

Manufacturing in a Natural Resource Based Economy: Evidence from Canadian Plants

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Since the 1980s, myriad studies have investigated the oil price shock impacts on the economic performance in oil-exporting countries. However, the theoretical and empirical research on understanding the responses of firms to oil price shocks is limited. While most studies have focused on aggregate or sectoral analysis, only recently have researchers begun to examine the firm level impacts of the oil price shocks, thanks to the availability of large-scale micro data. The firm level studies allow us to examine the heterogeneous responses of firms to the oil price shocks based on their individual characteristics, which can aid to understand how regional economies perform generally after the boom. They will also provide better understanding of the diverse evidence on total employment and trade effects.

In this paper, we contribute to the literature of oil price shock effects on economic performance by first developing a theoretical model to analyze firm level outcomes in economies affected by a resource sector, and second, by conducting an empirical analysis using a large firm level dataset. Our general equilibrium model with heterogeneous firms and a natural resource sector allows us to understand how different firms respond to oil price shocks based on their given productivity. Relative to other studies setting out heterogeneous or productivity differentiated firms, we therefore leave behind the classical dichotomy of a traded and non-traded sector suggested by Dutch disease model. The model assumes a resource boom as an increase in the oil price or an increase in total factor productivity in the oil sector, which prompts a reallocation of labor from manufacturing firms to the oil sector. It further allows a geographical factor to interact with these dynamics. Specifically, the oil sector pays a wage premium over the wage of the manufacturing sector, which is largest for firms that are in the same locality as the oil sector and diminishes with distance.

We derive a number of predictions that reflect the interaction between the resource sector and the firm's performance including the export decisions, wages, and employment. For instance, the model predicts how a firm's choice on exporting responds to a resource boom, which after aggregating to a sectoral level gives an endogenous expansion of non-trading firms. Additionally, in contrast to other studies using firm-level data, we look at the export performance of firms affected by natural resource sector development. Specifically, our model suggests that while wage rate and domestic sales increase for a given firm, only most productive firms continue to export. Also, employment increases in a given non-exporting firm, but the effect is ambiguous for exporting firms. All these effects are attenuated by a distance parameter, allowing for a differentiation between geographies.

As a case study, we take the predictions of the model to a rich Canadian data source. Canada is a developed country with well-diversified economic activities across its provinces. Specifically, major oil extraction facilities are located in the western prov-

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ince of Alberta, while the eastern provinces of Ontario and Quebec are the major producers of manufacturing products. However, the oil and gas produced in Alberta are almost exclusively exported, mainly to the United States. In this sense, the Alberta oil industry is exemplary case of a booming sector that generates a local foreign exchange windfall. From the Annual Survey of Manufacturers (ASM) of Statistics Canada, we obtained yearly plant level data of all manufacturing plants in Canada from 2000 to 2010. We estimate the relationship between economic performance of each plant and time-varying revenues in the natural resource sector and cross-section varying distance of each plant relative to Ft. McMurray, Alberta, as the main hub of the oil extraction activity. We find that on average plants tend to be negatively affected by a boom in the natural resource sector in terms of employment, total revenue, productivity and exports. However, there exists a great heterogeneity in plants' responses, indicating that some plants actually do rather well. We cannot attribute this effect exclusively to the tradability of the produced output or industry linkages. Instead, we find that plants that have above average levels of productivity at the beginning of the sample period do relatively better and increase their exports in response to the resource boom.

The interaction between a resource extracting sector and manufacturing remains an important area for research. This paper indicates that plant level productivity can be an important explanatory channel to understand how firms, rather than sectors, respond to a resource boom. Relatively high productivity plants appear better able deal with shock in the resource sector. Policies aiming to prepare regional economies to the transition away from fossil fuels would do well to take account of the productivity of plants, rather than solely their linkage to the resource sector.