

REGIONAL AND SECTORAL EFFECTS OF NATURAL RESOURCE BOOMS: INTERRELATIONSHIPS IN PERU, 2001-2015

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Abstract

This study demonstrates, by various geostatistical and descriptive resources, that natural resource booms causing Dutch disease can generate effects more acute in regions of a country where the natural resource (NR) boom originates; this would merit special regional development programs for these regions. However, the particularities of Peru involve dispersion of mineral and hydrocarbon resources. Adverse effects of NR booms can be seen in the tradable sectors of agriculture and manufacturing in terms of lower growth rates. However, in non-tradable sectors, there is evidence that the building sector increased overall and not always in services regional-sectors.

Keywords: Dutch Disease, regional development, regional economy, industries allocation in regions.

JEL Codes: N56, N66, O18, R11, R12

1. Introduction

This article seeks to contribute to the discussion on the appropriation of benefits of Natural Resources (NR)³. Graphics and statistical elements are intended to test long-term hypothesis that in countries with Dutch disease, some subnational regions with NR booms face greater sectoral imbalances which lead to greater challenges for development⁴. This is Regional Dutch disease -RDd-. Balanced sectoral growth is a situation in which sectors of the economy grow so that the proportions of each sector in the GDP are not radically changed. See Young (2005) and (Ohlin, 1959). They highlight the interdependence between inter-sector supply and demand (Cuadrado, 2005).

This paper shows evidence correlating booms in natural resources with low growth in other sectors, and thus adverse sectoral effects generated by the

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³ Natural resources are divided into point and diffuse. The point is located at specific punctual minerals and diffuse the different living beings with economic use and/or land. (Willebald, 2011, p. 88). Punctual mineral has a appropriability potential higher.

⁴ In this paper we consider departments of Peru regions as subnational level, for example Piura, Chiclayo, Huanca and others.

exploitation of punctual natural resources. These situations require a suitable national policy on regional development or planning for the development of these regions one by one because the NR boom can have adverse effects on long-term growth through the decline of economic diversification or slow growth of other sectors (in this case, non-mining sectors). It puts into doubt the social equity or interregional solidarity. It would seem common sense to distribute the benefits of exploitation of natural resources among different regions of a country; however, this investigation indicates that such a distribution would have its objections. Meanwhile, the boom regions suffer from intersectoral economic imbalances in addition to environmental damage. Sovacool (2014). Requiring the situation developmental efforts, planning with attention, among other things, urban provisions that meet mining needs, smaller space needs for manufacturing activity, and/or additional actions for the promotion of manufacturing economic activity.

This article explores the situation of Peruvian regions from 2001-2015. That country traditionally has had a strong primary-export tradition. However, literature in subnational level is not available. Although subnational RDd studies or linked issues have been treated for developed and developing countries as Australia, U.S.A. China, and some African countries in LatinAmerica is inexistent in practice.

2. Theoretical Overview

In regional economics and development analysis there is a debate between scholars focusing on inequalities and scholars focusing on the convergence process. The first follow the theorists of the location of economic activities. The second follow the framework of convergence derived from neoclassical models of growth and developed. Since the convergence theory it was deduced that given a long-term equilibrium there will also be convergence. At same time both trends argue that the study of regional development is validated by the unequal distribution of resources in the space and territory of countries. The clearest example is punctual natural resources⁵. These regional inequalities generate market failures. In the same way, the theory of location explains the constant tension between the forces of economies of scale and agglomeration, the transport costs of the markets of inputs and demand of companies (Thisse, 2011, p. 10-11). Apart from multiple works that relate economic performance with the primacy of the mining sector in a certain economy, we consider it appropriate to review those fields that have dealt with regional development, whether implicitly or explicitly. Such fields are actually denominations for the same concerns: space economy, economic geography, and regional development.

The theorists of space economics highlight the issue of localization of economic activities, whether agricultural, commercial, and/or industrial, as well as urban-regional problems like polycentrism, monocentrism, and city system versus urban

⁵ Auty (2001) describes punctual natural resources as diffuse natural resources scattered throughout the territory that are specifically localized (which includes minerals).

macrocephaly. Additionally, transportation is a factor that generates inequalities between regions; it impacts the costs of economic activities and growth rates, especially in countries without maritime coasts. Maritime transport is cheaper than land and air transport (Limão & Venables, 2001). Thus, transport is configured as a location factor and helps determine the appearance of different central places.

This opens a discussion about the incentives of firms in where to locate themselves. Firms from non-mining sectors would seek to balance the ease of production flow to their buyer's markets with the ease of access to their inputs. This is especially important for countries and regions with low purchasing capacity in which a large part of their production is destined for export to obtain foreign currency, even when in order to finance development programs. This leaves regions without ports at a disadvantage, as it would imply additional transport costs⁶.

New Economic Geography (NEG) explain the different agglomerations and spatial configurations of economic activities at different geographical levels. (Fujita & Krugman, 2004). The NEG notion of a *snowball effect* explains that agglomeration forces reinforce concentration (Krugman, 1991, p. 486). In essence, the one who has more will be given more in terms of growth. Since a region has an industrial economic base, it will tend to continue attracting or at least retaining economic activities, even in scenarios in which the initial comparative advantages for the appearance of an industry have disappeared.

RDd appearing in a national context with previous national concentration of the manufacturing and that determine the negative effect of the regional NR boom. That was linked by Reina-Bermudez, Alejo-Barrera & Devia (2018) to five different approaches to regional sectoral changes relating to natural resources and economic performance: i) Big push, ii) Dutch disease, iii) staple trap, iv) the appropriation of the rents of the natural resource, and v) the curse of natural resources. The first two approaches describe phenomena that can happen independently of institutions, by natural economic dynamics. The third is growth tied to a product or sector and may well be a consequence of scarce economic opportunities (as in the case of some islands) or of institutional conditions averse to competition and innovation. The last two approaches imply a sequence after Dutch disease, which, given a high level of appropriation of natural resources by rent seekers, causes the curse of natural resources (Reina-Bermúdez et al., 2018, p. 130). In this paper is being proposed an extra explanation derived from the equilibrate growth into the historical overview.

The Dutch disease, is perceived only if there is a free exchange rate, its symptoms are: i) appreciation of the local currency, ii) increase of non-tradable economic sectors such as localized services and building, iii) decrease in the tradable sector, especially manufacturing, and iv) decrease in manufacturing exports. (Stijns, 2003).

The first and fourth symptoms are on one side of the spectrum and according to

⁶ Regions without ports are affected in two ways: First, export activities assume part of the costs of international ports, indicating a price perceived by the lowest producers to be able to compete. Second, imports of consumer goods and capital goods are more expensive. MacKellar, Wörz, and Wörgötter (2000).

Stijns (2003), are clear theoretically and empirically. On the other hand, symptoms two and three depend on the net effect on demand caused by the booming sector. Thus, in relation to the second symptom, the economic activities of non-tradable products are positively affected by the increase in domestic demand generated by the booming sector. However, they are negatively affected by a possible drop in exports due to the domino effect that causes a decrease in production of and employment in export products. In relation to the third symptom, an appreciated local currency narrows and even nullifies the profit margins of the product destined for export; on the other hand, the booming sector positively affects the increase in domestic demand.

Symptom four is considered a direct effect of the Dutch disease. Inasmuch, symptoms two and three are considered indirect effects produced in the medium term by rearrangement of investments in search of activities with greater profitability, happening in both sectors tradable and non-tradable. For that reason, some subnational studies can't be considered as RDd studies because were done for analyzing subnational changes in countries enough diversified and most important: without appreciation currency process caused by a NR boom and export of themselves. See for example: (Freeman, 2009), (Weber, 2012), (Brown, 2014), (Weinstein, 2014), (James, A. & James, R., 2011).

In growth tied to a product or sector, *staple trap*, it is natural that certain economies limited to a small territory present this configuration of primacy, and is typically seen in the service sector and tourism. The interesting thing about growth tied to a product or sector is that in some economic systems it is the product of an institutional framework prone to waste, the low capacity of fiscal collection by the state, and protectionist programs that favor business elites that are not very innovative and unable to compete internationally (Auty, 2017). This happens especially in countries rich in natural resources where the efforts of the elites are directed more to take advantage of high levels of appropriability of natural resources than to expand innovation. That situation blocks the society to establish developmental states with clear rules that help maintain growth rates, equal rights, and low economic inequality. Auty (2001)

The greater degrees of appropriability, in coexistence with disrespect of law, would unleash the curse of natural resources, understood as low growth and long-term development (Willebald, 2011, p.88; Mehlun et al., 2006; Van Der Ploeg, 2007). For Boschini, Pettersson, and Roine (2007) appropriability is the possibility of collecting income derived from NRs. Those appropriability levels are the connection between strong Dutch disease, a weak case of staple trap, that can also make it appear in the long- term the curse of natural resources -CNR-, which Gelb (1988) and Auty (1993) thought and Sach and Warner (1995 and others after) have demonstrated or controverted.

Appropriability can stall economic development in two ways. The first way is the fiscal laziness, (Auty, 2001) and/or adverse preference for rising taxes by State. The second way in which the degree of appropriability compromises development is corruption, that is, the ease of diverting such resources to private hands (Gylfason, 2000). For Willebald (2011) the level of appropriability tends to be higher in countries rich in natural resources and which depends on the institutional

context. In addition, the level of appropriability depends on the type of natural resource. (see Footnote 3). As Willebald (2011) notes, “Point resources” generate greater opportunities for rent-seeking and corruption and the negative effects on economic growth are more severe” (p. 88).

There are six explanations for the curse of generation of minerals (Frankel, 2012). The first two explanations are linked to the prices of minerals, since the long-term trend is the reduction of the terms of trade accompanied by high volatility of mineral markets. The third explanation, which for the researchers authors of this paper is a symptom, is the permanent increase of non-manufacturing sectors, which is reinforced in cycles coinciding with periods of Dutch disease caused by booms that occur over time (the latter is Explanation six).

Explanations four and five have to do with institutions, since the concentration of power and inherent oligarchical or dictatorial institutions increase appropriability (Explanation four), as well as anarchic institutions in the sense of being disrespected, deceived, or constantly changed by instability, policy, and internal conflict (Explanation 5).

The previous national explanations can translate into subnational region as follow: if a subnational region has a NR boom and that cause a significant rise of mining exports, the exchange rate could rise and affect others sectors as Dutch disease describes into the region, but in other non-boom regions, too. Additionally, the effects depend of the previous national economic concentration and the national labor division, which is function of the cost of transport and of the historical process of location of economic activities.

3. Peruvian Legal Context of Mining and Oil Exploitation

The government of Fujimori (1990 – 2000) promoted the foreign investment in the mining sector through the Promotion Act of the Mining Sector by Legislative Decree No. 708. After the creation of Law 708 (Peru, 1991), standards for environmental protection, industrial safety, and the health of workers have been implemented (Tamayo, Salvador, Vásquez, and V. Zurita, 2017). The participation of local, regional, and public university participation in mineral sector was called “*canon*”, and was in place from 1996 through a Supreme Decree (Supreme Decree No. 88-95-EF) until June 2002. During this period, 20% of corporate income tax was earmarked for the use of natural resources, such as minerals, hydrocarbons, hydropower, fishing, and forestry, receiving the national-state only. In 2002, with Law No. 27506, the percentage of the *canon* was changed to 50% for distribution in the regions and areas of exploitation of said resources (Arellano, 2008).

In oil *canon* case, a special distribution was established according to legislation of sub-national governments where the exploitation of the resource is found. The oil *canon* and surcharge is constituted of 12.5% of the production value obtained by the state for the exploitation of oil, associated natural gas, and condensates; the departments that enjoy the payment of the royalties derived from their exploitation are Loreto, Ucayali, Piura, Tumbes, and the province of Puerto Inca in Huánuco (with 10%). This is, the legal framework of regulated distribution is different for each department, for each region.

4. Methods and empirical evidence

4.1. Methods

In order to analyze the regional effects of Dutch disease created by the boom of natural resources in Peru. It paper is outlines the trends in the sectoral structures changes of subnational regions with NR booms. Empirical RDd evidence from the period 2001-2015 was treated with descriptive techniques and cartograms. As others, like Reina et al. (2018) the identification and diagnosis of the phenomenon at the national level was made with data obtained from the Central Reserve Bank of Peru (BCRP).

Then, for the analysis of intersectoral effects in Peruvian regions, the national accounts by department and sector will be used at constant prices for 2009 for the study years 2001 to 2015, as reported by the National Institute of Statistics and Informatics (INEI). Both for the departments and regions, was analyzed five sectors: Agricultural; Mining, Manufacturing; Building; and Services. (for details see the online annexed).

Additionally, Relative Rates of Sectoral participation in regional product (RRS) was calculated and complemented with annual geometric regional and sectoral growth rate (RSG) for the study period. For macroregions we used five regions that have been used by the Peruvian Institute of Economics (IPE): North, Center, Lima, South, and East.

4.2. Empirical Evidence of Regional Dutch Disease Effects

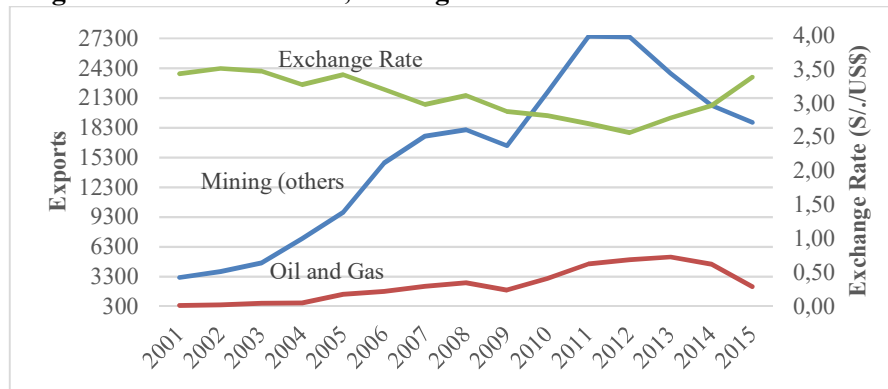
The graph below shows a relationship between the growth of mining and oil exports with the appreciation of the *Nuevo Sol* (Peruvian currency) in relation to the international dollar. Mining and hidrocarbons stand out as important activities that generate foreign currency, and therefore important for the development of the country (Key & Kuramoto, 2007).

In fact, mining and hydrocarbons exports represent 64.39% of total exports on average between 2001 and 2015. This growth in mining sector, according to IPE (2015), was due to the high prices of mineral prices including copper, gold, zinc and silver. The export of mining products explained the large increase in the export index (INEI, 2016).

The fall in mining exports in 2011 is probably linked to Chinese economy changes (Osinerming, 2016). This has influenced the value of mining exports, since 2008, as seen in the chart. Exports of hydrocarbons and minerals were thus influenced by the international financial crisis. The various explanations for the fall in the prices of mining goods are reflected later with the decline of mining and hydrocarbon exports value, which coincide with increases in the price of the dollar in terms of the local currency.

The average annual growth of the GDP of 4.3% was mainly due to the mining resources in the 2001-2005 period, and that sector relief the drop in private investment (Olarde, 2007).

One criticism is that although the mining sector has been important in the Peruvian economy, the transfer of wealth to local governments has not meant an increase in economic development due to populism.

Figure 1. Evolution TRM, Mining and Petroleum Sector

Source: By authors with statistics from IPE and BCRP (2017). Exports in millions of US\$.

There is evidence that resources have been allocated to populist spending, including social policies (in the sense of social aid) and salaries of officials (Maldonado, 2011). Has been noted that governments have not been democratic in the use of wealth generated by mining activities. (Kahhat, 2012)

In the period 2006-2010 the Peruvian economy had an average annual growth of 6.9%, thanks to the growth of domestic demand. In addition, investments grew in the mining sector with the implementation and expansion of processing plants, such as the projects at Cerro Verde, Buenaventura, and Southern, the investments of Yanacocha, Shougang, and Milpo, and hydrocarbons investments in Odebrecht Peru and the Camisea II project (INEI, 2016).

Despite the growth, the mining sector has presented negative effects in environmental, social, and political aspects. This has generated social protests that paralyzed, approximately, 15 projects since 2008 to 2015 in Northern Sierra region departamentos of Cajamarca and La Libertad, and the South in departamentos of Ayacucho, Apurímac, Arequipa, Puno, Moquegua, and Tacna (IPE, 2015). In fact, the number of social conflicts increased still to 139 in 2014 (Chirinos, 2015).

According to IPE (2015), rejection by local actors has generated losses in the sector of 21.5 million dollars in investments, in addition to a negative balance of taxes of 24.6 million dollars due to the Peruvian State. For Glave and Kuramoto (2007), these social conflicts are due to many issues, including fear of water pollution (60%), fear of land pollution (15%), air pollution (11%), the alternative use of resources (related to that production affects the performance of other activities), anger about not consulting the population in prior consultations (6%), and fear of possible accidents (2%).

Well, once the first effect of the Dd. was demonstrated, is possible began to analyze the effects in the sectors regionally. In the first place, the North, Central, and South regions had significant booms in the mining sector that are reflected in the largest mining RRS and that was not due to contractions of some sectors but to higher growth rates in this sector. The RSG of the mining and hydrocarbon sector was 15.43%, 15.47%, and 21.2% in North, Central, and South regions respectively, higher rates compared to annual growth rates of the regional

product of 12.74%, 13.09%, and 14.31% in the same regions.

In those regions where the mining boom was more pronounced, the participation of the mining sector in total regional production grew as follows: from 10.63% to 14.78% in the northern region, from 13.62% to 18.24% in the central region, and from 7.95% to 18.03% in the southern region. None more than 20%.

This creates effects in the other economic sectors that we analyze in search of a description that illustrates about sectoral and regional effects of booms in natural resources with or without signs of Dutch disease such as growths of urban sprawl, changes in urban-regional and urban-national structures, and/or environmental conflicts.

With respect to the agricultural sector there is a generalized loss showed by RRS as can be seen in Figure 2. In all regions except the East or '*Oriente*' region the agricultural RSG was lower than the annual geometric growth rate of the total regional product. This could be because the prices of some merchandise have changed or for the direct and indirect effects of the Dutch disease.

Regarding the manufacturing sector, there is a general decline in the RSS. Being that initially three of the five regions had participation around 16.5% (2001: North, Lima, and South) and the other two were in the range of 8% to 13%. Subsequently, with the exception of Lima, none region managed to have a manufacturing sector that surpassed 13% of its regional GDP. Compared to the other sectors, manufacturing had the lowest RSG with the Lima exception. This is, in South, East, North and Central regions the manufacturing sector have had lower RSG than other sectors. This situation is half-adjusted to the third symptom that Stijns (2003) developed because there is not an absolute decline in the manufacturing sector, but a relative decline.

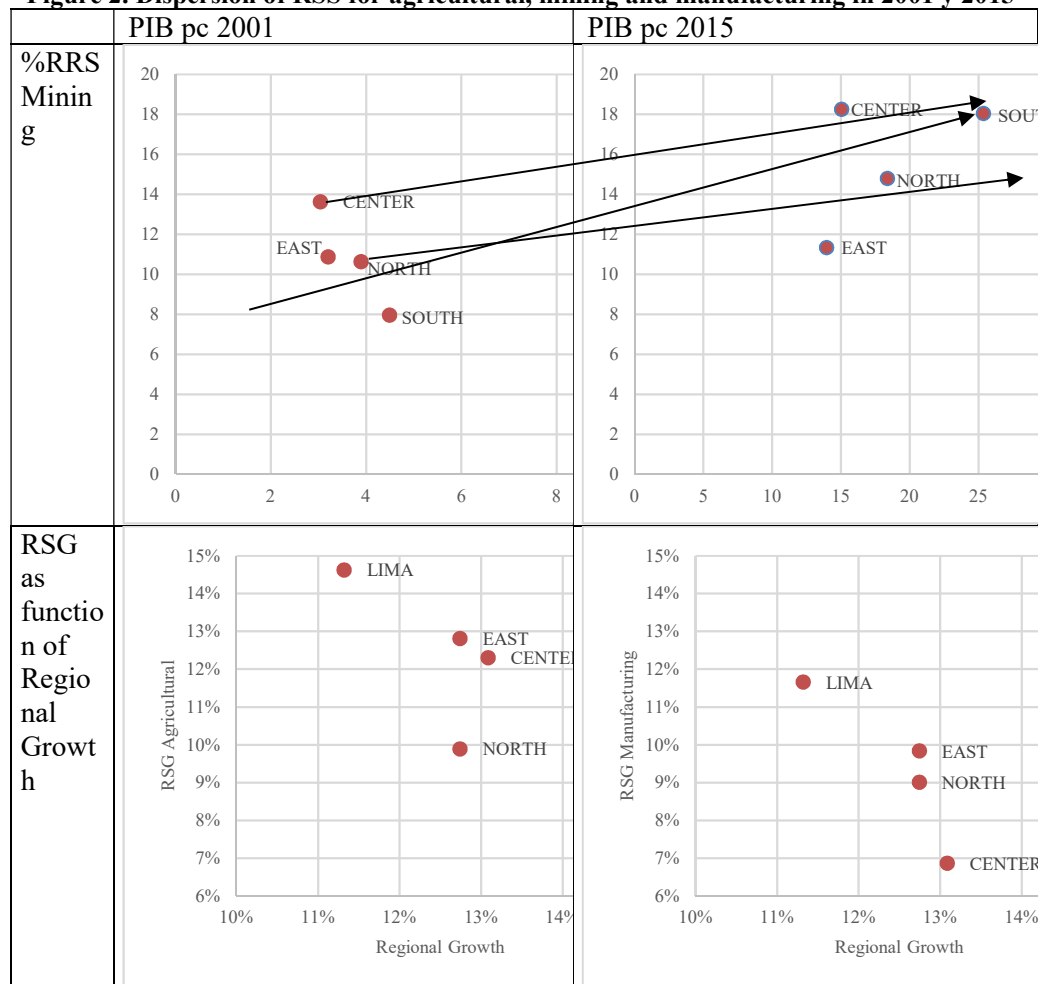
Was observed the greater growth of the mining sector with respect to the other sectors in three of the five regions: North, Center, and South. In the two remaining regions it was the second most dynamic sector in the analyzed period and in absolutely all regions the mining sector grew more than the regional GDP.

In the South region, the energy mining sector increased its relative share in regional production from 7.95% to 18.03%. This implied a decrease in the relative share of the manufacturing product from 16.44% to 11.4%. The growth of the manufacturing sector was only 9.83%, five percent below the regional growth of 14.31%. Some hypothetical links maybe include the increase in mining production in the *northern* region of 10.63% to 14.78% associated to a relative decline in manufacturing output of 16.79% to 10.47%. In the *Center* region, was experienced an absolute and relative "mining" production growth that presents a similar process in the mining RRS from 13.62% to 18.24% while decreasing its manufacturing sector from 9.5% to 4.31%. The annual growth of manufacturing at 6.86% was just a little above half the annual growth in the region, 13.09%.

It should be noted that, although the growth of the mining sector in Lima was significant in percentage terms, and in fact exceeded the growth of regional output in the period, its involvement in the regional product is very small, which

leads us to think the idea of a combination of situations that affect NR booms in tradable sectors within the framework of Dutch disease (see Graph 3) is happening in Lima. First, a size of mining sector, in a level X , for example, might generate Dutch disease. Second, we will have to consider the size of the growth of the mining sector in the region and the country.

Figure 2. Dispersion of RSS for agricultural, mining and manufacturing in 2001 y 2015

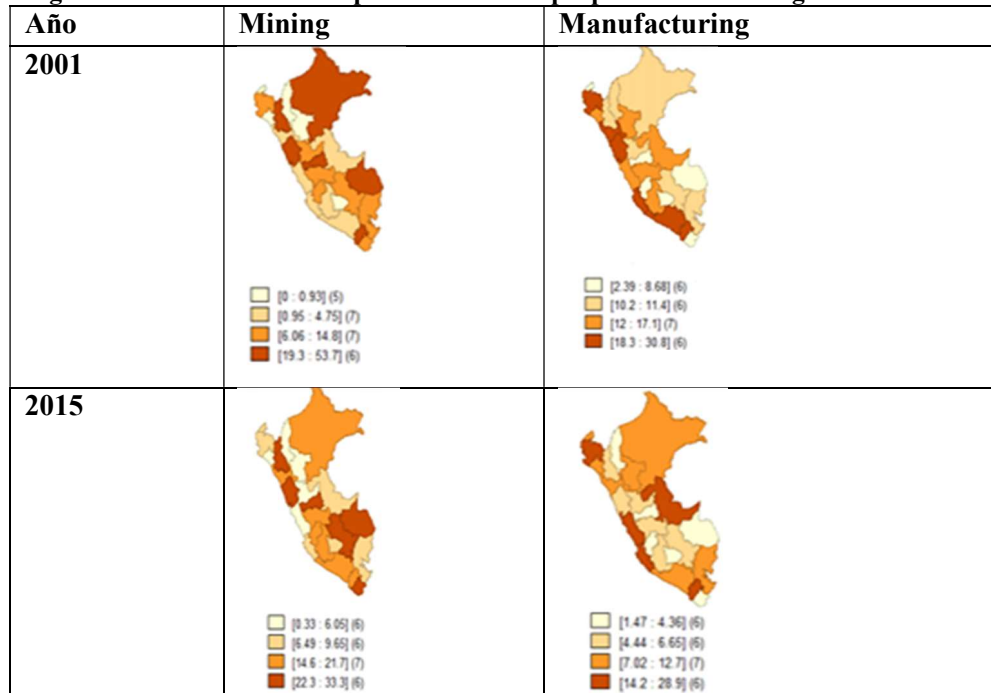


By authors based in INE and BCR statistics. PIB *per capita* in thousands of *Nuevos Soles* (constant prices 2009).

Regarding the non-tradable sector of building, Figure 2 (previous page) shows a generalized movement of increases in the participation of this sector in regional economies, as indicated by symptom two of Dutch disease (Stijns, 2003). In all regions, the sector grew at a higher annual rate than the annual regional growth rate (see Table with RSG by sector). As a result, the average participation of the sector in the five regions increased, from 5.64% (2001) to 6.83% (2015). Finally, the services sector presents contradictory behavior because in some boom regions it grew while in other regions it decreased.

The mining sector is an important source within the economies of the departments of Cajamarca, Ancash, Pasco, and Madre de Dios. For Cajamarca, the sector represents 22.27% of GDP, according to the BCRP (2015). Between January and December of 2015, the sector contracted, mainly due to the low extraction of gold, copper, and silver. Pasco's economy, a department located in the southern region, is dependent on the mining sector like zinc, which according to the BCRP (2015) accounted for 45% of the sector. According to BCRP, mining exports play an important role in the department's economy; in December 2015 they accounted for 45.6% of traditional exports. The region Madre de Dios also has economic dependency in the mining sector, especially in the production of gold, which can be shown at a growth of 21.48% of GVA, according to our analysis.

Figure 3 Relative Rates of departmental GDP proportion for Mining and Manufacturing



In 2015, the departments of Piura, Ucayali, Lima, and Moquegua were highlighted by the participation of the manufacturing sector. In the case of Piura, fishing (processing) and oil refining are important. The region of Ucayali is represented in its greater proportion to non- primary manufacturing such as malted beverages (62.9%) and sawn wood (8.8%), among others, which represent a percentage structure of 78.9%. In terms of primary manufacturing, the refining of oil is 21.1%. In the Moquegua region, primary manufacturing is in blister copper (57.5%) and copper cathodes (40.2%).

The departments of Tumbes, Lambayeque, Loreto, Ucayali, and Lima have greater dependencies in the services sector. In the case of the department of Ucayali, this is related to the greater number of tourists.

Figure 3 and the analysis made indicate that the growth process of the last two decades in Peru has consolidated a center-periphery scheme, where the center (Lima and Callao) disproportionately appropriates the benefits of growth to the detriment of the periphery (the rest of the country) (Schuldt, 2004) Gonzales de Olarte, 2000).

5. Conclusions

Possibly given that the mining phenomenon is so distributed in Peru, the interregional effects were less marked than in the Colombian case that is for now the comparative study. In Colombia, the department that most came to have a mining share exceeded 60% and focused mainly on oil. On the contrary, the mining and energy boom in Peru is based on several minerals, so the effect of Dutch disease with regional accent was lower and nevertheless the national data do show evidence of such phenomenon as shown in Figure 1.

As Reina et al. (2018) pointed out at the regional level, it can be observed that the growth rates of the manufacturing and industrial sectors are lower in those departments that are being boom. This would indicate that despite the global-national nature of the phenomenon of Dutch disease, this affects in a different way the economic regional structure.

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