Large-scale mining in a small developing country: Macroeconomic impacts of revenue allocation policies

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A B S T R A C T

If fulfilled, the plan to start exploiting iron ore reserves at a large-scale in Uruguay would attract the country's largest foreign direct investment and would change the productive structure of the country, historically based on agricultural and livestock production. The prospective of large-scale mining could increase public revenue by taxing the activity. However, as the "natural resources' curse" hypothesis states, there may be some negative effects associated to the exploitation of natural resources: Dutch disease phenomenon, high-income volatility of resources, rent seizing, among others. The aim of this paper is to assess the impact that the exploitation of iron ore reserves might have on the Uruguayan economy, and to discuss different policy options in order to make use of funds derived from the activity. To do so, we apply a dynamic general equilibrium model, and we simulate different revenue allocation policies. Our results show that, even when the exploitation of iron ores reserves might lead to an appreciation of the domestic currency and thus have a negative impact on traditional export sectors, the magnitude of the effect would not be significant, and it would not adversely affect the long-term growth rate. The negative impact can be mitigated with the creation of an intergenerational investment fund, especially when a higher part of it is destined to foreign assets. Destining a high part of the fund to investment in infrastructure also contributes to boost the growth in GDP linked to the introduction of a large-scale mining activity in the country.

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1. Introduction

Recently, a foreign company presented to the Uruguayan government a project for large-scale extraction, processing and export of iron ore, with an estimated investment of USD 3000 million. If executed, this would become the largest foreign direct investment in the country's history, which has historically based its economy on agricultural and livestock production, with a limited tradition of mining activities. The economy would receive a supply shock that would expand its productive base, introducing large-scale exploitation of a nonrenewable resource for which currently there is no exploitation. At the same time, introducing taxes on the activity could increase significantly public revenues.

However, at government level there are reasons for analyzing this project with caution. The so-called "natural resources' curse" states that in many cases, the abundance of natural resources in an economy could be associated with poor performance in terms of growth (Sachs and Warner, 1995; Auty, 2001; Neumayer, 2004;

Collier and Hoeffler, 2005; Mehlum et al., 2006).[1]

One of the major negative effects associated with the discovery and large-scale exploitation of natural resources is the reallocation of production factors between the traditional tradable sector (i.e. not based on the newly discovered natural resource), the sector experiencing the boom and the non-tradable sector. This is usually known as the "Dutch disease." The growth in the tradable sector affected by the original boom creates a demand pressure in the non-tradable sector, raising its price. This causes a real appreciation of the domestic currency and the reallocation of resources from traditional tradable sectors (usually industry) towards the other sectors.

However, as Van der Ploeg (2011) notes, the "Dutch disease" is not the only downside associated to the natural resources' curse. For instance, when the traded sector is the "engine of growth" and

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[1] It is worth noting that many authors do not find empirical evidence to support the negative relation between natural resource exploitation and growth. See for example Sinnott et al. (2010), Lederman and Maloney (2008), Alexeev and Conrad (2009) and Brunnschweiler (2008).

benefits largely from learning by doing and other positive externalities, a temporary fall in competitiveness may cause a relative fall in the productivity of the traded sector in the long run. Also, high price and income volatility derived from the natural resource, associated with a low price elasticity of commodities' supply, may adversely affect the economic performance of countries rich in the natural resource. The effect of this phenomenon may be aggravated in the presence of financial markets imperfections and labor markets rigidities (see for example Van der Ploeg and Poelhekke (2009), Van der Ploeg (2011), and Hausmann and Rigobon (2003)).

Other explanations for the resources' curse rely on political economy arguments or on institutional factors. Countries with governments whose revenues depend mainly on income from the exploitation of natural resources tend to favor distributive policies and pay less attention to promote investment and enhance productivity and economic growth. The lower dependence on taxes as a source of revenue may favor less transparency, leading to governance problems and weak accountability (Moore, 2004).

Additionally, income from natural resources may contribute to income concentration. Certain groups may influence public policies and reduce social cohesion, by influencing public policies which do not benefit the general population or the most disadvantaged groups (Broad, 1995). This situation leads to "rent-seizing", where certain elites seek control over the right to allocate such income, encouraging their appropriation by interest groups and creating dubious development programs (Ross, 2001), or blocking technological and institutional improvements that could weaken their power (Acemoglu and Robinson, 2006). The strength of institutions is a key factor to dissipate the negative effects. According to Van der Ploeg (2011), strong institutions encourage productive entrepreneurship and results in positive profits and fewer people engaged in rent seeking, while in weak institutions environments, rent seeking has a higher return and there will be less productive entrepreneurs, worsening the economic outcomes.

The exploitation of a nonrenewable resource poses an additional challenge: how to balance the use of the resources between present and future generations. Since exploitation leads to depletion, resource use by current generations would reduce its usage by future generations, violating the principle of intergenerational equity.

Some instruments or institutional arrangements have been discussed as good practices to offset the natural resources' curse. One of them is the creation of government funds to save revenues obtained from the exploitation of natural resources, combined with a rule of fiscal balance. These tools help to withdraw the excess of foreign currency from the domestic market avoiding strong variations in relative prices. They ease the effect of inter temporal volatility of revenues on domestic demand and keep the wealth for future generations, while discouraging rent seeking. Some successful examples in this sense are those of Norway, Chile and Botswana (Wright and Czelusta, 2007; Acemoglu et al., 2003; Iimi, 2006; Stevens and Dietsche, 2008).

In Uruguay, following the private initiative to exploit the iron ore reserves, a new regulatory framework for mining was established. The new law regulates issues such as the production processes, the environmental management and the taxation regime associated with large-scale mining (LSM) in the country. The new regulatory framework creates a new "large-scale mining" tax linked to the operating margin, added to a 5% tax on sales. The law also establishes a set of rules for the allocation of this fiscal revenue. 30% of large-scale mining revenues are to be allocated to infrastructure, education and production projects; and the remaining 70% is saved in a Sovereign Intergenerational Investment Fund (FSII, for its Spanish acronym). FSII resources may be invested in a restricted set of assets, with the requisite that financial instruments nominated in local currency may not exceed 50% of total assets.

The aim of this paper is to analyze the effects of large-scale mining on the national economy, emphasizing the impact of alternative allocating rules for mining revenues. The discovery of iron ore reserves, as well as a recent prospect of oil exploration, are big challenges for a country historically specialized in agriculture and livestock. The assessment of the new regulatory framework and the rules for the allocation of the new fiscal revenue may shed light into the way of effectively minimizing a possible negative impact of mining on the economy and promoting economic growth. This could derive in policy implications for other countries that undergo similar reforms. Moreover, this work adds to the literature that analyzes the role of natural resources in Latin American countries' development, which has been particularly important recently (Albrieu et al., 2012, 2014; Caselli and Michaels, 2009; Menaldo, 2015; Burchardt and Dietz, 2014).

For this purpose, we apply a dynamic general equilibrium model. This methodology is relevant since it allows analyzing direct and indirect effects of the mining activity, while enabling some flexibility in setting macroeconomic rules to assess the impact of different fund allocation policies. This tool has been widely used in this type of analysis (see for example Traore and Djiofack (2015) for the case of gold reserves in Mali; Xu et al. (2015) for coal mining in China; Breisinger et al. (2010) for oil revenues in Ghana; and Benjamin et al. (1989) for oil revenues in Cameroon). The main advantage of the methodology is that it allows estimating the ex-ante direct and indirect impact of the mining boom simulating different counterfactual scenarios on the allocation of government benefits. The tool is adequate to analyze to what extent the appreciation of the real exchange rate induced by the wealth effect of the boom of the mining activity translates into a Dutch disease phenomenon, and to assess its sectoral impact. The model also considers the effects of public investment on total factor productivity as an externality factor resulting from public investment in infrastructure.

The downside of the methodology is that it does not consider political economy issues, such as rent-seizing, which was previously argued to be relevant to analyze the presence of a natural resource curse. Also, it is not possible to assess the intergenerational equity derived from the allocation of the fiscal revenue from the mining activity.

As our paper not only analyzes the impact of the mining sector, but also the policy implications derived from the allocation of revenue from the mining activity, we expect to contribute to the literature that analyzes to what extent natural resources might become a curse for developing countries.

The rest of the paper is organized as follows: Section 2 describes the methodology and data, Section 3 describes the simulated scenarios, Section 4 discusses the results and Section 5 presents the main findings. Finally, we draw some conclusions.

2. Model, data and assumptions

This section presents the computable general equilibrium model applied for the analysis of iron production and the distribution of resources derived from the large scale mining activity in Uruguay, as well as the data and the simulation scenarios.

2.1. The dynamic general equilibrium model

We apply a dynamic computable general equilibrium model for the Uruguayan economy. The model, called MAMS (Maquette for MDG Simulations), has been applied in numerous works for various developing countries including Uruguay (Laens and Llambí,