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FDI and trade: is China relevant for the future of our environment? The case of Argentina

WORKING GROUP ON DEVELOPMENT AND THE ENVIRONMENT IN THE AMERICAS

Julian Donaubauer[1], Andrés López[2] and Daniela Ramos[3]

As in many other Latin American countries, China's economic presence in Argentina has become very significant over the past decade. Most significantly, China has become the main export destination for Argentina's soy products. Increasingly, Argentina is also becoming a strategic location for Chinese firms to invest in oil and gas.

After providing an overview of these trends, this paper examines the social and environmental ramifications of Chinese economic engagement in Argentina in two ways. First is an aggregate statistical analysis of the greenhouse gas and water intensity of Chinese economic activity in Argentina. Second is a field-based case study of the performance of Chinese firms in Argentina's oil and gas sector.

In terms of greenhouse gas emissions we find that China is the only major export destination for which emissions intensity is growing and total emissions to China rank second (to Brazil) in terms of trade-based emission from Argentina. In terms of China's water footprint in Argentina, we find that by 2012 China had the second largest water footprint (to Spain) in 2012, due to the concentration of Chinese imports from Argentina's water-intensive soy sector.

Our case study on Chinese investment is also revealing. Of course it must be acknowledged that oil extraction in Argentina (indeed anywhere) is endemically

[1] Helmut Schmidt University Hamburg
[2] CENIT/UNTREF.
[3] CENIT/UNTREF.

environmentally degrading. Moreover, due to the fact that Chinese investment in Argentina's oil sector is in the form of mergers and acquisitions (M&As) it is difficult to assign responsibility to environmental damage and liability because environmental damage could be a function of previous ownership. Nevertheless, we find that Chinese firms have been assigned blame for increasing amounts of environmental damage, though they may not be responsible for such damage.

Our fieldwork gives some indication that Chinese firms tend to be more environmentally responsible when in a merger with a western firm. For example, CNOOC partners with British Petroleum, which has the capabilities to adhere to stricter environmental standards and is under intense scrutiny for its overseas operations by global governments and non-governmental organizations (NGOs). Our interviews also indicate that Chinese firms have tended to respond when civil society and provincial governments apply pressure. However, we also find that there is an institutional mismatch between the federal and provincial governments with respect to the incentives and capacities on the environmental regulation of foreign firms. Provincial governments and civil societies have sought to respond to local water issues around Chinese firms, but have lacked institutional and political support from national authorities.

Chinese activity is not necessarily categorically more environmentally degrading within a sector than other domestic or foreign counterparts. That said, as Chinese demand continues to grow in the soy and energy sectors, Argentine authorities will need to strengthen efforts to maximize the benefits and mitigate the environmental risk stemming from economic activity in these sectors. More specific policies might be to:

- Foster 'learning' among firms with stronger environmental capabilities with their Chinese counterparts to speed the environmental learning curve.
- Better align national and provincial efforts at environmental policy in the extractive sector.

- Encourage all foreign firms, including Chinese, to engage with EITI and other mechanisms for transparency and accountability
- Generally upgrade social and environmental policy, particularly in the extractive sector.

1. Introduction

The emergence of China as a global economic power has had strong impacts on most countries and regions worldwide. Latin America and Argentina have been no exception. In a few years China became Argentina's second most important trading partner, behind Brazil. Argentina's trade with China is based on a clear pattern: Argentina exports natural resource-based products (mainly soybeans and soybean oil), while China exports manufactured goods to Argentina. This is the 'standard pattern' of bilateral trade relations with China for all Latin American countries.

In turn, China's investments in Argentina have been growing significantly in recent years, although the country is still far from being one of the major investors in the country. The lag of foreign investment relations vis–à-vis trade is not surprising as undertaking foreign direct investment (FDI) operations requires more experience, internal capabilities, and knowledge of potential host countries.

The growing relevance of China as a trade and investment partner of Argentina has generated a number of concerns, including: a) domestic firms complain that their home and global market share is threatened by China, sometimes going so far as to accuse China as deploying unfair trade practices; b) employees of those industries are in danger of losing their jobs; c) environmental and social movements warn about the possible abuses of Chinese firms in light of China's weak domestic legislation in those areas and the antecedents of poor environmental and labor standards applied by Chinese firms when they invest abroad; d) as many Chinese firms investing abroad are State-owned, fears in the political arena emerge, mainly related to sovereignty issues; e) as bilateral trade and FDI with China are strongly concentrated in natural resources, concern about

the sustainable use of those resources and the environmental impacts of their exploitation have emerged.

This study focuses mainly on the environmental impacts of Argentina's trade and FDI relations with China. The next section briefly describes the main trends associated with those relations. Section 3 analyses the environmental impacts of exports to China. Section 4 deals with the case of Chinese FDI in the oil industry. Section 5 concludes.

Before proceeding with the rest of the paper some caveats are needed. First, there are still very few Chinese firms in Argentina and their presence is very recent. Hence, this is an incipient phenomenon and great caution must be used in comparing the behavior of Chinese firms with FDI from traditional investor countries whose multinationals have been in the region for a long time—those from Europe, the United States, and from other Latin American countries. Second, there is evidence of a wide difference between actual and officially recorded flows of Chinese FDI, so caution should be used in any analysis of Chinese FDI.

Third, Argentina's exports have always been strongly related to its natural resources endowment. Chinese demand is indisputably the leading factor behind the commodity prices boom, but Argentina is a traditional agricultural producer and exporter, and the oil industry in Argentina dates from more than 100 hundred years ago. Soybean and petroleum production in Argentina, as well as concerns about their environmental impacts, started prior to the emergence of China as a global power.

Fourth, although agriculture and oil sectors often have serious environmental impacts, the technology employed by soy, soybean oil, and petroleum producers does not differ depending on whether the buyers are Chinese. Although in the case of petroleum it could be the case that different firms differ in their technologies and environmental management systems, as explained below in more detail this information is not available in the case of Argentina. While Chinese firms are often reluctant to give information on their activities, environmental NGOs criticize all oil firms operating in Argentina with more or

less the same determination.

2. Bilateral trade and investment flows

Bilateral trade between Argentina and China has been growing quickly in recent years (Table 1). China's share in Argentine exports increased from 1.4 to 6.4% between 1995 and 2012, having peaked at 9.2% in 2007. Currently, China is tied with Chile as the second-largest buyer of Argentina's exports (Brazil is first). The fall in China's share in recent years is related to the reduction in soybean oil exports. In 2009 45% of Argentina's exports of soybean oil went to China (USD 1,440 million), but afterwards exports to China fell dramatically (USD 255 million in 2010), to later recover but without reaching the 2009 levels (USD 853 million in 2012, less than 20% of total Argentina's exports of soybean oil) –more on this below.[4]

Table 1. China's relevance as trade partner of Argentina (1995-2012)

Year	Exports to China		Imports from China	
	Share	Rank	Share	Rank
1995	1.4%	17th	3.0%	8th
1996	2.6%	9th	2.9%	8th
1997	3.3%	5th	3.3%	8th
1998	2.6%	8th	3.7%	8th
1999	2.2%	11th	3.9%	8th
2000	3.0%	6th	4.6%	4th
2001	4.2%	4th	5.2%	3th
2002	4.3%	5th	3.7%	4th
2003	8.3%	4th	5.2%	4th
2004	7.6%	4th	6.2%	3th
2005	7.9%	4th	7.8%	3th
2006	7.5%	4th	9.1%	3th
2007	9.2%	2th	11.4%	3th
2008	9.1%	2th	12.4%	2th
2009	6.6%	3th	12.4%	3th
2010	8.5%	2th	13.5%	2th
2011	7.4%	2th	14.3%	2th
2012	6.4%	2th	14.6%	2th

Source: Authors' calculations using INDEC (National Institute of Statistics and Census) data.

[4] This fall reflects two causes. First, China reduced imports of soybean oil as a consequence of increased domestic crushing capacity. Second, Argentina lost market share in the Chinese market: Chinese imports fell from USD 3,300 million in 2008 to USD 1,300 million in 2013, but Argentina's share in those imports fell from 67 to 55% in that period.

Argentina's exports to China are strongly concentrated in a handful of natural resource related products. Just five products represented 89% of Argentina's exports to China in 2012 and 20 products (at six-digit level of the trade harmonized system classification) amounted to 95%. In 2012 Argentina sold 407 different products to China, in contrast with 1,465 products sold to the United States and 1,712 to the European Union (CEPAL, 2013). However, it is important to note that this is a common trend for almost all South American countries, Brazil being the only case with a higher diversification.

Natural resources value chains are much more relevant in exports to China than in total Argentinian exports (97% compared to 66% in 2012 – see Table 2 for details). Soybeans accounted for 56.2% of Argentina's exports in to China 2012, while soybean oil and crude oil's share reached 13.4% and 15%, respectively. Other natural resource-related exports include tobacco, leather, poultry, wool, wine, groundnut oil, barley, whey, mollusks and to a lesser extent minerals.

Table 2. Composition of Argentina's exports (2012)

	Exports to the World	Exports to China
Primary goods	24%	57%
Agricultural based manufactures	34%	29%
Industrial based manufactures	34%	3%
Petroleum, energy and gas	8%	11%
Total exports	*100%*	*100%*

Source: Authors' calculations using INDEC data.

As an origin of imports, in 2012 China ranked second (as in the case of exports, Brazil ranked first). China's share in Argentina's imports went from 3.0% in 1995 to 14.6% in 2012 (see Table 1). China's exports to Argentina are almost totally composed of industrial goods. Moreover, the composition of those exports has been gaining diversification and complexity during the last two decades, following the trends in Chinese exports to the world (and the transformation of the Chinese economy). Hence, while in 1995 China's exports to Argentina consisted mainly of consumer goods, currently China is a key provider of capital goods and intermediate inputs (e.g. petrochemicals, chemicals, steel, etc.); in both cases China's share in total Argentina's imports went from less than 2% in 1995 to around 22% in 2012 (see Table 3).

Table 3. China's share in Argentina's imports (2012)

	1995	2000	2007	2012
Capital goods	1.9%	4.3%	15.6%	21.8%
Intermediate inputs	1.7%	2.6%	9.1%	22.5%
Parts and accessories for capital goods	1.0%	2.8%	9.9%	11.6%
Consumer goods	11.6%	11.9%	24.1%	24.7%
Others	0.1%	1.0%	0.6%	0.3%
All exports	3.0%	4.6%	11.4%	14.6%

Source: Authors' calculations based on INDEC data.

As a result of this divergence between exports and imports, Argentina has developed a growing trade deficit with China (see Table 4). In this context, Argentina has adopted various protectionist measures, which were met with similar Chinese initiatives. For example, in 2010 China suspended imports of Argentina's soybean oil during several months and while later on the ban was lifted Argentina's presence in the Chinese market never regained the previous levels.

Table 4. Bilateral trade between Argentina and China (1990-2012)

Period	Annual average value (USD million)			Annual growth rate	
	Exports	Imports	Balance	Exports	Imports
1990-1994	201	412	-211	-1.7%	119.1%
1995-1999	591	894	-303	15.5%	13.0%
2000-2004	1,625	935	690	34.8%	4.9%
2005-2009	4,372	4,476	-104	3.5%	21.2%
2010-2012	5,679	9,417	-3,738	-3.6%	7.0%

Source: Authors' calculations using INDEC data.

In contrast to the relevance of bilateral trade, FDI flows (when measured by official investment statistics) are very low. According to Argentina's Central Bank (BCRA), Chinese FDI in Argentina reached around USD 500 million between 2005 and 2012, barely 0.7% of all FDI inflows to Argentina in that period, although Chinese FDI has been growing tremendously in that period and recorded an acceleration in 2010-2012 (see Table 5).

Table 5. China compared with the five main origins of FDI inflows to Argentina (2004-2012, FDI stock and flows in USD billions)

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	Growth in FDI stock (2004-2012)
Stocks:										
Spain	17.0	18.9	21.1	23.1	23.1	22.6	23.2	22.6	20.2	19%
United States	10.3	11.7	12.2	13.9	14.1	14.4	15.2	16.8	19.4	89%
Netherlands	4.2	5.2	5.3	5.7	6.7	6.9	7.0	7.3	9.6	129%
Brazil	1.8	2.5	2.8	3.7	5.0	4.3	5.4	6.8	7.0	250%
Chile	2.0	2.7	3.1	3.6	4.2	4.4	5.5	6.7	6.8	282%
China	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.6	4,439%
TOTAL	56.9	63.0	69.1	78.3	81.4	80.9	88.7	96.1	102.3	79%
China (Flows, - USD million)		-2.8	30.7	39.5	26.4	0.0	100.5	38.3	274.4	

Source: Central Bank of Argentina (BCRA). Note: China FDI inflows USD million

As is well known, to a large extent Chinese FDI goes to Hong Kong, Macau, Taiwan and other tax havens and offshore financial centers. However, if we include Chinese FDI made through these countries (again on the basis of BCRA estimations) China's share remains approximately at the same level (0.7%) of total FDI arrived at Argentina between 2005 and 2012.

Taking into consideration this pattern of Chinese FDI outflows, Chen and Pérez Ludeña (2013) have re-estimated the destinations of those outflows. Their results suggest that actual Chinese FDI in Argentina is considerably higher than that reported in official statistics. Chen and Pérez Ludeña's estimates confirm that until 2009 Chinese investments in Argentina were very low (just USD 143 million between 1990 and that year). However, the authors, using press reports regarding two large Chinese takeovers in Argentina's petroleum industry (including the purchase of 50% of local oil firm Bridas by CNOOC, China National Offshore Oil Corporation, and the purchase of the Argentine assets of Occidental Petroleum by Sinopec, China Petroleum and Chemical Corporation) estimate that in 2010 and 2011 Chinese FDI in Argentina reached USD 3.1 and 2.45 billion, respectively. In fact, due to these large investments, Argentina was the second to Brazil as a destination of Chinese FDI in Latin America. In contrast, estimations by Yue (2013) –based on MOFCOM data- suggest that Argentina ranked fifth in Latin America in terms of Chinese FDI stock (2010 data), also behind Peru, Venezuela and Panama.

However, even when Chen and Pérez Ludeña's estimations are taken into account, Chinese FDI in Argentina is well below the bombastic figures announced at different times both officially as well as through the media. At present, there are only a dozen Chinese firms in Argentina, mostly with commercial offices only. To this, we may add the peculiar phenomenon of the Chinese supermarkets, which have gained a widespread presence in Buenos Aires and other Argentinean cities in recent years.

According to official figures, and in great contrast with the case of trade, Chinese investments in Argentina are less concentrated in natural resources than total FDI in the country (see Table 6). In 2012, according to official BCRA figures, mining accounted for 11% of Chinese FDI stock in the country –the main Chinese investor in this sector is China Metallurgical Group Corporation- and petroleum for another 13% -the already mentioned cases of Sinopec and CNOOC, although a huge difference exists between the official figures of Chinese FDI in this sector and the abovementioned figures reported in the media related to Sinopec and CNOOC investments in Argentina. Although no official data on Chinese investments in agriculture exist, on the basis of media information we know that various Chinese firms such as Noble Grain and Chongqing Grain Group have been buying land and investing in grains trade in Argentina.[5] In 2012, 30% of total FDI in Argentina in 2012 was concentrated in the natural resource-related sectors of oil, mining and grains, while China's corresponding FDI figure was 25%. The bulk of Chinese FDI was in banking (more than 50%, reflecting the acquisition in 2012 of the Standard Bank by the ICBC) and the other relevant sectors were industry (9%, concentrated in assembly operations in the electronic industry in Tierra del Fuego island,[6] such as those by Huawei, TCL and Ambassador Fueguina), and commerce (9%, including the above-mentioned Chinese supermarkets).

[5] In 2012 a law was passed limiting the acquisitions of lands by foreign owners, which led to the cancellation of some Chinese projects in this sector.

[6] A special regime promoting the manufacturing of electronic products in Tierra del Fuego was enacted some years ago, fostering investments, but without generating any significant linkage with the local economy (beyond employment generation) –since all components except those related to packaging are imported-and totally oriented to providing the domestic market.

If we turn now to Chen and Pérez Ludeña's estimations, although they do not disaggregate their figures by sector, we may infer that the concentration of Chinese FDI in natural resources is much higher than that suggested by the official data, considering that the bulk of Chinese investments in Argentina according to the authors' figures is associated with the above-mentioned takeovers by CNOOC and Sinopec. These purchases highlight the dominant presence of state-owned firms (SOEs) in Chinese FDI, especially in strategic industries such as oil –more on this below (Dussel Peters, 2013).

Table 6. China's investment pattern compared to the main origins of FDI inflows in Argentina (2012, FDI stock in USD million)

	Spain	United States	Netherlands	Brazil	Chile	China
	Millions of USD					
Petroleum	2,392	6,345	1,239	248	67	76
Manufacturing	5,599	4,946	2,515	1,499	3,451	53
Banking	1,838	1,050	1,123	0	702	308
Commerce	1,287	714	156	1,287	238	54
Communications	2,765	1,194	304	37	17	1
Mining	193	454	2,294	1,572	482	65
Grains	584	437	427	3	12	0
Other	5,550	4,240	1,493	2,372	1,791	28
Total	20,206	19,380	9,552	7,018	6,760	584
	Percent of whole					
Petroleum	12%	33%	13%	4%	1%	13%
Manufacturing	28%	26%	26%	21%	51%	9%
Banking	9%	5%	12%	0%	10%	53%
Commerce	6%	4%	2%	18%	4%	9%
Communications	14%	6%	3%	1%	0%	0%
Mining	1%	2%	24%	22%	7%	11%
Grains	3%	2%	5%	0%	0%	0%
Other	28%	22%	16%	34%	27%	5%
Total	100%	100%	100%	100%	100%	100%

Source: BCRA

2.1 Environmental impacts of bilateral trade

Environmental damages of bilateral trade can be measured along several dimensions: emissions, energy consumption, water use and pollution, land degradation, deforestation and so on. Due to a lack of cross-country data regarding most of these aspects, the vast majority of the existing literature examining the effect of trade on the environment focuses on emissions (e.g. Antweiler et al, 2001; Frankel and Rose, 2005). We follow this approach and use

data on carbon emission intensities from Peters et al (2011).[7] In addition, we use data on the water footprint of production to estimate the water content of Argentinean agricultural exports to its major trading partners. Among Argentina's major export markets, we find that China is the only one associated with a growing carbon intensity, and the second most water-intensive export destination.

To measure the impact of exports to China on Argentina's emissions (compared to other export destinations) we use data from the Global Trade Analysis Project (GTAP)(Peters et al, 2011). It provides information on emission intensities (MT of CO2 equivalent per USD of output) for 57 production sectors in Argentina. Table 7 relates the latest available data on overall greenhouse gas emissions (for the year 2007) to Argentina's exports to its main trading partners at two points in time (2007 and 2012).

Table 7. Greenhouse gas emissions (GHG)* and emission intensity of Argentinean exports 2007/2012, by export market**

	Total GHG emissions from exports			GHG emissions intensity of exports		
	2007	2012	Change, 2007-2012	2007	2012	Change, 2007-2012
Brazil	7,950	10,614	+33.5%	0.76	0.64	-15.8%
Chile	3,199	3,233	+1.1%	0.77	0.64	-16.9%
China	2,087	2,335	+11.9%	0.40	0.47	+17.5%
USA	5,438	4,767	-12.4%	1.25	1.15	-8.0%
Spain	1,342	1,487	+10.7%	0.65	0.56	-13.8%

* In 1,000 tons of CO2 equivalents; based on 2007 emission data
** In kg of CO2 equivalents per USD
Source: COMTRADE; GTAP database; Peters et al. (2011)

The first thing that stands out is that the overall amount of greenhouse gas emissions embodied in bilateral trade increased in Argentina's trade with all its main trading partners except with the US, where a sharp decline in emissions

[7] Alternatively, data on emissions of noxious gases are available from the UN Framework Convention on Climate Change (UNFCCC) Secretariat (available at http://unfccc.int) and in the World Bank's World Development Indicators (WDI) database (available at http://data.worldbank.org/data-catalog/world-development-indicators). However, sector-disaggregated information is rarely available. The same is true for data on energy consumption across different sectors (e.g. UN Energy Statistics, available at http://unstats.un.org/unsd/energy/edbase.htm).

(exceeding 12 percent) has taken place.[8] At the same time, the emission intensity dropped in all export markets except China. The emissions intensity of exports to China rose significantly in this five-year period, from the equivalent of 0.40 metric tons of CO2 per USD to the equivalent of 0.47 metric tons: an increase of 17.5 percent. However, this intensity is still the lowest among major export markets. Argentina's exports to China's are less polluting than exports to all other major trading partners. Exports to the US are for example more than twice as polluting as exports to China (1.15 vs. 0.47 kg of emissions per USD of goods exported).

Table 8 shows Argentina's exports to its main trading partners with emission intensities on a sectoral basis. Overall, in terms of total emissions (in thousands of metric tons of CO2 equivalents), agricultural and petroleum products seem to be most harmful to the environment. The share of these products in total Argentinean exports to China is higher than its share in exports to the world as a whole (see Table 2 and the discussion in Section 2).

Next, we focus on the water consumption and pollution of Argentinean exports. For that purpose, we calculate the water content of Argentinean agricultural exports to its major trading partners, using data from the water footprint network[9]: "The water footprint of a product is the volume of freshwater used to produce the product, measured over the full supply chain" (Aldaya et al, 2012, p. 2). It takes into account both water consumption (green and blue water footprint) and pollution (grey water footprint). This indicator is widely accepted and used for example in Aldaya et al (2010) to calculate the virtual-water content of primary crop exports of three major exporting countries: USA, Argentina, and Canada. Here we use data on the total water footprint (henceforth WFP), which is the sum of the green, blue, and grey water footprint.[10]

[8] However, this is also due to reduced trade flows over that period (-4.88 percent).
[9] Mekonnen and Hoekstra (2010a, 2010b).
[10] Alternative sources are the WDI on water pollution or FAO's Aquastat (available at http://www.fao.org/nr/water/aquastat/main/index.stm), where information on water withdrawal by sector can be found. In both datasets, however, the sectoral breakdown is on a rather aggregated level. In addition to that, data are not available per kilogram or USD of output in each sector.

Table 8. Greenhouse gas emissions of Argentinean exports 2007/2012, most polluting sectors for each trading partner

	Top Exports, 2007			Top Exports, 2012		
	Sector	Emission intensity*	Total emissions**	Sector	Emission intensity*	Total emissions**
Brazil	**Total exports**	**0.76**	**7,950**	**Total exports**	**0.64**	**10,614**
	Vegetables, fruit, nuts	6.57	3,186	Vegetables, fruit, nuts	6.57	5,170
	Petroleum, coal products	1.60	2,646	Petroleum, coal products	1.60	1,997
	Crops, NEC	7.25	921	Crops, NEC	7.25	1,777
	Wheat	0.33	378	Wheat	0.33	460
	Ferrous metals	1.27	113	Ferrous metals	1.27	288
Chile	**Total exports**	**0.77**	**3,199**	**Total exports**	**0.64**	**3,233**
	Petroleum, coal products	1.60	916	Crops, NEC	7.25	813
	Gas	1.58	627	Oil	0.74	733
	Electricity	8.73	343	Petroleum, coal products	1.60	451
	Crops, NEC	7.25	284	Vegetables, fruit, nuts	6.57	385
	Vegetables, fruit, nuts	6.57	235	Mineral products, NEC	2.29	225
China	**Total exports**	**0.40**	**2,087**	**Total exports**	**0.47**	**2,335**
	Oilseeds	0.38	1,002	Oilseeds	0.38	1,025
	Wool, silk-worm cocoons	14.50	550	Wool, silk-worm cocoons	14.50	601
	Oil	0.74	313	Oil	0.74	444
	Vegetable oils and fats	0.05	85	Vegetables, fruit, nuts	6.57	71
	Vegetables, fruit, nuts	6.57	34	Fishing	0.80	60
USA	**Total exports**	**1.25**	**5,438**	**Total exports**	**1.15**	**4,767**
	Vegetables, fruit, nuts	6.57	2,324	Vegetables, fruit, nuts	6.57	2,901
	Petroleum, coal products	1.60	1,769	Oil	0.74	591
	Oil	0.74	524	Ferrous metals	1.27	438
	Ferrous metals	1.27	183	Petroleum, coal products	1.60	202
	Crops, NEC	7.25	125	Crops, NEC	7.25	175
Spain	**Total exports**	**0.65**	**1,342**	**Total exports**	**0.56**	**1,487**
	Vegetables, fruit, nuts	6.57	713	Vegetables, fruit, nuts	6.57	986
	Fishing	0.80	281	Fishing	0.80	301
	Cereal grains, NEC	0.35	91	Metals, NEC	0.44	54
	Ferrous metals	1.27	71	Food products, NEC	0.08	54
	Food products nec	0.08	69	Chemical, rubber, plastic prods	0.05	48

* In kg of CO2 equivalents per USD

** In 1,000 tons of CO2 equivalents; based on 2007 emission data

Source: COMTRADE; GTAP database; Peters et al. (2011)

Table 9 matches exports (on a product level) to Argentina's five most important trading partners with data on the WFP associated with the production of the respective good[11] in Argentina. As can be seen in Table 9, the most water-intensive sectors are biodiesel (with a total WFP of 11,214 liters/liter of biodiesel), soy (between 1,751 and 4,041 m^3 of water/MT of soy), wheat (about 1,900 m^3/MT), and meat (almost 5,800 m^3/MT). While Argentinean exports to most of its main trading partners are relatively diversified across product categories, agricultural exports to China and Spain are concentrated in a few products. In the case of China more than 70 percent of the goods that are exported from Argentina are soy-based. Spain imports more than 60 percent biodiesel and soya products. Thus, in terms of water consumption, trade with these two countries seems to be more biased towards water-intensive goods. This becomes even clearer when we weigh Argentinean exports to its major trading partners (on a product level) with the respective product shares in total bilateral exports (see Figure 1).

All in all, given the limitations of the available data and the respective analysis, it is difficult to assess whether Argentinean exports to China are or not more polluting than those to the country's other main trading partners. Although greenhouse gas emission intensities of Chinese imports are rising, they are still low compared to other countries' imports' emission intensities. Thus, the most critical aspect regarding environmental effects of trade is water consumption and water pollution. Particularly, the disproportionately high share of soya products in total exports in combination with the water-intensive cultivation of soya is a major concern.

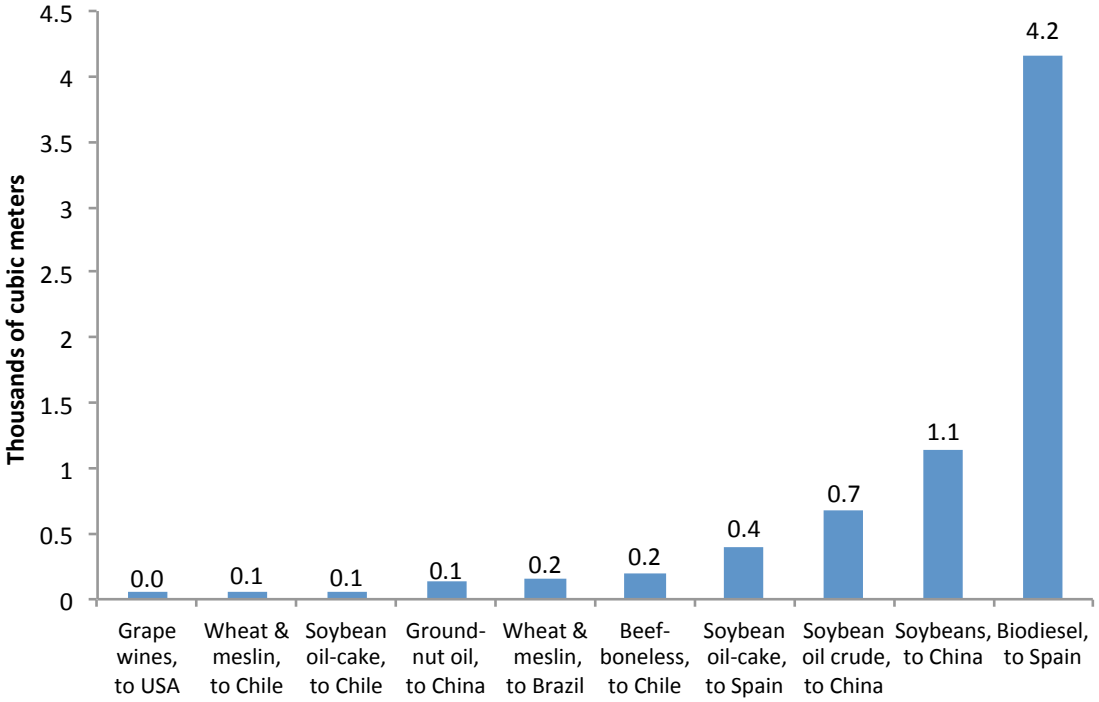
[11] Irrespective of the trading partner.

Table 9. Water footprint* of Argentinean agricultural exports, main products for each trading partner 2012

	Pct. of total bilateral exports	Total WFP**(in m3/MT)
Brazil		
Wheat and meslin	8.37%	1.891
Wheat or meslin flour	1.39%	1.913
Malt, not roasted	1.29%	2.086
Pears	0.96%	0.370
Milk and cream powder	0.73%	2.668
Chile		
Animal feed prep.	3.71%	1.603
Soya-bean oil-cake	3.52%	1.751
Animal/veg fats & oils	3.46%	6.640
Bovine cuts boneless	3.36%	5.791
Wheat and meslin	2.82%	1.891
China		
Soya beans	54.22%	2.110
Soybean oil	16.96%	4.041
Tobacco, unmanufactured	1.94%	1.508
Poultry	1.47%	2.661
Ground-nut oil	1.47%	9.101
USA		
Grape wines	9.07%	0.531
Honey, natural	2.94%	2.592
Grape juice	2.60%	0.609
Black tea	1.79%	0.531
Cranberries	1.61%	0.664
Spain		
Biodiesel***	37.03%	11.214
Soya-bean oil-cake	22.99%	1.751
Frozen shrimps, prawns	9.80%	NA
Molluscs	2.40%	NA
Resid. of legum. plants	1.82%	NA

* Average, 1996-2005
** Total water footprint (WFP) is the sum of green, blue, and grey water footprint
*** litre/ litre of biodiesel
Source: COMTRADE; Mekonnen and Hoekstra (2010a, 2010b)

Figure 1: Total* water footprint of Argentinean agricultural exports, main products for major trading partners 2012 (in m^3/ton, weighted by product shares in total bilateral exports)



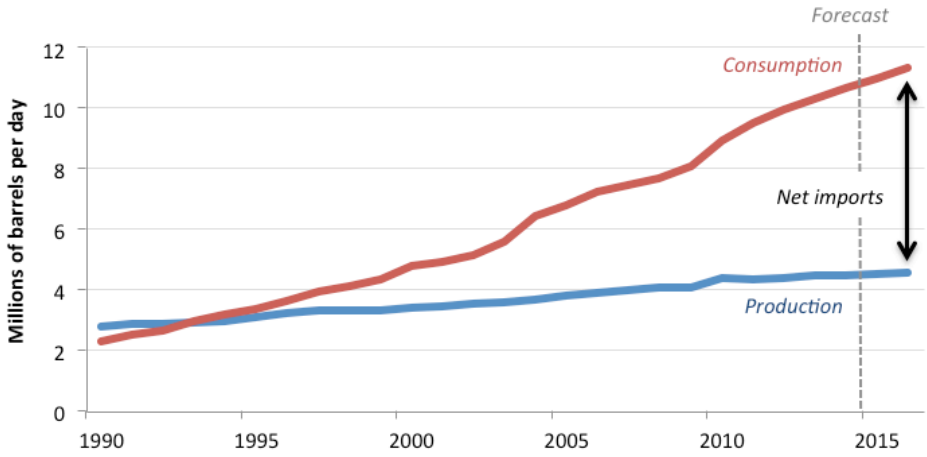
Source: COMTRADE; Mekonnen and Hoekstra (2010a, 2010b)
* Sum of green, blue, and grey water footprint, using intensity data for 1996-2005

3. Chinese investments in the oil industry in Argentina (CNOOC and Sinopec)

China was a net oil exporter until the early 1990s, later becoming the second-largest oil importer after the United States. This change was strongly related to its rapid economic growth, increasing urbanization, the expansion of its transport system and the growing demand of its refineries.[12]

Chinese oil production has seen sustained growth since the mid-1980s and its current volumes is twice that of the earlier period. Hence, its share in global oil production has increased from 3.3% in the 1980s to 5.0% currently. According to the US Energy Information Administration (EIA), in 2012 China was the world's fourth-largest oil producer and the second-largest consumer (with 11.5% of total consumption). Natural gas production has also expanded rapidly, and China's share in world production rose from 0.6 to more than 2.5% between 1990 and 2012, while China is currently the fourth world consumer with a 3.9% of the global natural gas demand. Hence in both cases, China is a net importer of energy.

Figure 2. Production and consumption of oil and gas, China (1990-2013, thousands of daily barrels)



Source: U.S. Energy Information Administration *International Energy Statistics and Short-Term Energy Outlook* (August 2012).

[12] According to IHS Global Insight, refining capacity in China (currently 11.6 million barrels per day) has doubled since 2000 and is projected to reach 14 million in 2015. FACTS Global Energy estimates that China will add another five million from 2015 to 2020. In contrast, Argentina's refining capacity is 700,000 barrels per day.

Three large oil SOEs are the key players in the energy sector in China. First, CNOOC, (founded in 1982) controls the largest part of offshore oil production and exploration. Second, Sinopec (created in 1983), focuses on refining and marketing. Third, CNPC (China National Petroleum Corporation) was established in 1988 as a spin-off of the Oil Industry Ministry and focuses on *onshore* production (Strecker et al, 2000). In the late 1990s the Chinese government aimed at creating global, vertically-integrated firms, forcing CNPC and Sinopec to restructure: CNPC transferred oil fields to Sinopec in exchange for refineries. Notwithstanding, CNPC is still dominant in the upstream segment[13] while Sinopec controls the downstream stage.

Although the three big oil companies are SOEs, they manage themselves to some extent applying private managerial criteria and operate in a dual price system, in which they are able to sell any oil and gas exceeding the quotas fixed by the government at market prices. Investments are financed through retained earnings or loans, so public financial support is being gradually reduced (Houser, 2008). In turn, the refining sector has been modernized and consolidated in recent years, as public policies have promoted mergers and closures of smaller refineries for economies of scale and higher efficiency.[14]

The growing need for energy has led Chinese firms to increase offshore exploration and production and to embark upon international expansion (Xu, 2007). The government supports this goal through strengthening bilateral relations with target countries. The Ministry of Trade and the National Development and Reform Commission (NDRC) has defined a list of (mostly developing) countries and resources eligible for investment subsidies (Zweig and Jianhai, 2005).

Another objective of internationalization in this sector is to develop technical expertise in non-conventional resources and gain access to profitable segments of

[13] CNPC and its subsidiary PetroChina have 60 and 80% of the oil and gas market, respectively.
[14] The increased diversification of the oil import sources led Chinese refineries to adapt new technologies able to process different types of crude oil, like the Venezuelan and other Latin American ones, which are usually heavier than those coming from the Middle West.

the upstream market (EIA, 2013). According to Wu (2008) other drivers include: i) the need to survive through continuous expansion both at home as well as abroad, ii) the aim of diversifying business which is higher abroad (where competition is more open) than in China; iii) the search for higher profits (which, even if they are below those obtained by other oil companies, are still higher than those obtained in the Chinese market) and iv) full employment of their technology and labor force.

In general, Chinese oil companies pursue FDI through M&As. Firms finance their projects with their own resources except in highly strategic projects in which access to public funding is available (Wu, 2008). It is often the case that, as these firms have highly diversified business interests, they compete in bids in which they end up offering much more than their competitors can justify, taking advantage of their huge financial capacity, their lower profit expectations, and the access to public financing. According to Wu (2008), this is does not reflect the Chinese government's geopolitical strategy, but domestic political considerations and inter-agency competition. In fact, the Chinese government has been pushing firms to form partnerships for investing abroad instead of competing among themselves.[15] Finally, it must be noted that Chinese firms are willing to invest in countries considered too risky by other international oil companies.

Summing up, Chinese oil FDI is seemingly guided by a mix of market-based decisions by SOEs, competition among them for the favor of the government, and political pressures to increase access to energy sources. This combination of factors, jointly with the above-mentioned aggressive attitude in search of new businesses, has generated concerns regarding China's growth in the global energy market in coming years.[16]

Outward Chinese FDI has grown since the beginning of the 21st century: since 2009 Chinese firms have bought assets in Africa, Asia, Latin America, the United

[15] While CNOOC and Sinopec competed for bidding in Brazil, Petrochina, Sinopec and Sinochem associated to buy oil assets in Ecuador.

[16] Some authors, however, argue that this strategy is not very different from that applied by other State oil firms like those of India, Brazil and Malaysia (see Wu, 2008).

States and the Middle East. According to EIA data, in 2011 alone those firms invested USD 18 billion in energy assets, mainly related to natural and non-conventional gas. As a result, Chinese oil production abroad went from 140 million barrels per day in 2000 to more than 1.5 billion in 2011 and forecasts suggest that its share will keep growing in coming years. Currently 20% of oil and gas production of Chinese firms comes from abroad and it is estimated that this figure will grow to 30% in 2015 (see EIA, 2013 using PFC Energy data). According to press information in 2010 alone Chinese oil firms bought more than USD 38 billion in assets, more than one-third of which pertained to operations in Latin America (diariodefusiones.com, 2010).

Regarding Latin America, the first firm to invest in the region was CNPC, which has operated oil wells in Peru and Venezuela since the 1990s and in Ecuador since 2006 Sinopec started operations in the region in 2006 in Colombia while CNOOC was the last to invest in the region (Argentina, 2010). According to CEPAL (2013), FDI in Latin America of these three firms amounts to more than USD 23 billion and they currently have investments in all producing countries except Bolivia and Mexico.

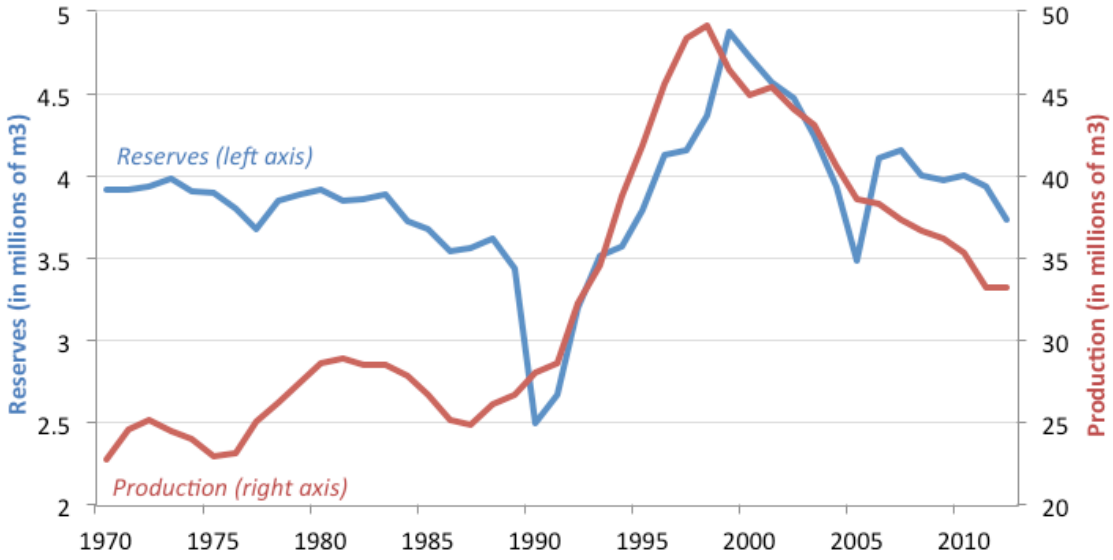
3.1. The Argentinean oil sector

Argentina contributes with less than 1% to worldwide oil production (EIA data, 2012). This figure has been stable during the last three decades. Natural gas production has fluctuated but with a long-term growth trend, allowing a slight increase in the share of world production (1.1% in 2012 according to EIA data).

The hydrocarbons sector has been a key activity for Argentina's economic development since the discovery of the first oil well at the beginning of the 20th century. On the one hand, the oil and gas industry has generated employment, wealth and, in recent decades, exports. On the other hand, Argentina's energy

matrix is highly dependent on hydrocarbons.[17] This dependency has grown in recent decades after the discovery of large natural gas fields in the mid-1970s. This trend has not reversed in spite of the fact that gas reserves have been steadily falling since the mid-2000s.

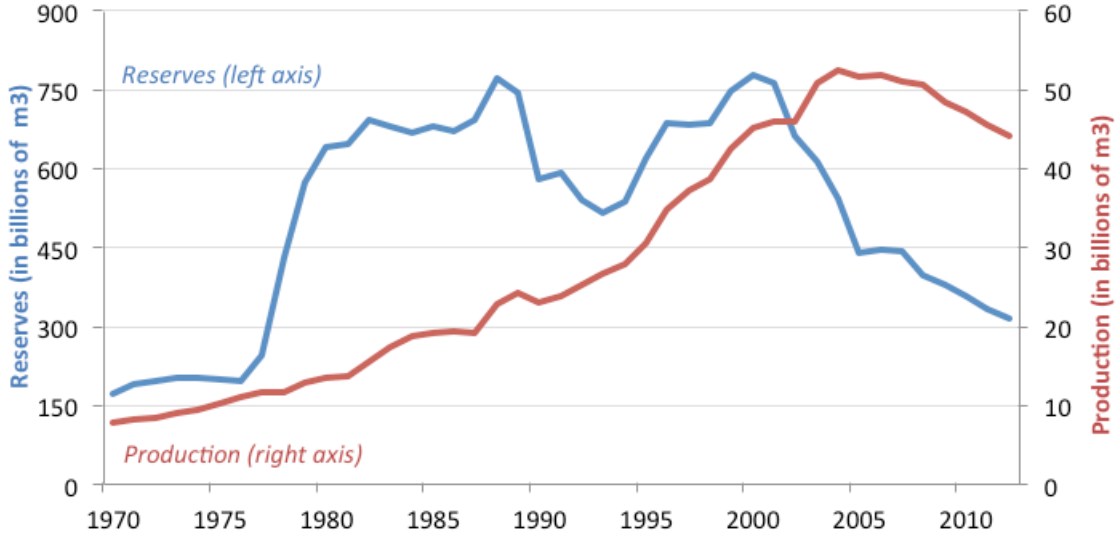
Figure 3. Oil production and reserves



Source: Authors' calculation using IAPG data.

[17] Argentina's reliance on petroleum is not very different from the world's matrix, but Argentina's gas dependency is much higher than the world average, while the use of coal is much less extensive.

Figure 4. Natural gas production and reserves



Source: Authors' calculation using IAPG data.

The fall in oil and gas production during the last decade emerged *pari passu* a strong increase in energy consumption, resulting from high growth and strong subsidies that dis-incentivize energy savings. Hence, Argentina became a net energy importer in recent years.[18] For its part, refining capacity is limited. Argentina has ten oil refineries –with four of them accounting for three-quarters of total refining capacity[19]- but their production is not sufficient to meet domestic demand, leading to the need of importing fuels –though a trade surplus in oil still exists.

Although Argentina produces more natural gas than any other South American country, production levels have been falling after the 2006 peak, and the country became a net importer in 2008. This in turn puts strong pressures on the external accounts: in 2012 the energy trade deficit reached USD 7 billion and some estimates suggest that it could surpass USD 9 billion in 2014[20]. The recent announcement regarding the start of the exploration of supposedly very large

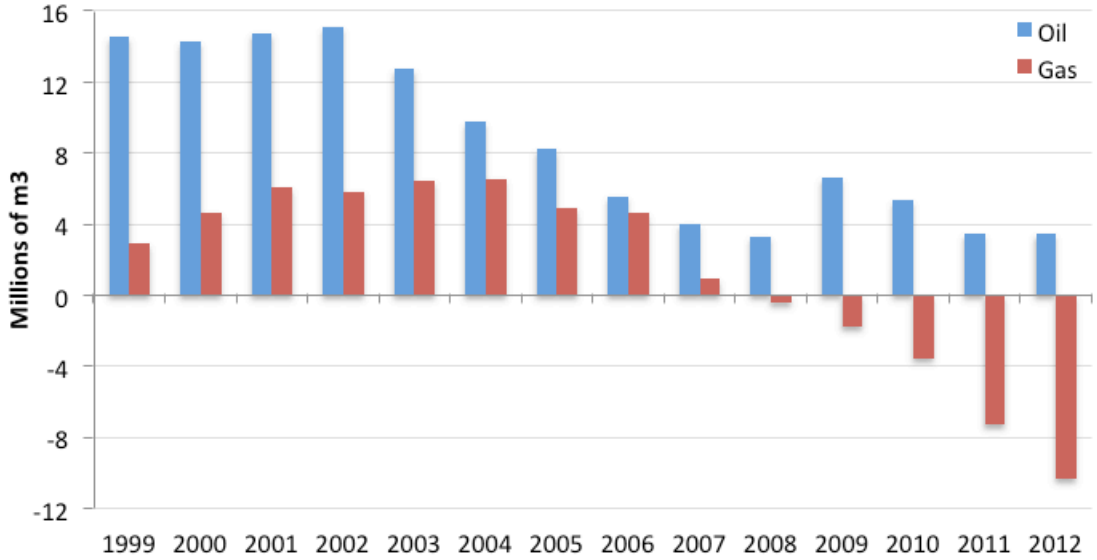
[18] Both the oil and gas prices in the domestic market have been systematically below the international ones since 2002.

[19] YPF (La Plata and Luján de Cuyo), Shell (Buenos Aires) and Exxon Mobil (Campana).

[20] By the mid-2000s the surplus in the energy trade balance reached USD 5,600 million / USD 6,000 million (INDEC's data for 2005 y 2006, respectively).

shale oil and shale gas fields could signal the possibility of a reversal of this situation in the medium and long-term.[21]

Figure 5. Oil and natural gas trade balance (in m^3)



Source: IAPG

Hydrocarbon sector deregulation[22] began in the late 1980s and early 1990s.[23] Many exploration and production areas that were previously owned by the SOE YPF[24] were privatized, and through Law 24,145 hydrocarbon resources were federalized giving the dominion of the wells to the respective provinces. As a result, oil production grew significantly and self-reliance was attained by mid 1990s (which was later lost in mid 2000s). YPF itself was first sold to private investors through IPOs in different stock exchanges, but later the Spanish firm Repsol took control of the company until its renationalization in 2011.[25]

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[21] The first drilling of a non-conventional hydrocarbon field was made in 2010 in Loma de la Lata, Neuquén. Shale gas and oil in Argentina were discovered in the 1960s in Argentina, but the technology to exploit them was not available and the hydrocarbon prices were not high enough as to allow their profitable exploitation (Di Sbroiavacca, 2013).

[22] In fact, this allowed free entry for private companies to the oil industry, the granting of new concessions for oil areas and freedom to invest in refineries and gas stations.

[23] Decree 1,055/89 created a free crude oil market in the exploration and production stages (upstream). Decree 1,212/89 defined new rules of the game for the refining and marketing stages (downstream). Finally, Decree 1,589/89 established free trade and eliminated tariffs and other trade taxes for oil and its derivatives (http://www.ecopuerto.com/petroleo07/informes/infoPetrolero.html).

[24] YPF is the largest Argentinean firm by sales and assets.

[25] The renationalization was based, according to the official arguments, on the fact that Repsol had not been investing enough in Argentina and diverted funds to make investments abroad. Previously,

At present, many domestic and foreign firms operate in the hydrocarbon sector in Argentina, including two Chinese SOEs, CNOOC –through its share in Pan American Energy (PAE)- and Sinopec. These firms rank second and fifth in terms of oil production in Argentina, respectively.

Table 10 Argentina's main oil producers (2012, % of total production)

Producer	Pct. of total production
YPF S.A.	35.0%
Pan American	**17.9%**
Petrobras Argentina S.A.	6.8%
Pluspetrol S.A.	6.7%
Sinopec Argentina Exploration Inc.	**6.6%**
Chevron Argentina S.R.L.	5.2%
Tecpetrol S.A.	4.0%
Total Austral S.A.	3.1%
Petrolera Entre Lomas S.A.	2.6%
Compañías Asociadas Petroleras S.A.	1.9%

Source: IAPG

Table 11. Argentina's main natural gas producers (2012, % of total production)

Producer	Pct. of total production
TOTAL AUSTRAL S.A.	30.1%
YPF S.A.	23.4%
PAN AMERICAN	**12.0%**
PETROBRAS ARGENTINA S.A.	9.0%
APACHE ENERGIA ARGENTINA S.R.L	3.9%
TECPETROL S.A.	3.3%
PETROLERA LF COMPANY S.R.L	3.1%
PLUSPETROL S.A.	2.9%
PLUSPETROL ENERGY S.A	2.8%
Sinopec ARGENTINA EXPLORATION INC	**1.7%**

Source: IAPG

some provinces had cancelled exploration and production licenses owned by Repsol. Repsol still has 12% of the YPF capital stock.

3.2. Main features of the Chinese oil firms investing in Argentina

According to Houser (2008), Sinopec had 700,000 employees in 2006, and by 2011 its payroll had surpassed one million employees in 2011 (Fortune data)[26]. The firm commands 46% of the Chinese refining market and is the second-largest firm globally in refining capacity (with five million barrels per day in China alone in 2012). It is also the second-largest firm globally by number of gas stations. Since 2000 Sinopec stock has been listed in the NY and Honk Kong stock exchanges. In recent years the company has focused on quality and efficiency improvements and expanding into other chemical market segments (ICIS Chemical Business, 2013)

Sinopec was the last of the three large oil Chinese firms to invest abroad. The firm operates more than 30 oil and gas projects abroad, including in Iran, Algeria, Saudi Arabia, Kazakhstan, Brazil, Canada, Egypt, Colombia, Oman, Nigeria, Cuba, Venezuela and Argentina (Wu, 2008). In the case of Latin America, Sinopec has been expanded its operations through flexible contracts and agreements with oil companies already in the region (Xu, 2007). It is estimated that Sinopec production capacity abroad reached nearly 450,000 barrels per day in 2011[27].

CNOOC is the third Chinese oil company in terms of sales and it has specialized in offshore exploration and production (Xu, 2007). Although it is a much smaller company – Houser (2008) estimates that it has 37,000 employees – CNOOC has proven to be a major competitor for CNPC and Sinopec, due not only to its projects offshore in South China but also its growing participation in downstream operations.

Internationalization has been a key objective of the firm since its creation, and its overseas activities have been steadily growing since the first operation abroad started in 1993 in Indonesia. CNOOC has a highly professionalized management

[26] CNPC, the largest Chinese oil firm, had 1.7 million employees in that year (Houser, 2008)
[27] http://www.eia.gov/countries/cab.cfm?fips=ch

that has shown great ability to find profitable businesses abroad and establish strategic M&As, which have been its preferred channel for FDI (Xu, 2007).

CNOOC's production capacity abroad reached 150,000 barrels per day in 2011, and grew further in 2012 through new acquisitions of oil and gas companies.[28] These acquisitions aimed not only at increasing proven reserves and production capacity but also at gaining access to technical expertise in non-conventional gas fields and deep-water oil.[29] At present, it is estimated that around 20% of CNOOC's proven reserves are located abroad. (EIA, 2012)

3.3 History of Chinese FDI in the oil sector in Argentina

The first Chinese oil company to invest in Argentina was **CNOOC.** In March 2010 it acquired 50% of the local oil company Bridas for USD 3.1 billion. Some months later, Bridas aimed to acquire the 60% of Pan American Energy (PAE) owned by British Petroleum (the remaining 40% was owned by Bridas itself) for USD 7.1 billion, but this acquisition was later abandoned.[30]

According to CNOOC sources, the association with Bridas allowed the firm to combine its experience in offshore operations with Bridas' knowledge in onshore production and exploration (OPSur, 2011). However, according to press sources, CNOOC is considering selling its stake in PAE, to free up money for other projects. Note must be taken that PAE is currently under investigation by the US Securities and Exchange Commission for bribes allegedly paid seven years ago to extend the Cerro Dragón oil field concession in Argentina. If a judge rules against CNOOC, the

[28] In 2012, CNOOC signed an agreement to acquire the Canadian TNC Nexen.

[29] In this scenario, one of the main operations of investment abroad was the acquisition of offshore areas in Indonesia to REPSOL-YPF in 2005.

[30] According to Laufer (2013) the reasons behind the the agreement's failure are not very clear, but possibilities include resistance from some members of the Argentine government, changes in BP's financial situation, and the decision by the Argentine government to force oil companies to liquidate 100% of their export incomes in Argentina's official currency exchange market (formerly part of those incomes could be held abroad).

extension could be considered void and the company's concession would expire in 2017[31].

PAE is Argentina's second-largest producer of oil and third-largest producer of gas, with 18% and 12% of the country's production, respectively (IAPG data, 2012), and operating the main oil area of Argentina -Cerro Dragón- located in Golfo San Jorge. Until recently, the firm had been steadily increasing its share of the domestic oil market, although in recent years it has been affected by several labor and social conflicts.[32] PAE has also recently acquired the Exxon Mobil local affiliate (Esso) as part of a strategy of vertical integration (Esso owned a refinery and several gas stations).

According to Nosis data PAE has around 1,500 employees, as well as the employees of those firms that supply services to PAE. Personnel firings in contractor companies are often attributed by labor and social movements to decisions of the oil companies, creating strong conflicts that affect production (more on this below).

Note must be taken of the fact that Bridas and PAE management is still in hands of the Bulgheroni family (the founders of Bridas). This arrangement avoided a possibly long adaptation process for CNOOC managers who are newer to onshore operations in Argentina.

PAE's exports, like those of its competitors, have been falling. In contrast, the firm has imported machinery and equipment and scientific and precision instruments for the oil industry, as well as tubes and pipes (Nosis data).

[31] http://www.bloomberg.com/news/2014-04-07/cnooc-said-to-weigh-sale-of-bridas-stake-bought-for-3-1-billion.html

[32] Due to the conflicts in Chubut province and the discussions regarding the new provincial Hydrocarbon Law, only one oil field was explored in 2012.

Table 12. PAE's exports (USD million)

	2008	2009	2010	2011	2012	2013
Crude petroleum oils	3,750	5,110	5,581	4,574	3,389	886
Natural gas	636	420	16	25	6	4
Liquefied gas (propane)	15	28	24	25	0	13
Gas turbines	7	5	7	3	9	2
Butane gas	11	5	0	0	0	12
Gas oil	1	9	8	8	2	0
Aviation kerosene	0	0	1	0	1	1
Petrol	1	0	0	0	0	0
Total	4,421	5,578	5,639	4,635	3,408	918

Source: Nosis.com

Sinopec also arrived in Argentina in 2010, through two major acquisitions: the oil fields operated by US TNC Occidental Petroleum Corporation (Oxy) for USD 2.45 billion and 40% of Repsol Brazil for USD 7.1 billion. The Oxy acquisition came first, and among the first Chinese investments in Argentina[33] –and the second one in the oil sector –and accounted for around one-third of the FDI received in Argentina that year.[34]

When Oxy was acquired its proven reserves reached 393 million barrels and it had 23 oil and gas production units in Santa Cruz, Chubut and Mendoza, 19 of which were operational. By then Oxy accounted for 6.4% of Argentina's oil production (it ranked 5th among oil producers) and 1.5% of natural gas production (IAPG data).

The sale of Oxy's Argentina's affiliate to Sinopec was a relative surprise since the US firm had announced its aim of renewing its oil concessions and had agreed with the Santa Cruz province government an extension of its contract in exchange for USD 100 million in royalties and USD 30 million for provincial infrastructure works.

[33] One of the main antecedents was the acquisition of the iron mine of Sierra Grande by China Metallurgical Corporation.

[34] Although this figure does not match official FDI data coming from the Argentina's balance of payments, as mentioned above, it is likely that the operation was channeled through a tax haven or an offshore financial center. Unfortunately, we have no means to corroborate this data, although different sources, both from the firms as well as from the media, agree on the abovementioned figure.

After three years of investing in the country Sinopec has kept its market share (6.6% in the case of oil and 1.7% in natural gas in 2012) –in 2013 it apparently became the fourth largest oil producer in Argentina–and has around 550 employees (Nosis data) and more than 3,000 contract workers. Agreements signed with the provincial government stipulate that direct and indirect Sinopec employees must have at least two years' residence in Santa Cruz.

Sinopec exports have had wide fluctuations in recent years, but are mostly composed by crude oil. In fact, Sinopec has no refineries in Argentina. Regarding imports, Sinopec buys capital goods and accessories, including precision equipment, valves, tubes, telecommunication equipment, etc.

Table 13. Sinopec's exports (in USD million)

	2008	2009	2010	2011	2012
Crude oil	146.1	1,160.8	1,814.7	452.2	1,131.5
Petroleum oils, other than crude	6.9	13.9	11.3	3.5	13.3
Total	153.0	1,174.7	1,825.9	455.8	1,144.8

Source: Nosis.com

Summing up, the arrival of CNOOC and Sinopec to Argentina did not generate major changes in the operations of the acquired firms in the productive, technological and trade areas. It is likely that the acquired firms would have continued their operations even without the infusion of Chinese capital, as their assets were attractive to many other oil companies. Notwithstanding, in the case of CNOOC (assuming the firm decides not to sell its stake at PAE), the presence of the company could contribute in the future to the expansion of offshore activities, as the Chinese company is an industry leader in offshore exploration.

4. The case studies

Before beginning our analysis, we must highlight the fact that the oil industry has strong environmental impacts and that oil firms usually rank high in terms of environmental incidents, complaints and penalties. In fact, during the last two years the "winners" of the Public Eye Awards[35], given to companies with the worst environmental and ethical behavior, were oil firms: Gazprom and Royal Dutch Shell. Moreover, oil firms often work in countries where human right abuses are common, because oil is often found in developing countries with weak institutional structures and low democratic standards (in fact, some econometric studies have blamed oil abundance for severe institutional failures, and even increasing the probability of civil wars – see Ross, 2013). However, the large economic impacts of the oil industry and the power of big oil firms make this industry especially prone to regulatory capture, corruption and other government failures even in countries with strong, well-enforced environmental standards.

In this context, it is very difficult to establish which oil companies are "greener". In fact, the second place in the 2011 ranking of the greenest oil firms elaborated by the environmental organization Greenopia was granted to Royal Dutch Shell.[36]

Media information indicates that CNOOC and Sinopec are no exception, with less than satisfactory environmental and labor management records worldwide. Complaints of CNOOC's persecution of workers belonging to the Falun Gong movement in China, human rights abuses and environmental contamination in Myanmar, and serious environmental incidents in China (including oil spills in the Bohai Bay and an oil refinery explosion in Guandong) have been raised[37]. Complaints regarding Sinopec include its having begun oil exploration in the

[35] These prizes are hosted by the Berne Declaration, a Swiss NGO, and Greenpeace.

[36] Greenopia defines itself as "the leading directory for eco-friendly businesses and services making sustainable shopping easier. Greenopia provides the market's only independent rating system that ranks businesses and products according to their sustainable practices".

[37] http://www.sustainalytics.com/sites/default/files/sustainalytics_corporate_action_alert_cnooc_to_buy_nexen_26july2012.pdf

Loango National Park, Gabon —a nature sanctuary—before the Environmental Impact Assessment (EIA) had been approved by the Ministry of Environment (Kotschwar et al, 2012). Both firms have had to pay fines and reach agreements with affected communities and governments. However, as mentioned above, the same could be said of other oil companies around the world (in fact, in its Bohai Bay operations CNOOC was associated with Conoco Philips).

Complaints about CNOOC and Sinopec ignoring or bypassing national and international corporate and legal standards in areas such as labor, corruption, and the environment do not make them unusual among Chinese SOEs. In fact, Sinopec is one of 10 firms on the 2008 Fortune China 100 lists that Greenpeace cites as having violated the Measures on Environmental Information Disclosure (for Trial Implementation) adopted in China[38]. However, as reported in Kotschwar et al (2012), some signs of improvement in Chinese domestic and international environmental policy (including SOEs' behavior abroad) are slowly emerging, which comes as no surprise given the growing international pressures on the subject. In a similar vein, Urban et al (2013) point out that growing pressures from civil society and international financial institutions are forcing Chinese companies to demonstrate a commitment to addressing environmental impacts of their overseas projects. Consequently, some Chinese TNCs are getting involved in Corporate Social Responsibility programs (CRS), focused on environmental issues.[39]

In the specific case of Argentina, uncovering the impacts of the recent investments of China's oil firms is difficult due to a number of reasons, including: a) the investments are very recent; b) in both cases they have been channeled through total or partial takeovers of existing firms, and in the case of CNOOC the management is still in the hands of the Argentine partner company (so it is not

[38] http://www.greenpeace.org/eastasia/press/releases/toxics/2009/silent-giants/

[39] In the case of Chinese investments in Africa, Tan-Mullins and Mohan (2013) suggest that the outcomes of these CSR strategies are very heterogeneous and rely on specific local political and social structures.

clear whether changes have been introduced after the takeover); c) Chinese firms have shown reluctance to give information on this or any other aspect of their businesses; d) as in other countries, the oil industry in Argentina has a record of poor environmental behavior, and all firms in the sector are affected by complaints, lawsuits, and governmental sanctions.[40,41].

We have had no opportunity to meet with CNOOC's or PAE's representatives since the firms refused our requests. As far as we know, this is the standard behavior of Chinese firms in all sectors (at least in Latin America). We had the opportunity to speak with the president of ASSUPA (Asociación de Superficiarios de la Patagonia) (see previous footnote). We also met representatives of firms providing environmental services to the oil firms. In spite of our efforts to speak with government officials of Chubut and Santa Cruz, we did not have access to information from those sources (beyond what is published in official media).

Our paper also benefited from information available in the media and opinions from various stakeholders, mainly environmental NGOs. Not surprisingly, this led to a rather gloomy picture regarding the behavior of Chinese oil firms in Argentina. Moreover, we have to consider that, given the importance of oil activities in Patagonia (the main region of oil production in Argentina) politicians often use the subject in their campaigns and personal branding. Hence, caution is needed when analyzing complaints and statements made in the political arena.

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[40] See www.opsur.org.

[41] For example, ASSUPA (Asociación de Superficiarios de la Patagonia) has sued a dozen firms operating in the main 5 oil basins in Argentina. ASSUPA is an NGO created by land owners in Patagonia affected by activities of oil firms, which later broadened its objectives to include the protection of the environment from the consequences of oil and mining activities in Argentina (http://www.assupa.org.ar/ASSUPA/Principal.html). The first suit by ASSUPA involved a UNDP report that estimated an environmental liability of USD 545 million from the activities of the oil industry in the Argentinean province of Neuquén between 1991 and 1997. As a result Repsol finally agreed in a remediation plan in 2011, which is apparently currently suspended after the re-nationalization of the firm (http://www.opsur.org.ar/blog/2014/03/18/la-mega-causa-ambiental-en-la-cuenca-neuquina-y-la-negociacion-con-repsol/).

4.1 Environmental Enforcement and Negotiation at the Province Level

Provincial governments are the most directly involved in terms of environmental regulation of the oil industry and negotiating oil concessions and royalties. This fragmented approach to enforcement, coupled with the provinces' need for royalty revenue, creates a conflict of incentives in which environmental standards can easily fall by the wayside. Nonetheless, oil provinces have pursued strategies to hold oil companies accountable, with varying degrees of success.

According to the current legal framework regulating the oil industry in Argentina, an EIA must be issued before any project can begin; each province has its own standards for this assessment. Water pollution is regulated on the federal level under the Hazardous Waste Law, which sets permitting regulations and acceptable quality levels, although each province has its own Water Code for basins that do not cross provincial borders (Bareisaite et al, 2013). Although, as seen below, various actions have been taken at the provincial level in order to create standards and regulations and remedy existing environmental damages, some of the people consulted for this study stated that the effective enforcement of these regulations is weak.

As the oil rich provinces are highly dependent on oil revenues (for example, in Santa Cruz oil royalties amount to 12% of the provincial budget), addressing environmental liabilities and other impacts of the oil industry (employment, local linkages, social responsibility actions, etc.) are part of complex negotiations in which both the government and the private firms exchange commitments in various areas, a process in which environmental objectives could be sacrificed in exchange for other government's objectives such as more royalties, more local employment, etc. (Note must be taken, however, that some recent statements by public officers in Patagonian provinces show that they have discovered that

remediation and environment protection activities also generate employment opportunities)[42].

The province of Chubut has tried to address some of these conflicting incentives through greater transparency, but with limited results. PAE is the major oil operator in Chubut province, so it comes as no surprise that PAE has received a number of complaints regarding not only its environmental behavior but also on alleged lack of accomplishment of investment commitments (besides the alleged bribes mentioned above). Naturally, criticisms of PAE's environmental action are prior to CNOOC's investment and have continued after the entry of the Chinese firm. Chubut passed a law creating a special Parliament Commission in 2012 to monitor investments, environmental liabilities and other aspects of the oil provincial activity but it has not yet published a report.

The province of Santa Cruz has taken a different, but related strategy for environmental enforcement. Last year the Santa Cruz government announced that it would require oil firms to draft investment plans to deal with their environmental liabilities at the time of granting or renegotiation of oil concessions. Sinopec has faced sanctions and complaints in recent years,[43] and according to press reports, the amount of those liabilities was preliminarily estimated around USD 150 million at the current peso-dollar exchange rate[44]. In the case of PAE no precise figure has been published (the firm's last renegotiation of concessions was prior to the passing of this new legislation). YPF's liabilities were estimated around USD 3.5 billion in 2012 (considering that year's exchange rate)[45]. The environmental liabilities were the result of lack of investment in equipment maintenance, human resources training and remediation activities. A large part of

[42] http://magnamedia.com.ar/index.php?option=com_content&view=article&id=18392:pasivos-ambientales-95-de-las-piletas-de-crudo-estarian-mal-saneadas&catid=110:cat-locales-03&Itemid=532

[43] The firm has stated that some of the recorded environmental incidents are the result of sabotage actions (http://www.laopinionaustral.com.ar/diario.asp?Modo=Noticia&NId=6096&texto=&A=2012&M=10&D=11).

[44] http://www.santacruzdigital.net/nota.asp?n=2013_8_18&id=16556&id_tiponota=4

[45] See http://www.santacruzdigital.net/nota.asp?n=2013_8_4&id=16556&id_tiponota=4.

the remaining environmental issues involves inactive wells that have not been appropriately cleaned and whose wastes were disposed in unsafe ponds, leading to contamination of several aquifers (it is estimated that there are 13,000 inactive wells in Santa Cruz).[46] In the case of Sinopec, the remediation plan has established a 5-year period to undertake the works needed to remedy the identified liabilities (including nearly 1,100 contaminated wells). This requirement of estimating environmental liabilities and presenting remediation plans was a consequence of Law Nº 3122 in 2010 (Santa Cruz is the only province with such kind of legislation). Notwithstanding legal obligations, press reports state that oil firms are reluctant to make the required investments and in many cases argue that those liabilities are the result of the operation of the former owners of the oil fields (as in the case of Sinopec and YPF)[47].

Another key issue in both Santa Cruz and Patagonia regarding the impacts of oil activity has to do with water availability. Given the lack of appropriate infrastructure in the region (in particular dams and water pipes), there has historically been a strong controversy between civil society and oil companies for the use of water, especially in Patagonia, due to the fact that oil companies use huge amounts of drinking water for oil production while some cities face shortages of clean water for agriculture and consumption. In December 2012 the Governor of Santa Cruz and the President of Sinopec Argentina signed an agreement to build water wells and new pipes in Caleta Olivia and Pico Truncado, and deliver the equipment needed to operate them, train the required employees and provide their maintenance. However press reports stated that the works schedule in 2013 had not been met. In Patagonia, oil firms were blamed for not helping when an aqueduct serving many Southern Patagonian cities broke and left thousands of citizens without water for almost two weeks[48].

[46] See http://www.santacruzdigital.net/nota.asp?n=2013_8_4&id=16556&id_tiponota=4.
[47] http://www.empresasnews.com/noticia-2714.html
[48] http://www.lavanguardiadelsur.com/index.php/politica/2860-claudio-vidal-cargo-contra-las-operadoras-petroleras-que-se-desentendieron-de-la-crisis-hidrica-de-caleta

On a related note, Santa Cruz has also had to deal with alleged negative impacts of the oil industry on fishing. Complaints have been made accusing PAE of damages to fisheries due to offshore operations. The firm elaborated a report for the Santa Cruz government, which apparently shows that fishing activity has in fact increased in recent years.[49] However, in 2013 PAE stopped a seismic prospecting project in San Jorge Gulf due to a lawsuit by fishing firms, which alleged negative impacts on their activity due to a similar previous project undertaken in 2009 (trade unions and the Santa Cruz government also opposed the project).

4.2 Voluntary measures by CNOOC and Sinopec

Beyond their relationships with provincial governments, it is worthwhile to note the overall environmental behavior of CNOOC and Sinopec. Some sources consulted for this study stated that Sinopec lowered the budget dedicated to environmental activities after the acquisition of Oxy. At the same time, during this research we have also been told that PAE's environmental commitment is stronger than Sinopec's, due to the participation of British Petroleum in PAE and the fact that BP has a stronger commitment with the environment than Chinese firms as a consequence of having accumulated a number of important environmental incidents in the past that damaged its reputation. As always, it bears emphasizing that we have no hard evidence supporting these statements.

Finally, both PAE and Sinopec have embarked on CSR programs. In 2008 Oxy launched a program to protect biodiversity in the area "Reserva Natural Loayza y Duraznillo". After the acquisition of the company, the program was upheld by Sinopec and later recognized as the best environmental conservation program by the Ecumenical Forum in December 2013. Other CSR programs by Oxy PAE focus on helping preserve endangered bird species[50], prevent drug addictions[51], reduce

[49] See http://www.prochubut.com.ar/node/1274.

[50] http://www.vocesyapuntes.com/nuevo/index.php/noticias/politica/5509-pae-suma-esfuerzos-para-la-preservacion-del-maca-tobiano-un-emblema-de-la-patagonia-pan-american-energy-colaborara-con-aves-argentinas-y-ambiente-sur-en-su-proyecto-para-evitar-la-extincion-de-esta-especie-endemica-que-es-exclusiva-de-la-argentina-

the digital gap by facilitating access to computers and computer training[52], and building parks in Patagonian cities[53].

4.3 Looking to the future: shale oil and gas

The most relevant issue regarding the future of environmental impacts of the oil industry in Argentina involves the exploration and exploitation of shale oil and gas wells. According to various sources Argentina has one of the world's main reservoirs of shale gas. The biggest concentration of these resources is located in Vaca Muerta, Neuquén province. YPF has been trying to form partnerships with various major private companies to promote the development of this area. PAE as well as CNOCC itself have been among the firms that showed interest in establishing associations with YPF, although so far only Chevron has signed a formal agreement.

The development of shale hydrocarbons is based on the use of hydraulic fracturing (or "fracking"). According to Mares (2012), since these techniques are relatively new, there is no scientific consensus on the degree of associated risks. Nevertheless, it is well-known that fracking requires large amounts of water and that the water used in fracking contains potentially hazardous chemicals and must be managed properly. Large amounts of toxic wastewater must be treated and disposed. Disposal of such wastewater into deep wells can cause earthquakes and other damages. Moreover, competition for water affects other human and economic activities, including drinking water, recreation, and agriculture, and could have a negative effect on wildlife habitat. The development of shale gas also carries emissions consequences, including NOx, SO2, volatile organic compounds, particulate matter, and methane. The only environmental benefit reported by

[51] http://patagoniaenergetica.com/2014/05/sinopec-argentina-curso-preventores-comunitarios-en-adicciones/

[52] http://www.patagonianexo.com.ar/v2/labor-conjunta-entre-pae-y-la-fundacion-proyecto-puente/#sthash.K5oDW5v6.dpuf

[53] http://patagoniaenergetica.com/2012/05/sinopec-inauguro-la-plaza-david-charles-en-las-heras/

Mares is that horizontal drilling significantly reduces the number of well pads, access roads, pipeline routes, and production facilities vis-à-vis vertical drilling.

Fortunately, Argentina's shale gas reserves are largely in sparsely populated regions of Patagonia, making some of the environmental issues less pressing (Mares, 2012). Nevertheless, there is a growing NGO movement against the use of fracking in Patagonia as well as in the rest of Argentina.[54] Some provincial affiliates of center-left political parties[55] as well as one of Argentina's trade union confederations (CTA) are also (formally or informally) part of this alliance. However, as noted above, the exploitation of these resources is still on a prospection and exploration phase and, except for the case of Chevron, no other oil firm has signed agreements with YPF to operate in this area, and the list of possible partners includes firms from many different countries.

4.4 Other aspects

National Law 17319 (reformed by Law 26197) establishes that oil and natural gas producers must pay a 12% royalty based on the crude oil price in the field (that figure may be reduced down to 5% according to the location and productivity levels of the fields). Although provinces may not legally increase royalties above that ceiling, some of them, like Neuquén and Chubut, create "special fees" that are added to the 12% established by law. In the case of Chubut this fee amounts to 3 to 4% of the crude oil price in the field.[56] Some provinces also include extra royalties and lump sum payments when they negotiate concessions with the oil operators. For example, Santa Cruz's 2008 renewal of PAE's oil field concession for 40 more years required the firm to pay another 3% in royalties and an initial payment of

[54] Some of the involved NGOs include Coordinadora de Comunicación Audiovisual Indígena Argentina (CCAIA), Grupo Ambiental Nogoyasero, Ambiente Comarca, Asamblea Ambiental Ciudadana (AAC) of Rio Gallegos, Asamblea Popular of Zapala, Asamblea Popular Colon-Ruta 135, Movimiento por la Recuperación del Petróleo en Neuquén, Asamblea Permanente por el Agua del Comahue, Foro Ambiental y Social de la Patagonia, and Mesa Entre Rios Libre de Fracking.

[55] Proyecto Sur, Frente Amplio Progresista and Coalicion Civica ARI.

[56] Contracts also include additional royalties that must be paid by oil firms to local governments where the oil activity is undertaken.

USD 40 million for infrastructure projects and educational programs. As mentioned above, the extension of PAE's concessions in Patagonia is under investigation in the United States due to alleged bribes.

Regarding **labor relations and wages**, note must be taken that workers in the oil industry are among the best paid in Argentina's economy, and the same holds in Chubut and Santa Cruz (salaries in the oil extraction sector are double the average salary in both provinces). However, oil firms operating in those provinces have had a long series of conflicts with workers and supplier firms, triggering strikes, picketing, and occupation of oil fields and plants. The main origin of these conflicts is the outsourcing process initiated with the restructuring and later privatization of YPF in the 1990s, but they also include complaints regarding the tax burden of oil workers and complaints that small contracting firms in Patagonia usually lack the resources to meet the technical demands of the oil companies. This situation is aggravated insofar as oil communities in Patagonia tend to see oil firms as the main source of employment generation in their territories[57].

Conflicts have been especially fierce in the case of PAE. In 2012 a group called "Los Dragones" (The Dragons), a breakaway from the construction workers union of Chubut, ransacked the Cerro Dragón oilfield and blocked several roads, demanding wage increases (the workers belonging to this group work for subcontractors and earn lower salaries than those directly employed by the oil industry) and the reinstatement of 40 workers who had been fired after PAE terminated contracts with two suppliers.

[57] As an illustration, Sinopec has been recently involved in three labor conflicts that affected their subcontractors. In all cases the origins of the conflicts were personnel firings which were due in one case to complains for poor labor conditions while in the other two cases the workers claims were about mismatches between salaries and skills required for certain jobs -subcontractors alleged that workers protests were illegal so firings were justified (http://www.elciudadanodelasheras.com/?p=39580).

In this context, in 2012 a new Hydrocarbons Law was passed in Chubut[58] that, among other objectives, regulates the relations between the oil firms and their goods and services providers, with the aim of promoting more linkages with the local economy. Currently, Chubut's government is trying to adapt the oil licenses in force to the new criteria introduced in the abovementioned law.

To reduce social conflict, PAE, has implemented various CSR programs aimed at improving the relations with suppliers, training the local labor force and promoting technology transfer. All these programs existed before the arrival of CNOOC but have been preserved after the entry of the new Chinese partners. The main program is SMEs of Golfo San Jorge, which started in 2005 and aims to improve the performance of local SMEs (focusing in organizational and technological capacity), increase value added and local content of production, and improve employment in the region. The program contains five main actions: i) preferred procurement for local SMEs, ii) technical capacity-building of local suppliers and upgrading in the value chain, iii) development of new suppliers for PAE, iv) creation of a network of local institutions and companies aimed at promoting cooperation and collective actions in the region, and v) technical and financial assistance for SMEs.

The Program has been quite successful. Since 2005, the number of participating companies has increased from 34 to 90, the number of locally-produced products grew from 12 to 28,[59] and the number of services provided by firms within the region grew from 3 to 15. Moreover, the Program offered more than 23,000 training hours and 18,000 hours of in house training. Several participating SMEs obtained quality assurance certifications. Finally, according to PAE, the Program has allowed a substitution of certain local producers for products previously imported. (PAE, 2013).

[58] Law XVII Nº 102 and Decree Nº 91/13
[59] Note that not all the products are specific of the oil industry.

Regarding NGO involvement, there are many like the abovementioned ASSUPA, which campaign against the environmental damages generated by the oil industry and are especially active in Patagonia. In turn, oil firms (including PAE and Sinopec) often seek alliances with local NGOs in order to jointly develop CSR programs.

5. Conclusions

As stated in the introduction, this study should be considered an exploration of relatively new subjects. Argentinean exports to China have grown quickly and currently China is among its major trade partners, but exports are extremely concentrated on soybean and its derivatives. This export basket produces less carbon emissions per dollar than exports to other markets, but that difference has been narrowing, as China is the only major trading partner associated with rising carbon emissions intensity. China's impact on water consumption is more direct, as soy is a high water consumption crop, and its water footprint is relatively large.

In our view, Santa Cruz's recent adoption of a law demanding that oil firms remedy their environmental liabilities is an example of the type of actions that should be taken to reduce the environmental impacts of the oil industry. Although Chinese firms may be less conscious of the need to adopt greener practices than other established oil firms, it is the responsibility of the local authorities to foster the use of better environmental management systems. Although the evidence suggests that provincial (and national) governments in Argentina have often been more interested in maximizing royalties or tax collection, growing pressure from local communities and other stakeholders could bring more attention to the environmental impacts of this industry.

In addition, more transparency is needed for a better evaluation of our research issues. Neither governments nor private firms are prone to disseminating relevant information on these matters, and no legal framework pushing for more

transparency in the relations between both parts exists in Argentina, making it difficult to have a good assessment of the current situation and its prospects[60].

Both more transparency and more active policies are needed in face of the opportunity (and challenges) associated to the apparently huge gas and oil reserves existing in Vaca Muerta, which need to be exploited through the use of fracking techniques. If forecasts are correct, Argentina could be one of the major reservoirs of those resources at the world level, which should give the country leverage to establish favorable negotiation conditions not only in terms of royalties, technology transfer and other economic variables, but also in terms of the preservation of the environment and the protection of local communities and producers. The main antecedent in this regard, however, is not very auspicious, since the terms of YPF's exploration contract with Chevron have not been made public. Moreover, the government of Argentina has been the target of complaints and a new investigation, due to allegations that a decree was signed that to give specific benefits to Chevron[61].

As China consolidates its role as a major economic and political superpower, there is a need for strategic consideration of the role of Argentina in this new international context, and how to handle the opportunities and risks presented by China's growing role in trade and investment. Long-term vision is needed, since the temptation of short-term profit opportunities in spite of long-term risks is very strong in countries with fragile institutional settings. More research on these issues could help to inform the public debate and help politicians and decision makers adopt more informed and better policy choices aiming at taking advantage of the trade and investment opportunities under an inclusive and sustainable development framework.

[60] In this regard, one option for Argentina could join the Extractive Industries Transparency Initiative (EITI), following the steps of Peru.

[61] http://www.lanacion.com.ar/1690219-la-camara-federal-impulsa-una-investigacion-sobre-cristina-kirchner-por-el-acuerdo-con-chevron

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