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Subsidy and natural resource curse: Evidence from plant level observations in Iran☆

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A B S T R A C T

Using plant level panel data of manufacturing firms in Iran from 2003 to 2013, we test the Dutch disease predictions, including the impact of a rise in oil prices on intensive and extensive margins of trade. Our findings indicate that during periods of high oil prices domestic currency appreciates, but contrary to resource curse theories, domestic firms export more, and new firms enter foreign markets. We reconcile this paradox by proposing a new channel, which we call "subsidy disease." Despite rising oil prices, the government of Iran kept domestic energy prices at low levels, which increased the implicit subsidy accruing to energy intensive firms. In effect, these firms gain a competitive advantage in foreign markets because of the increased subsidy. We show that energy intensive plants export more when the oil price is high. Moreover, consistent with natural resource curse models, we show that the average wage increases during periods of high oil prices, but much less for exporting firms. We also find robust evidence that high oil prices reduce investments of manufacturing firms.

1. Introduction

There is a heated debate about the effects of natural resources on the economy. Many theories such as the "natural resources curse" or "Dutch disease" have been introduced to explain why a country with abundant natural resources faces slow growth. Dutch disease theories imply that the manufacturing exports decline during periods of high oil prices, because the domestic currency appreciates. In contrast, we observe that a rise in international oil price increases the manufacturing export in both intensive and extensive margins, which seems inconsistent with the notion that oil revenues shrink this sector. Interestingly, the rise in manufacturing exports occurs despite the domestic currency appreciation. This finding appears puzzling.

The micro data at plant level enables us to examine alternative explanations. The domestic firms, that become exporter, should have gained a competitive advantage over their foreign counterparts. A potential answer to why they become exporters is productivity growth. However, this is not the case in Iran because manufacturing productivity actually declined at a rate of 2% per year in the same period (Rahmati and Pilevari 2017). We propose a new channel that can explain the positive effect of oil price on exports. The country uses the oil revenues to keep low energy prices despite a rise in international oil price. A cheap input such as energy allows inefficient domestic firms to gain a competitive advantage to export. This can explain why during periods of high oil prices the exports of manufacturing sector will increase. Moreover, we show that energy intensive firms export more during periods of high oil prices.

This explanation is in line with theoretical papers such as Murphy et al. (1993) and Torvik (2002) that discuss the impact of rent-seeking on growth. Theoretically, a price gap between international and domestic energy expenses provides an incentive for firms to export and gain from cheap domestic energy prices. This incentive for exports is relatively more pronounced for energy intensive firms and allows them to invest and grow. This shift of resources to energy intensive firms with low productivity may partially explain slow growth in resource abundant countries. Obviously, the massive and inefficient energy subsidies to low productive firms provide an example of how institution can matter whether oil windfalls to be a curse or a blessing. We call this channel "subsidy disease."

The facts show that the subsidy channel introduced in this paper is economically effective because many oil-exporting countries with slow long-run growth spend substantial resources on subsidies, which has destructive effects on production and encourages firms to employ energy intensive technologies. For example Venezuela, Iran, Kuwait,

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and Saudi Arabia subsidized 93.1%, 82%, 81.4%, and 78.6% of energy prices in 2014. Iran and Saudi Arabia paid 78 B US$ (19.3% of GDP) and 71.3 B US$ (9.5% of GDP) in energy subsidies in 2014.[1] The energy price subsidy reform is a good indicator of a well-established government that is executing the correct policies.

Another contribution of this paper is that we examine the dynamics of wages, investments, and other firm activities in response to oil shocks by using plant level observations. We find that the depreciation of domestic currency increases exports, larger and more productive firms export more, and a rise in the oil price increases the average payment to workers. Additionally, we observe that a rise in the oil prices on average reduces investments of manufacturing firms, except for firms with very high energy intensity. This paper is organized as follows. Section 2 reviews the literature on natural resource curse. Section 3 describes data. Section 4 explains methodology and the empirical models. The main results and sensitivity analysis are presented in Section 5, and Section 6 draws a conclusion.

2. Literature review

Economists proposed several frameworks to explain the natural resource curse. The first theory focuses on the role of real exchange rate, reviewed by Van der Ploeg (2011), in which a resource windfall appreciates domestic currency and increases imports, so it shrinks tradable sector. At the same time, the increase in natural resource revenues improves the national income, so the demand for nontradable sector increases. In reality, nontradable sector cannot respond to the surge in demand, so the prices of nontradable goods increase, and capital and labor concurrently move from tradable toward nontradable sector. Some papers provide evidence for this prediction. Kuralbayeva and Stefanski (2010) show that workers in tradable sector move toward nontradable sector to benefit from higher wages. Vostroknutova, Brahmbhatt, and Canuto (2010) document that in countries whose the share of resources is more than 30% of GDP, the share of manufacturing sector is 15% lower than the norm. Harding and Venables (2010) study 134 countries for the period 1975–2007 and show that a one dollar increase in the resource revenue increases imports by 15 cents and crowds out non resource exports about 50 cents, so national income increases only by 35%.

The second theory of Dutch disease emphasizes the role of learning-by-doing and other positive externalities of the tradable sector. Rising resource exports shrinks the tradable sector and reduces the level of employment in this sector, so learning-by-doing is decreased and economic growth stagnates. In these models, the tradable sector is the driving forces of economic growth. (Sachs and Warner (1995), Gylfason, Herbertsson, and Zoega (1999), Van Wijnbergen (1984), and Krugman (1987)). Nevertheless, one can also explain how energy subsidies to less productive firms with often high energy intensity discourage innovation and learning-by-doing, which hamper growth in the long-run.

The third theory stresses the role of institutions which is most likely related to our explanation of massive inefficient energy subsidies.[2] A windfall in resource revenues, especially point-source natural resources, increases corruption and weakens institutional capacity; thus it hampers economic growth (Isham et al., 2005; Mauro, 1995; Pritchett, Suryahadi, and Sumarto, 2000). Boschini, Pettersson, and Roine (2007) and Mehlum, Moene, and Torvik (2006) contend that natural resources are cursed only if they have grabber friendly institutions instead of producer friendly ones. For example, Norway has experienced a remarkable growth in the manufacturing sector despite a drastic growth in oil exports since 1971. It has one of the lowest levels of corruption in the world and enjoys developed institutions (Larsen, 2006). In the same line, abundant natural resources can boost rent-seeking behavior and the possibility of civil wars and conflicts (Ross, 2001; Collier and Hoeffler, 2004). Moreover, recent papers argue that the volatility of resource revenues can reduce growth (Gylfason, Herbertsson, and Zoega (1999); Leong, Mohaddes, 2011; El-Anshasy et al., 2015).

Besides case studies (such as Usui (1997), Pegg (2010)), most empirical papers use aggregate datasets, either cross-section or panel data, to investigate the effect of natural resources on the economy (Dülger et al., 2013). Using macro data has one important limitation. Aggregate data combine multiple primary factors that could be opposite to each other; so one factor could undermine or even wipe out the effects of another factor in these studies. Moreover, the dynamics between exporter versus non-exporter firms cannot be studied using aggregate data. However, some papers use sectoral datasets to study the above questions, but none uses plant level data. For example, Ismail (2010) uses annual data of 90 countries for the period 1977–2004 and shows that a 10% permanent increase in windfall accompanies a 3.4% reduction in value added of manufacturing sector and a 3.6% reduction in manufacturing output. On the other hand, Spatafora and Warner (1999) study 18 oil-exporting developing countries for the period 1965–1989 and document that tradable sectors export more in response to the appreciation of real exchange rate, but no sign of resource curse is found. Spatafora and Warner (1995) examine the same countries from 1973 to 1989 and show that agricultural and manufacturing sectors do not react to an increase in oil prices. A recent paper by Mironov and Petronevich (2015) estimate the resource movements between sectors in Russia and exploit several signs of Dutch disease. Few papers studied the impact of oil exports in Iran; the most related studies that also use aggregate data are Esfahani et al. (2013), Mohaddes and Pesaran (2013), and Ahmed et al. (2016).

The international trade literature is another line of research that relates to this paper and its methodology. Many empirical papers study the export behaviors of firms using plant level observations. For example, they find that exporters have more workers, higher wages, higher productivities, higher technology intensity, and higher ages. (Bernard et al., 1995, 1999, and Roberts, Tybout (1997). However, none of them studies the impact of the oil price shocks, energy intensity, and energy subsidies on the trade behavior of firms. One noticeable exception is Bernard and Jensen (2004) who incorporate state export promotion expenditures and find that they have no significant effect on exports.

As reviewed above, there are many empirical studies in the literature on natural resource curse that use macro datasets of different countries rather than micro panel data. To the best of our knowledge, this is the first paper to use panel data at the firm level to determine the role of an oil price shock on the manufacturing sector. As an exception, Keane and Prasad (1996) use National Longitudinal Surveys (NLS) datasets from the U.S. Bureau of Labor and show that an increase in the oil price leads to a drastic decrease in real wages of all workers. In addition, they find that the short-term effect of an increase in the oil price on employment is negative, but the long-term effect is positive. In contrast, we have access to firm level data, and we can examine firm trade decisions, average wages in exporters versus non-exporters, investments, and imports of intermediaries.

3. Data

We obtain an access to annual unbalanced panel data at the plant level of manufacturing firms from the *Statistical Center of Iran*. Data is collected for plants with more than 10 workers every year[3] and cover

[1] Source: The online database of IEA

[2] The link between energy subsidies and quality of governance remains a topic for future study.

[3] For plants with 10–50 workers, the center surveys firms randomly, but for plants with more than 50 workers, all firms are surveyed every year.