different interests were aligned to change the way
- Sound financial background of increasing inflow of money
- Regional example: demonstration effect
- Financial facility to promote STI activities: e.g. IADB



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