UNIVERSITY OF SUSSEX | BUSINESS SCHOOL

ECONOMICS

Working Paper Series

No. 02-2022

Oil Discovery, Boom-Bust Cycle and Manufacturing Slowdown: Evidence from a Large Industry Level Dataset

Nouf Alsharif
Department of Economics, University of Sussex, BN1 9SL Falmer, United Kingdom
noufns@gmail.com

Sambit Bhattacharyya
Department of Economics, University of Sussex, BN1 9SL Falmer, United Kingdom
S.Bhattacharyya@sussex.ac.uk

Abstract: We investigate the effects of giant oil discovery and boom-bust price cycle on manufacturing using a large dataset of up to 49481 two-digit industry-years across 136 countries over the period 1962 to 2012. We find that oil discovery reduces growth in manufacturing value added and wages. The effect on employment is insignificant. We also find strong association between oil discovery and manufacturing slowdown episodes. Oil price boom and bust both negatively affects manufacturing perhaps due to increasing input cost (boom) and declining demand (bust). We do not find any evidence in favor of a real exchange rate appreciation driven effect as outlined in standard Dutch Disease models. We speculate that the effect is primarily driven by an increase in the cost of locally sourced manufacturing input.

JEL codes: D72, O11

Key words: Oil discovery; Boom-Bust; Manufacturing growth

Oil Discovery, Boom-Bust Cycle and Manufacturing Slowdown: Evidence from a Large Industry Level Dataset[1]

Nouf Alsharif and Sambit Bhattacharyya[2]

3 June, 2022

Abstract: We investigate the effects of giant oil discovery and boom-bust price cycle on manufacturing using a large dataset of up to 49481 two-digit industry-years across 136 countries over the period 1962 to 2012. We find that oil discovery reduces growth in manufacturing value added and wages. The effect on employment is insignificant. We also find strong association between oil discovery and manufacturing slowdown episodes. Oil price boom and bust both negatively affects manufacturing perhaps due to increasing input cost (boom) and declining demand (bust). We do not find any evidence in favor of a real exchange rate appreciation driven effect as outlined in standard Dutch Disease models. We speculate that the effect is primarily driven by an increase in the cost of locally sourced manufacturing input.

JEL classification: D72, O11

Key words: Oil discovery; Boom-Bust; Manufacturing growth

---

[1] We gratefully acknowledge comments by and discussions with Rabah Arezki, Andy McKay, Kunal Sen, Brock Smith, Rick van der Ploeg, the seminar and conference participants at Kassel, Marburg, Oxford and Sussex. All remaining errors are our own.

[2]Alsharif: Department of Economics, University of Sussex, email: N.Alsharif@sussex.ac.uk. Bhattacharyya: Department of Economics, University of Sussex, email: s.bhattacharyya@sussex.ac.uk.

1 Introduction

The question of how oil boom-bust cycles affect manufacturing productivity is a vexed one. Theory predicts that oil boom disadvantages manufacturing by augmenting its price relative to other tradable commodities exported by the country through a mere exchange rate effect (Corden and Neary, 1982). Exchange rate appreciation through an expansion in raw materials trade makes tradable manufactured commodities dearer relative to other commodities and imports. Furthermore, expansion of the raw materials sector absorb scarce labour resources from the rest of the economy increasing wage cost for the entire economy including manufacturing. Such an increase in input cost harms manufacturing competitiveness even further. Finally, the positive wealth effect from an expansion in wages and savings typically translate into an expansion in demand for local services which further increases wage cost for manufacturing.

Even though theoretical predictions appear to be unambiguous, opposing economic forces might play out very differently in the real world. For instance, the degree and nature of impact of resource boom on the exchange rate could depend on monetary policy and macroeconomic management. Note that oil is mainly traded in US dollars and dollarization of this trade might limit the degree of appreciation of national currencies and its harmful effects on manufacturing. Moreover, the manufacturing sector's ability to substitute expensive labour input with capital or technology could also mitigate potential damages to its profitability arising from labour resource reallocation within the economy. Similar mitigating effects could also follow from a strong currency led relative decline in the cost of imported capital goods. Finally, the magnitude and nature of the effect could depend on the origins of a boom. Manufacturing productivity response could vary if the oil boom is due to a technology-induced rise in productivity (e.g., shale oil and gas), a new resource discovery, or an increase in world oil price. Therefore, despite theoretical unambiguity, the question of how oil boom affects manufacturing productivity is ultimately an empirical one.

In this paper, we address the empirical question set out above by estimating the effect of giant oil discoveries and oil price boom and bust on the growth rates of manufacturing value added, wages, and employment. We use georeferenced panel dataset of giant oilfield discoveries over the period 1962 to 2012 as news shocks and relate it to the growth rates of manufacturing value added, wages, and employment. The methodology adopted to compute growth rates of manufacturing value added, wages, and employment maps Rajan and Subramanian (2011). They evaluate the impact of foreign aid on manufacturing productivity. They use the United Nations Industrial Development Organization (UNIDO) database in order to compute manufacturing productivity. UNIDO data is largely derived from national industrial surveys. We also follow Rajan and Subramanian's (2011) exportability classification in assigning certain manufacturing industries as "exportable" and focusing on them to assess the impact of oil shocks on the tradable manufacturing sector.

Theory predicts that oil discoveries are likely to boost demand for local currency denominated assets and hence lead to local currency appreciation. Such an appreciation could culminate into opposing demand and supply side effects for the local manufacturing firms (Ekholm et al., 2012). On the demand side, it could damage competitiveness of the firms by making its goods expensive relative to its analogs in the international market. Similarly damaging effects are also expected in the domestic market as firms would face stiff competition from cheaper imports. In contrast, on the supply side, it could in fact enhance competitiveness of the firms by reducing the cost of imported capital goods. The relative strength of the demand and supply side effects are likely to depend on the relative factor intensity of these firms. The positive supply side effect could dominate if the firms rely more on imported capital goods as opposed to labour input which is likely to become more expensive following a resource boom (Corden and Neary, 1982).

Guided by the theoretical argument as outlined above, we readjust Rajan and Subramanian's (2011) 'exportability index' to make it fit for purpose. Note that Rajan and Subramanian (2011) focus exclusively on aid recipient poor countries and thus base their 'exportability index' on labor-intensive industries that characterizes manufacturing in these economies appropriately. In contrast, our study offers a wider coverage that includes oil discoveries in both developed and developing countries. Therefore, there is good reason to alter the 'exportability index'. In particular, we re-construct the index based on Rajan and Subramanian's (2011) methodology but accommodate capital-intensive manufacturing exports that is commonly observed in developed countries[3]. Nevertheless, we also use Rajan and Subramanian's (2011) 'exportability index' and the results appear to be qualitatively similar.

A key innovation of our paper is to use three manufacturing outcome measures from UNIDO INDSTAT 2 ISIC revision 3 namely: value added, wages and employment. This is an improvement over Rajan and Subramanian (2011) who only use growth in value added as a measure of manufacturing outcome. Allcott and Keniston (2018) argue that the impact of resource booms on manufacturing depend on manufacturing wage growth, manufacturing tradability, and local productivity spillovers from resources to manufacturing. Thus, there is merit in using all three outcome variables as opposed to one. By doing so in conjunction with using the 'exportability index' we are able to assess productivity, wage growth, employment, and potential spillovers conditional on the exportability of the manufacturing sector. This is a significant innovation not attempted elsewhere.

Identification of the effects of giant oil discoveries on manufacturing relies on the

[3]Rodrik (2013) argues that skill and capital biased technological changes in manufacturing is not just limited to developed economies but is global in nature. As a consequence, modern manufacturing increasingly limits comparative advantage of labour abundant poor economies and their ability to absorb large volumes of labour into the sector.

exogeneity of the former as a news shock.[4] How exogenous is a giant oil discovery news shock? This issue has been discussed at length by Cotet and Tsui (2013), Bhattacharyya et al. (2017), Arezki et al. (2017), Bhattacharyya and Keller (2021), and Bhattacharyya and Mamo (2021) who use similar identification strategies. They rely on the stochastic nature of giant and supergiant oil discoveries. They work with the definition that a giant oil and / or gas (including condensate) field is a deposit that contains at least a total of 500 million barrels of ultimate recoverable oil or gas equivalent which generates an annual revenue stream of approximately USD 0.4 billion. The annual revenue stream estimate is based on assumptions of 5-year gestation lag between detection and operation, USD 25 a barrel average price over the lifetime of the deposit, and average discount rate of 10 percent. The annual revenue stream estimates are useful. However, it is noteworthy that professional experts disagree on discount rates, timing, technological progress, and price changes which renders net present value calculations extremely challenging. Arezki et al. (2017) presents a sophisticated analysis of net present value of giant oil discoveries. Given the uncertainties associated with estimating revenue, these studies argue that discoveries are better treated as exogenous news shock rather than a projection based expected revenue shock (Arezki et al., 2017; Bhattacharyya and Keller, 2021).

Giant or supergiant discoveries are rare events and therefore its exact timing is extremely difficult to predict. This is crucial for its exogeneity. Can politicians or governments manipulate the timing of announcement for political benefit? Arezki et al. (2017) rule out that possibility in Horn (2004), a dataset that we use here. It is also used in the previous studies. Horn (2004) shows that these concerns about possible manipulation have little grounds. Arezki et al. (2017) writes that, "*each discovery date included in his dataset has been independently verified and documented using multiple sources which are reported*

[4] Note that this relates to only the discovery shock part of the paper. The other part relies on price shocks and hence uses a different identification strategy.

systematically for each discovery date".

Political and macroeconomic factors, past discoveries, and exploration effort[5] could also predict giant discoveries. Exploration effort, political and economic factors could enhance the likelihood of a discovery. Arezki et al. (2017) argue that past discoveries could have two opposing effects on future discoveries. It could increase discovery cost thus reducing the likelihood of future discoveries. Conversely, it could also enhance knowledge of the local geology thereby increasing the likelihood of future discoveries. We control for these factors and discuss them in sections 2 and 6 of the paper. In particular, section 6 discusses the effect of wildcat drilling (a measure of exploration effort) on manufacturing outcome. These factors do not appear to predict either giant discoveries or affect our key estimates when included as an additional control.

We find oil discoveries reduce manufacturing wage and value-added growth 10 years after a discovery news shock. Therefore, it is reasonable to assume that these effects are induced by actual production as opposed to discovery. They also appear to be far more long lasting. In contrast, the employment effect appears to be instantaneous at $t = 0$ and 5 years after. The instantaneous effect is expectation induced whereas the effect after 5 years could be due to labour movement triggered by the beginning of construction at some of these deposit locations.

Despite reservations on the accuracy of present value calculations of deposits, we also estimate the effect of 'value of oil discoveries per capita' on manufacturing outcome variables and the results are similar. This is to account for the expected revenue effects of oil discovery which could be heterogeneous across deposits.

After establishing the link between discovery and manufacturing outcomes, we explore transmission channels. Theory predicts that the decline in manufacturing could be

[5]Exploration effort is measured by wildcat drilling as in Cotet and Tsui (2013), Bhattacharyya et al. (2017) and Bhattacharyya and Keller (2021).

related to a shift in preference from manufactured goods to services (Ngai and Pissarides, 2004). It could also be due to skill biased technological progress and productivity growth (Rodrik, 2013). Matsuyama (2009) argue that these effects are conditional on globalization. Integrated economies benefit from higher government revenue during oil boom which can then be used to support manufacturing (Michaels, 2011). We test this by interacting discoveries with trade openness and real exchange rate appreciation. We do not find evidence that trade openness and real exchange rate are the transmission channels through which oil discovery affects manufacturing.

Following Freund and Pierola (2012) methodology we code 40 manufacturing slowdown episodes between 1971 and 2011. This offers an alternative measure of manufacturing slowdown. We find strong positive effects of oil discovery on manufacturing slowdowns 5 to 10 years after discovery.

Our second identification strategy is based on oil price boom and bust cycle which is described by Bjørnland and Thorsrud (2016) as a major exogenous element that could potentially affect all sectors of the economy. We follow Hamilton (1983, 2009, 2011), Kilian (2008) and Smith (2019) to identify boom bust periods. The boom periods are 1974-1980 (boom1) and 2002-2012 (boom2) and the bust period is 1981-1986. We also add the "valley" period 1989-1995. More on this in section 4 of the paper.

We find that oil boom has a negative effect on manufacturing employment and wage growth. The effect on value added is negative but statistically insignificant. The negative effect disappears if we prioritize exportable manufacturing by interacting the oil boom dummy with the exportability index dummies. This could be due to largely procyclical policy induced transfers from the government to export-oriented manufacturing. It could also be due to positive supply side effects from cheaper capital goods import and the availability of cheap credit for investment in capital intensive export-oriented manufacturing firms. The negative effect is far more pronounced during the period of oil price collapse (bust). Price collapse unambiguously reduces manufacturing value added, employment and wage growth. Price collapse is often accompanied by credit crunch and therefore negative effect of the collapse on manufacturing is unsurprising. However, the effect is again statistically insignificant for export-oriented manufacturing. This could be reflective of the creditworthiness of these firms. Export-oriented manufacturing firms are likely to be relatively more credit worthy compared to firms that predominantly focus on the local market. A stable oil price environment (valley) does not seem to affect manufacturing value added and wage growth. However, manufacturing employment appears to continue retreating even under a stable oil price environment. This is perhaps reflective of skill and capital biased technological changes in manufacturing during that period (Rodrik, 2013) or a shift in consumption preferences away from manufactured goods to services (Ngai and Pissarides, 2004; Buera and Kaboski, 2009; and Foellmi and Zweimüller, 2008).

Our paper makes the following contributions to the literature. First, it estimates the effect of oil discoveries on manufacturing value added, employment and wages. The timing of oil discovery news shock allows for a distinction between contemporaneous expectation induced effects and long-term construction and production induced effects. It is worthwhile noting that previous studies typically ignore the effect of discoveries. Therefore, our study undoubtedly creates new knowledge. Moreover, previous studies solely focus on value added as opposed to employment and wages. Examining manufacturing employment and wages allow us to assess the impact of discovery shocks on the labor market and potential spillovers. Second, the paper presents new results on the effect of news shocks on manufacturing slowdown. Third, in addition to discovery news shock the paper also estimates the effect of oil boom-bust cycle conditional on exportability of the manufacturing industries. These results are new. Finally, our data includes both developed and developing countries at the industry level whereas earlier studies typically cover only one country group or a single country. Therefore, our results are generalizable and externally valid.

Our result demonstrates the enclave character of oil across countries. Petroleum unambiguously harm manufacturing and especially its labor-intensive segment. This prevents significant policy challenges for oil rich low- and middle-income countries. Manufacturing in these countries are predominantly labor intensive and therefore viewed as a major conduit for the 'poverty reduction through job creation' agenda. Our result discloses the risk of premature deindustrialization in these economies.

Early empirical literature on Dutch Disease tends to focus on the effects of a resource boom on manufacturing at an aggregate cross-national level. In contrast, in this paper we utilize industry level data observed across countries and highlight tradable industries. These are improvements over existing studies. In what follows, we review some of the notable cross-national studies on this topic. Ismail (2010) uses aggregate manufacturing value added data from a sample of oil exporting countries and finds that oil price shocks depress manufacturing value added conditional on capital markets openness. Arezki and Ismail (2013) show using a sample of 32 oil-rich countries over the period 1992 to 2009 that fiscal policies mitigate the harmful effects of oil shocks by reducing capital expenditure. Harding and Venables (2016) find that exports of natural resources crowd out non-resource exports and the impact on the latter is magnified in countries with high income and good governance. The magnified impact in high income and good governance countries could be associated with high manufacturing share in the non-resource exports of these countries.

More recently, two notable studies focus on within country variation instead. Allcott and Keniston (2018) investigate the impact of oil and gas booms on manufacturing in the United States by combining oil and gas endowments data and Census of Manufacturers microdata both aggregated at the county level covering the period 1969 to 2014. They find no evidence of a resource curse in the United States. They report that manufacturing employment, output and productivity are all pro-cyclical with oil and gas booms and thus they contribute to manufacturing growth. Bjørnland and Thorsrud (2016) study productivity spillovers between the booming resource sector and other sectors in Norway and Australia (two resource-rich countries) and find that they face a two-speed economy challenge whereby services and non-tradable sectors grow much faster relative to manufacturing. They also identify some important differences between the two countries. They show that increased activity in the technologically intense service sectors and generous government spending derived from favourable movements in commodity price has a positive effect on manufacturing value added and employment in Norway, whereas the absence of such policies explains the full effects of the Dutch disease and manufacturing decline in Australia.

Our econometric design is similar to Rajan and Subramanian (2011) even though they test the effect of foreign aid on manufacturing value added. Other key differences between our study and Rajan and Subramanian (2011) is our focus on manufacturing wages and employment as opposed to their exclusive focus on value added. Furthermore, our sample includes all countries whereas their sample is restricted to aid recipients only. Finally, we construct our own exportability index which is a departure from their study.

Smith (2019) is another study closely related to section 4 of our paper. Smith (2019) uses boom-bust cycles in oil price to identify the effect of resource boom on non-resource exports and manufacturing value added. His exports sample is from NBER-UN World Trade Flows covering the period 1962 to 2000 and 109 countries whereas the manufacturing value added sample is from UNIDO INDSTAT 3 ISIC revision 2 covering the period 1968 to 1995 and 78 countries. In contrast, our sample from UNIDO INDSTAT 2 ISIC revision 3 covers the period 1962 to 2012 and up to 49481 two-digit industry-years across 136 countries. Due to these data limitations, Smith (2019) concedes that his estimates of the effects of oil on manufacturing value added based on the UNIDO data are unreliable relative to his estimates on manufacturing exports based on the NBER-UN data. Furthermore, Smith (2019) assigns treatment countries based on resource dependency measured by resource revenue to GDP ratio in 1974. We follow a similar methodology while assigning treatment but exclude net oil importers. We also interact these treatment effects with the exportability index to prioritise differences in export-oriented manufacturing industries between treatment and control countries. Smith (2019) ignores exportability as a factor. Finally, Smith (2019) do not analyse the impact of discovery shocks which we do here.

Our paper is related to a literature on diversification, structural change and productivity growth. McMillan and Rodrik (2011) show that a raw materials price shock in resource-rich developing countries move labour away from high productivity manufacturing and tradable sectors to low productivity services and informality. Similarly, Rodrik (2012) highlights challenges for resource rich poor countries as resource boom can generate short-term growth but misallocate resources to the ‘‘wrong’’ sectors jeopardising long term prosperity. Diao and McMillan (2018) presents an in-depth analysis of Africa. They show that the share of manufacturing exports in total exports is actually rising in Africa once both formal and informal manufacturing is accounted for. This is notwithstanding the low productivity levels of manufacturing in the informal sector. Rodrik (2016) document that the manufacturing share in both employment and real value added is falling in developing countries since the 1980s, with the exception of Asia. Manufacturing typically follows an inverted U-shape when mapped against the level of development, but there is significant evidence of premature deindustrialization in poor and middle-income countries. Alsharif and Bhattacharyya (2019) report manufacturing export and employment concentration following oil discoveries using a sample of 136 countries observed over the period 1962 to 2012.

Our paper is also related to the wider resource curse literature. For a survey of the early literature, see van der Ploeg (2011) and Venables (2016). More recent studies on resource curse focus on its dependence on institutional quality (eg., Mehlum et al., 2006; Alexeev and Conrad, 2009; Bhattacharyya and Hodler, 2010, 2014; Bhattacharyya and Collier, 2014), local effects (Aragon and Rud, 2013; Mamo et al., 2019; Allcott and Keniston, 2018), leader's survival (Bhattacharyya and Keller, 2021), conflict (Cotet and Tsui, 2013; Lei and Michaels, 2014; Bhattacharyya and Mamo, 2021), oil discoveries (Arezki et al., 2017) and boom-bust cycles (Smith, 2015).

The remainder of the paper is organized as follows. Section 2, analyses the effect of oil discovery news shocks on manufacturing value added, employment, and wages. In doing so it introduces the model and the data. This is followed by a discussion of the results. Section 3, analyses the effect of oil discoveries on manufacturing slowdown measured by the metric developed by Freund and Pierola (2012). Discovery shocks may not be reflective of the revenue effects of oil. Thus, section 4 focuses on the effect of boom-bust cycle on the same manufacturing outcome variables. Section 5 deals with robustness and section 6 concludes.

2 Oil Discovery and Manufacturing: Value Added, Employment and Wages

In order to estimate the effect of oil discovery news shocks on manufacturing, we follow Rajan and Subramanian (2011) and estimate the following model:

$$\Delta \ln Y_{ict+j} = \gamma_i + \alpha_c + \omega_t + \beta_1 \text{Disc}_{ct} \times \text{Exportability}_{ci} + \beta_2 \text{PDisc}_{ct} + \beta_3 \text{Industry}_{ict-1} + \varepsilon_{ict} \quad (1)$$

where Y_{ict+j} is the manufacturing outcome variable of interest (value added, employment or wages) for industry i in country c at year $t+j$ where j takes the value 0, 5 and 10. Disc_{ct} is a binary indicator taking the value 1 for the discovery of a giant oilfield in country c at year t and 0 otherwise. $\text{Exportability}_{ct}$ is also a dummy variable that takes the value 1 for exportable ISIC industries and 0 otherwise. This variable closely follows the Exportability Index 1 variable in Rajan and Subramanian (2011) even though we also construct our own Exportability Index 2. Note that Rajan and Subramanian (2011) provide a detailed description of exportability indices. Exportability index 1 is described as a dummy that takes a value of 1 if industry i has a ratio of exports to value that exceeds the industry median value. For each industry, the average ratio of exports to value added was calculated using a group of developing countries. Exportability index 2 is a dummy for industries ISIC 29-35 which includes both labour and capital-intensive manufacturing. This is an improvement over Rajan and Subramanian (2011) who focus on a narrow group of labour-intensive industries (ISIC 321-324) more relevant to the aid recipient poor countries. For a full industry description, see table 1. PDisc_{ct} is the past discoveries variable which measures the number of years with discoveries in country c over the period $t-10$ to $t-1$ (i.e., the last ten years). Industry_{ict-1} is the share of industry i in country c at year $t-1$. It is computed as a share of the industry to total manufacturing sector a year prior to discovery news shock. This variable is expected to capture convergence effects with industries with a bigger share are likely to grow slower relative to industries with a smaller share. Finally, the specification also includes γ_i industry fixed effects, α_c country fixed effects, ω_t time varying common shocks, and ε_{ict} the error term. Note that β_1 is our main coefficient of interest with $\beta_1 < 0$ indicating harmful effects of oil discoveries on manufacturing outcome variables and vice versa.

The data for industry value added, employment and wages come from the Industrial Statistics database 2015 of the United Nations Industrial Development Organization (UNIDO) (INDSTAT2, 2013) series covering 136 countries over the period 1962 to 2012. The data is at the 2-digit level of ISIC Revision 3. A clear advantage of the INDSTAT2 data is its wide country coverage going back to the year 1962 for up to 23 manufacturing industries. UNIDO claims it to be the largest cross-national industrial statistical database[6]. Note that Smith (2019) uses INDSTAT3 instead, as it provides more disaggregated data at the four-digit level for up to 127 industries.[7] However, it covers fewer countries and its within country coverage is extremely patchy for the earlier years. The patchy coverage of the earlier years renders INDSTAT3 impractical to work with for years earlier than 1990. Our approach is similar to Rodrik (2013) who also use INDSTAT2 precisely due to its wider country and time coverage. Despite our explicit preference for INDSTAT2, we also use INDSTAT4 for robustness tests. These results are reported in the long appendix and discussed in section 5.

In addition to using value added, employment and wages data from INDSTAT2, we use it to construct the exportability indices 1 and 2. For exportability index 1, we match the industries with the ones selected by Rajan and Subramanian (2011) for index 1-developing countries. For exportability index 2, we choose ISIC industries 15-26 for developed countries. This is demonstrated in table 1.

Note that the database reports real manufacturing value-added measured in current US dollars. We deflate it using 2008 as the base year. Therefore, our value added is measured in 2008 constant US dollars. Value added data is reported to the UN Statistics Division by member countries denominated in their national currencies. This is then converted to US dollars using market exchange rate from the IMF or UN operational rates of exchange (UNOP) wherever appropriate. Price-adjusted rates of exchange (PARE) is used as an alternative in the event of considerable exchange rate volatility.[8]

Ideally one would like to use purchasing power parity exchange rates for international comparison. In the absence of such data, the 2008 constant US dollars offer a reasonable

[6] As described by UNIDO: https://www.unido.org/resources/statistics/statistical-databases.html

[7] The same applies to INDSTAT4.

[8] See https://unstats.un.org/unsd/snaama/ for further details.

compromise. Manufacturing is tradable and therefore in a globalized market economy manufactured goods are likely to face a common US dollar world price. Using 2008 as the base year allows us to compute real value added.

Note that UNIDO data do not cover informal sector activities and microenterprises as they are often excluded from national industrial surveys. Therefore, our results are applicable to organized and formal manufacturing.

Oil discovery variable is sourced from Horn (2004) and has already been used widely in previous studies (Cotet and Tsui, 2013; Lei and Michaels, 2014; Arezki et al., 2017; Bhattacharyya and Keller, 2021; Bhattacharyya and Mamo, 2021). This is a binary 0-1 variable taking the value 1 in the event of a giant or supergiant discovery. We have already discussed this variable at length in section 1 and therefore will not repeat it here. In short, Horn (2004) reports discovery date, country, and a number of other variables for 910 giant oilfields discovered both onshore and offshore from 1868 to 2003. A giant oilfield must contain ultimate recoverable reserves of at least 500 million barrels of oil equivalent.

Table 2 catalogues the number of giant oilfield discoveries by year from 1962 to 2003. It shows that discoveries peaked in the 1960s and 1970s. Double-digit number of discoveries emerged for a brief period in the late 1990s. Of the 910 giant oilfield discoveries catalogued by Horn (2004), only 364 are used in this paper to cover the period 1962 to 2003. Our UNIDO data starts in 1962 and therefore we are not able to go further back in time. The 364 country-year observations with giant discoveries account for 5.2% of the total observations. Table 3 demonstrates that giant oilfield discoveries are rare events in most countries. In our sample, discoveries are most common in Asia (40%), followed by Africa (17%), Europe (19%), South America (10%), North America (9%) and Oceania (5%). The treatment group comprises of 64 countries that have had at least one giant oil discovery during the study period. The control group comprises of 72 countries that have never had any giant oil discoveries during the study period. Therefore, our sample offers a balanced comparison between treatment and control.

Before we embark on discussing the baseline estimates, it is perhaps worthwhile analyzing some country specific trends. In figure 2 we examine the average growth rate of manufacturing value added 5-years before and after giant oil discoveries in Egypt, Philippines, Norway and Bangladesh. The chosen countries vary in terms of institutional quality and level of economic development. We observe that the value-added growth in tradable industries is weaker compared to other industries following giant oil discoveries. For instance, in Egypt, the tradable sectors of Electrical Machinery, Textiles, and Furniture Manufacturing appear to experience negative growth on average for 5 years following a giant oil discovery. The effect on the relatively less tradable Food and Beverage sector appears to be relatively mild. Similar patterns are observed in the Philippines, Norway and Bangladesh.

Do political and economic shocks predict giant oil discoveries? If they do, then that would call into question exogenous nature of the oil discovery news shocks. In table 4, we report fixed-effects logit models where the independent variables are lags of polity 2 scores, manufacturing value added, employment, growth, and oil prices. In addition, we also use shocks in income per capita, government expenditure and investments. The shocks are measured by changes. We do not find any evidence that these variables are able to predict giant oil discoveries.

Table 5 presents estimates of equation 1. In other words, what is the effect of oil discovery news shock on the growth rate of manufacturing value added after controlling for country, year and industry fixed effects; past discoveries; and industry share over the sample period 1962 to 2012 covering 136 countries. Column 1 presents the contemporaneous effects of a discovery and we observe no statistically significant effect. Columns 2 and 5 show the effects 5 and 10 years after discovery respectively. We find statistically significant negative effects on manufacturing value added growth 10 years after discovery which is indicative that the effect is driven by production as opposed to expectation or construction. On average it takes about 6 years for deposits to start production (Arezki et al., 2017).

A giant oil discovery appears to reduce the growth rate of manufacturing value added by 1.8% on average. This is indeed a reasonably large effect. For example, World Bank data indicates that the world average manufacturing growth rate for the period 1995 to 2020 was approximately 2.4% annually which offers a sense of perspective.

Columns 3, 4, 6, and 7 interact the oil discovery shocks with the exportability indices 1 and 2 respectively. Recall that exportability indices are dummy variables taking the value 1 if industry i has a ratio of exports to value that exceeds the industry median. Exportability index 2 includes both capital and labour intensive industries whereas exportability index 1 concentrates on labour intensive industries frequently observed in poorer countries. We do not find any evidence that exportability is a major factor influencing the negative effects of discovery.

Tables 6 and 7 estimates similar models with manufacturing employment and real wages respectively. The effects on real wage growth appear to be qualitatively similar to value added. The negative effect on employment growth appears to set in somewhat earlier. The contemporaneous negative effect could be induced by changes in expectations following the discovery news shock. Employment growth also appear to get affected 5 years after the discovery which is typically the construction phase of a deposit. Additional demand for labour from the oil sector is expected during this stage which perhaps explains the negative effect on manufacturing employment.

As expected, in tables 5-7 we consistently find strong convergence effects. Industries with a higher relative share (i.e., bigger) growing slower. Similarly, past discoveries appear to have a negative effect on manufacturing value added, employment and wages.

We have recorded giant oil discovery as a binary news shock variable. Such a design arguably ignores heterogeneity associated with expected revenue effects of giant oil discoveries. Some studies also argue that oil revenue could be used to support manufacturing that could potentially generate a contrarian effect. Thus, in table 8 we use the *log value of giant oil discoveries per capita* as the key independent variable instead of the binary oil discovery variable. We find that the expected revenue effects on manufacturing outcome are not qualitatively dissimilar to the discovery news shock effects reported in tables 5 – 7. The effects on manufacturing value added and wages are negative even though it is somewhat weaker in case of value added when the expected revenue shock is interacted with exportability index. In particular, the negative effect is not significant when revenue shock is interacted with exportability index 2. This is perhaps suggestive that relatively capital-intensive manufacturing industries are better able to utilize greater oil revenue to substitute expensive labor input with capital and technology to partially mitigate the negative effects on value added. We do not observe any statistically significant effect of the expected revenue shock on manufacturing employment.

Table 9 turns to examining transmission mechanism of the negative effect. Rajan and Subramanian (2011) and Bjørnland and Thorsrud (2016) argue that the effect is magnified by globalization and trade liberalization. If globalization is indeed the transmission channel then adding a measure of trade openness as an independent variable in equation 1 should eliminate or weaken the negative effect of oil discovery on manufacturing outcome measures. In table 9 we use real exchange rate (RER) as a measure of trade openness. It is expected that oil discovery shock would lead to appreciation of the RER thus damaging manufacturing.

RER is computed as the log difference between the actual and estimated price levels of exports and the data is sourced from the Penn World Table (PWT) version 8. We do not find any evidence that globalisation is magnifying the negative effects of an oil discovery shock. Thus, it appears that oil discovery adversely affects manufacturing primarily through increased input cost as opposed to adverse real exchange rate effects.

Similarly, we also test the same thesis using Sachs and Warner's trade openness index and the results are qualitatively unchanged. Note that, the Sachs and Warner (1995) index classify a country as not liberalized if any of the following conditions apply: (i) Its average tariff rate on imports of capital or intermediate goods is above 40 percent; (ii) Its non-tariff barriers cover 40 percent or more of its import of capital and intermediate goods; (iii) Its black market premium is 20 percent or more; (iv) It has a socialist economic system; (v) It has a state monopoly on major exports. The original index ran from 1950 to 1990. Wacziarg and Welch (2003) updated this index and extend it till 2000.The trade openness index results are reported in the long appendix.

3 Oil Discovery and Manufacturing Slowdown

In section 2, we have established the negative effects of oil discovery on manufacturing growth in value added and wages. Next, we analyze how sustained this negative effect is. In particular, we study to what extent oil discoveries predict 40 episodes of manufacturing slowdown. A slowdown is defined as a significant and sustained decline in manufacturing value added growth from one three-year period to the next. We use the Freund and Pierola (2012) filter to identify episodes of manufacturing slowdowns. A slowdown must satisfy the following criteria:

a) Real average manufacturing value added growth over 3 years is below -2%.
b) Real average 3-year manufacturing value added growth decreases by one third from the previous 3-year average and is at least two percentage points below the previous three-year average.
c) Average growth during the drop, excluding the weakest year of growth, is lower than the average growth before the drop.

Note that condition (a) ensures that value added growth is below world average for a slowdown. Condition (b) ensures that growth decreases significantly from the previous three-year period and is not just a trend. And condition (c) excludes slowdowns that are due to 1 year of very weak growth. To identify the slowdowns, we continue using the same INDSTAT2 dataset from UNIDO we used in the previous section. After applying the criteria mentioned above, we obtain 40 episodes of manufacturing value added slowdowns between 1971-2011.

In order to assess the effect of oil discovery on manufacturing slowdown episodes, we estimate the following model:

$$y_{ict+j} = \lambda_i + \theta_c + \mu_t + \gamma_1 \text{Disc}_{ct} + \gamma_2 \text{PDisc}_{ct} + \gamma_3 \text{Industry}_{ict-1} + \eta_{ict} \quad (2)$$

where y_{ict} is a dummy variable taking the value 1 if it is coded as slowdown in industry i, country c, and year t, and 0 otherwise. The specification also includes λ_i industry fixed effects, θ_c country fixed effects, μ_t time varying common shocks, and η_{ict} the error term.

Table 10 reports the effects of oil discovery shocks on manufacturing slowdown. We do not find any contemporaneous effect as reported in column 1. However, we do find statistically significant effects on manufacturing slowdown episodes 5 years and 10 years after oil discovery. These results are reported in columns 2 and 3. Note that reported coefficients are positive here indicating discoveries triggering slowdown.

4 Oil Boom-Bust Cycle and Manufacturing Growth

Oil boom is primarily a price driven resource shock which may not be captured by the oil discovery news shock. Therefore, in this section we introduce an additional identification strategy in the form of oil price boom and bust cycle. Bjørnland and Thorsrud (2016) describes this as a major exogenous element that could potentially affect all sectors of the economy. We use the following equation to assess the impact of boom-bust cycles on manufacturing.

$$\Delta \ln Y_{ict} = \sigma_i + \rho_c + \tau_t + \delta_1 \text{Boom}_t \times \text{Exportability}_{ci} + \delta_2 \text{Bust}_t \times \text{Exportability}_{ci} + \delta_3 \text{Valley}_t \times \text{Exportability}_{ci} + \delta_4 \text{Industry}_{ict-1} + \xi_{ict} \quad (3)$$

where Y_{ict} (as in equation 1) is the manufacturing outcome variable of interest (value added, employment or wages) for industry i in country c at year t. Boom_t is an indicator of oil boom years 1974-1980 and 2002-2012, Bust_t is an indicator of oil bust years 1981-1986, and Valley_t is an indicator of the flat valley years 1987-1995. Note that, δ_1 is the average difference in outcome growth rates in exportable sectors (captured by exportability indices 1 and 2) in treatment and control countries during the boom period conditional on country, year and industry fixed effects. δ_2 and δ_3 have the same interpretation for the bust and valley periods.

The most significant oil price shock took place in the 1970s when the Arab oil exporting countries declared an oil embargo in response to the western support to Israel in the Arab-Israeli conflict. Oil prices quadrupled between 1973 and 1974, and remained high for several years. Prices increased again in 1979 in response to the Iranian revolution. In 1981, oil prices crashed due to oversupply and weak demand. Prices remained relatively low until the mid-2000s when it increased again due to high Southeast Asian demand. Figure 2 demonstrates oil price trends over the period 1950 to 2011. Price is measured in real US dollars and the vertical lines represent boom and bust periods. We follow the literature to identify the boom and bust periods (see Hamilton, 1983, 2009, 2011; Kilian, 2008; and Smith, 2019). As a robustness test, the 2002-2012 boom period is also broken up between 2002-2007 and 2009-2012 to account for the decline in oil price in 2008. Results are qualitatively similar to the main result. It is reported in the long appendix. Oil price data used to construct these indicators is taken from Teorell et al. (2015).

One might argue that the valley period is almost flat and does not contain any significant information. We actually take advantage of this period as a placebo shock, meaning that oil countries are expected to exhibit similar trends to the non-oil countries during this time.

Corden and Neary (1982) suggest that oil price shock should affect net oil exporters only and net oil importers should be excluded even if they are oil producing. Following Corden and Neary (1982) we exclude the net oil importers from the sample. These countries are indicated by bold font in table 11. We also run regressions including these countries as a robustness exercise. These results are reported in the long appendix.

Table 12 reports the results. Oil price boom appears to negatively affect employment and wages in the treated oil exporting countries. The treatment effect on value added is negative but insignificant. Tradable manufacturing does not seem to suffer negative effects in all three manufacturing outcome variables as is indicated by the columns where boom is interacted with the exportability indices. This could be due to greater government support or a strong currency induced cheaper imported inputs. In contrast, the negative effect is preserved in a sample of all manufacturing perhaps highlighting the adverse consequences of a greater local input cost.

The effect of a bust also appear to be negative in the treated countries. This could be due to a general decline in local demand and withdrawal of state support. Again, both labor- and capital-intensive tradable manufacturing does not seem to get affected as they can mitigate weak local demand by a weak currency induced strong external demand.

Finally, there appears to be very little difference between treatment and control countries during the valley period.

5 Robustness

We conduct a range of robustness tests to check the overall validity of our results. We discuss them as follows. These results are not reported in the main text of the paper but are assembled in the long appendix which is not for publication.

Skeptics argue that oil discoveries are not exogenous and they are dependent on exploration effort. We do control for past discoveries to account for exploration effort but there is a view that this may not be sufficient. Therefore, we conduct the following robustness tests to confirm that we are not picking up the effects of exploration effort on manufacturing as opposed to oil discovery.

First, we follow Cotet and Tsui (2013) and use Association for the Study of Peak Oil (ASPO) data on international exploratory drilling. ASPO records data on exploratory drilling from 63 countries covering the period 1930 to 2003. This variable is commonly referred to as 'wildcat drilling'. Usage of the 'wildcat drilling' variable reduces our sample size to 63 countries observed over the period 1962 to 2003. We replace the oil discovery variable by wildcat drilling in equation (1) and re-estimate the model. If indeed we are picking up the effects of exploration effort as opposed to oil discovery then we would expect the associated coefficient to be significant. Note that we do not find such effects with 'wildcat drilling' thus confirming the validity of our oil discovery based identification strategy.

Second, we use oil reserves as an instrument for oil discoveries following Cotet and Tsui (2013). The instrumental variable is the log of oil reserves calculated for each country in any year by subtracting cumulative production from cumulative discovery. For detailed definition see Cotet and Tsui (2013). Results are robust and is reported in the Long Appendix.

Third, Bjørnland and Thorsrud (2016) argue that nominal values of wages and value added may not deliver the same result as real values. Thus, we check robustness by estimating equation 1 using nominal values and the results are robust.

We also conduct other robustness tests. We rerun the baseline regressions using INDSTAT4 data instead of INDSTAT2 from UNIDO's industrial statistics database at the 4-

digit level of disaggregation for manufacturing. This data covers fewer countries, and a smaller time horizon as it goes back to 1985 only. The results are robust.

With regards to the boom-bust model, we test robustness by including oil producing net importers in the sample. Furthermore, we divide the 2000s oil boom into two booms: 2002-2007 and 2009-2012 respectively. Results are robust in both cases.

6 Concluding Remarks

A large literature focuses on the aggregate macroeconomic effects of oil using cross-national dataset. However, little attention is devoted to sectoral effects and potential industry level effects. In this study, we aim to fill this gap by investigating the effects of giant oil discovery and boom-bust price cycle on manufacturing using a large dataset of up to 49481 industry-years spanning 136 countries over the period 1962 to 2012. We find that oil discovery reduces growth in manufacturing value added and wages. The effect on employment is negative but insignificant. This is perhaps reflective that manufacturing firms are sluggish to adjust labour input and most of the adjustment takes place in physical capital. We also find strong association between oil discovery and manufacturing slowdown episodes. Oil price boom and bust both negatively affect manufacturing perhaps due to increasing input cost (boom) and declining demand (bust). We do not find any evidence in favour of a real exchange rate appreciation driven effect as outlined in standard Dutch Disease models. We speculate that the effect is primarily driven by an increase in locally sourced manufacturing input cost.

Our results complement a literature that suggests that in resource-rich countries the tradable manufacturing sector could be declining while overall growth is increasing (Smith, 2015; Allcott and Keniston, 2018). This could be due to local demand induced expansion in the informal sector (Diao & McMillan, 2015) and not by globalization (Rodrik, 2016).

Are there any lessons for resource rich poor countries aspiring to modernise their economy? It appears that oil affects manufacturing through increasing input cost as opposed to real exchange rate appreciation. Thus integrating with the global supply chain in order to import affordable capital goods could be critical towards industrialisation of these countries.

Appendices

A1. List of Countries in the Sample of Table 5 Column 1:

Albania, Algeria, Angola, Argentina, Armenia, Australia, Azerbaijan, Bangladesh, Belarus, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Congo Dem. Rep., Congo Rep., Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Ghana, Greece, Guatemala, Guinea, Guinea Bissau, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea South, Kuwait, Kyrgyz Republic, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Macedonia, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, United Arab Emirates, United Kingdom, USA, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, Vietnam, Yugoslavia, Zambia, Zimbabwe.

References

Alexeev, M. and R. Conrad (2009), "The elusive curse of oil." *The Review of Economics and Statistics*, 91, 586–598.

Allcott, H. and D. Keniston (2018) Dutch Disease or agglomeration? The local economic effects of natural resource booms in modern America. *Review of Economic Studies*, 85(2): 695-731.

Alsharif, N. and S. Bhattacharyya (2019) Oil Discovery, Political Institutions and Economic Diversification. *Scottish Journal of Political Economy*, 66(3): 459-488.

Aragon, F. M. and JP. Rud (2013) Natural resources and local communities: evidence from a Peruvian gold mine. *American Economic Journal: Economic Policy*, 5: 1-25.

Arezki, R. and K. Ismail (2013) Boom-bust cycle, asymmetrical fiscal response and the Dutch disease. *Journal of Development Economics,* 101: 256-267.

Arezki, R., V. Ramey, and L. Sheng (2017), "News Shocks in Open Economies: Evidence from Giant Oil Discoveries." *The Quarterly Journal of Economics*, 132, 103–155.

Bhattacharyya, S. and P. Collier (2014), “Public Capital in Resource Rich Economies: Is there a Curse?” *Oxford Economic Papers*, 66 (1), 1-24.

Bhattacharyya, Sambit, Louis Conradie, and Rabah Arezki (2017), “Resource discovery and the politics of fiscal decentralization.” *Journal of Comparative Economics*, forthcoming.

Bhattacharyya, S., and R. Hodler (2010). Natural Resources, Democracy and Corruption, *European Economic Review*, 54, 608-621.

Bhattacharyya, S., and R. Hodler (2014). Do Natural Resource Revenues Hinder Financial Development? The Role of Political Institutions, *World Development*, 57, 101-113.

Bhattacharyya, S. and M. Keller (2021) Resource discovery and the political fortunes of national leaders. *Economica*, 88(349): 129-66.

Bhattacharyya, S. and N. Mamo (2021) Natural resource discovery and conflict in Africa: what do the data show? *Economic Development and Cultural Change*, 69(3): pp. 903-950.

Bjørnland, H. C., and L. A. Thorsrud (2016). Boom or Gloom? Examining the Dutch Disease in Two-speed Economies. *The Economic Journal*, 126(598): 2219-2256.

Buera, F. J. and J. P. Kaboski (2009). Can traditional theories of structural change fit the data? *Journal of the European Economic Association, 7*(2-3), 469-477.

Corden, W. M. and Neary, J. P. (1982) Booming sector and de-industrialization in a small open economy. *Economic Journal*, 92: 825-48.

Cotet, A., and K. Tsui. (2013). “Oil and Conflict: What Does the Cross Country Evidence Really Show.” *American Economic Journal: Macroeconomics* 5(1): 49–80.

Diao, X. and M. McMillan (2018). Toward an Understanding of Economic Growth in Africa: A Re-Interpretation of the Lewis Model, *World Development*, 109: 511-522.

Ekholm, K., A. Moxnes, and K. H. Ulltveit-Moe (2012). Manufacturing restructuring and the role of real exchange rate shocks. *Journal of International Economics, 86*(1), 101-117.

Foellmi, R., and J. Zweimüller (2008). Structural change, Engel's consumption cycles and Kaldor's facts of economic growth. *Journal of Monetary Economics, 55*(7), 1317-1328.

Freund, C., and M. D. Pierola (2012). Export surges. *Journal of Development Economics, 97*(2), 387-395.

Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *The Journal of Political Economy*, 228-248.

Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007-08: National Bureau of Economic Research.

Hamilton, J. D. (2011). Historical oil shocks: National Bureau of Economic Research.

Harding, T., and A. J. Venables (2016). The implications of natural resource exports for non-resource trade. *IMF Economic Review*, 64: 268-302.

Horn, M. (2004). Giant Fields 1868-2004 (CD-ROM), Houston.

INDSTAT2, U. (2013). Industrial Statistics Database at the 2-digit level of ISIC (Rev. 3).

Ismail, K. (2010). The Structural Manifestation of the'Dutch Disease': The Case of Oil Exporting Countries. *IMF Working Papers*, 1-36.

Kilian, L. (2008). The economic effects of energy price shocks. *Journal of Economic Literature, 46*(4), 871-909.

Lei, Y-H., and G. Michaels (2014). Do Giant Oilfield Discoveries Fuel Armed Conflicts? *Journal of Development Economics*, 110: 139–157.

Mamo, N., S. Bhattacharyya, and A. Moradi (2019) Intensive and extensive margins of mining and development: evidence from Sub-Saharan Africa. *Journal of Development*

Economics, 139: 28–49.

Matsuyama, K. (2009). Structural change in an interdependent world: A global view of manufacturing decline. *Journal of the European Economic Association, 7*(2-3), 478-486.

McMillan, M. S., and D. Rodrik (2011). Globalization, structural change and productivity growth: National Bureau of Economic Research.

Mehlum, H., K. Moene, and R. Torvik (2006). Institutions and the Resource Curse, *The Economic Journal*, 116, 1-20.

Michaels, G. (2011). The Long Term Consequences of Resource-Based Specialisation. *The Economic Journal,* 121(551), 31-57.

Ngai, L. R., and C. Pissarides (2004). Balanced growth with structural change. Meeting Papers 450, Society for Economic Dynamics.

Rajan, R. G., and A. Subramanian (2011). Aid, Dutch disease, and manufacturing growth. *Journal of Development Economics,* 94(1), 106-118.

Rodrik, D. (2008). The real exchange rate and economic growth. *Brookings papers on economic activity,* 2008(2), 365-412.

Rodrik, D. (2012). Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1): 165-204.

Rodrik, D. (2013). Structural change, fundamentals and growth: an overview. *Institute for Advanced Study*.

Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth,* 21(1): 1-33.

Sachs, J. D., and A. M. Warner (1995). Natural resource abundance and economic growth, National Bureau of Economic Research.

Smith, B. (2015). The resource curse exorcised: Evidence from a panel of countries. *Journal of Development Economics,* 116, 57-73.

Smith, B. (2019). Dutch disease and the oil and boom and bust, *Canadian Journal of Economics*, 52(2): 584-623.

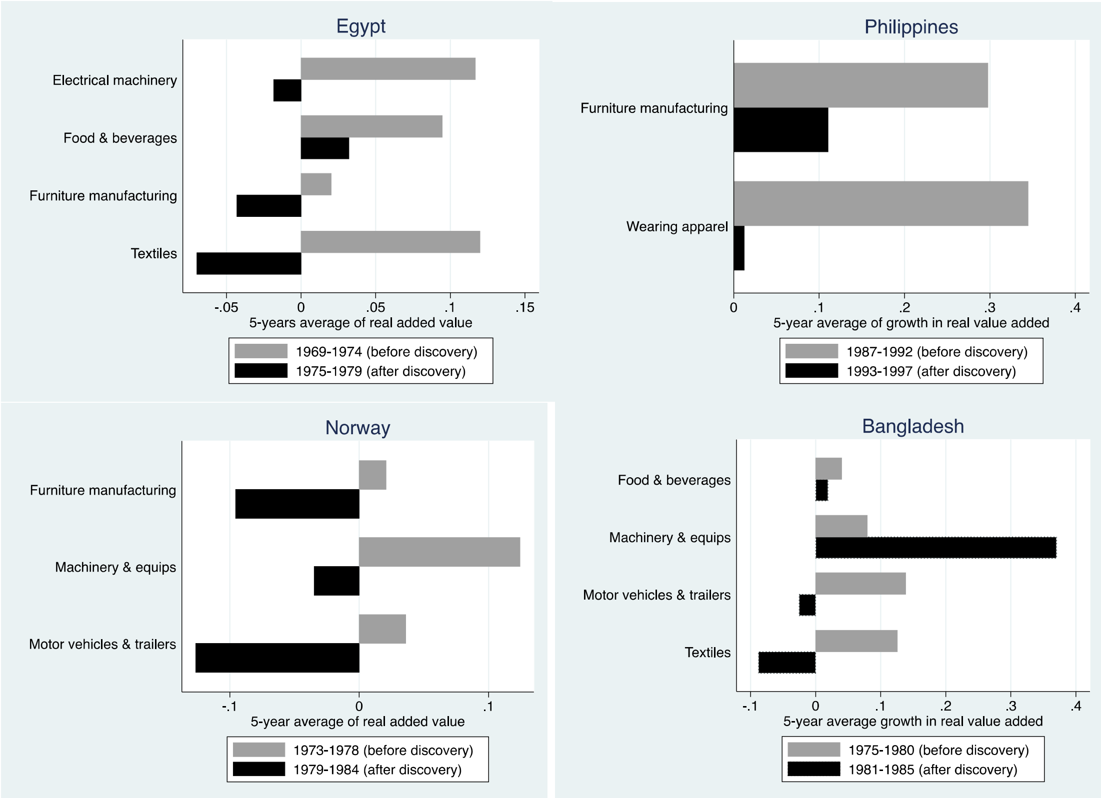
Teorell, J., S. Dahlberg, S. Holmberg, B. Rothstein, F. Hartmann, and R. Svensson (2015). The quality of government standard dataset, version jan15. *University of Gothenburg: The Quality of Government Institute*.

van der Ploeg, F. (2011) Natural resources: curse or blessings? *Journal of Economic Literature*, 49: 366-420.

Venables, A. (2016), "Using Natural Resources for Development: Why Has It Proven So Difficult?" *Journal of Economic Perspectives*, 30, 161–84.

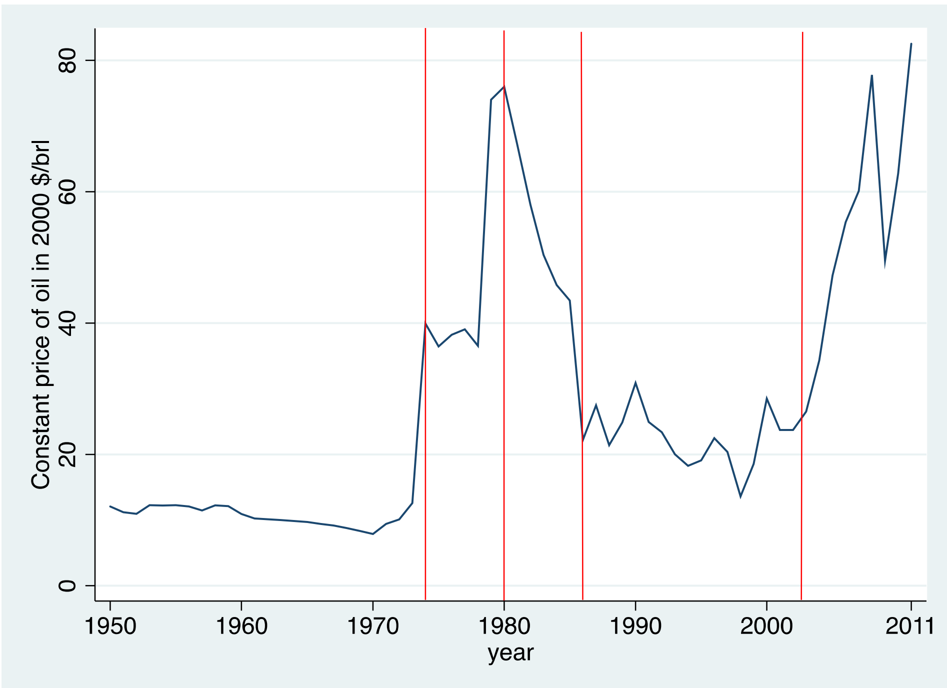
Wacziarg, R., and K. Welch. (2003). "Trade Liberalization and Growth: New Evidence," NBER Working Paper No. 10152, December.

Figure 1: Manufacturing Value Added Growth before and after Giant Oil Discoveries



Notes: The x-axes report the 5-year average growth in real value added in percentage terms, the y-axes show selected exportable industries in each country. Data sources: value added data is from UNIDO. Oil discovery data is from (Lei and Michaels, 2014).

Figure 2: Oil Prices Boom and Bust Periods 1950-2012



Notes: Oil prices are constant prices of oil in 2000. Red lines represent oil prices shocks, oil booms from 1974-1980 and 2002-2012, bust from 1981-1986, and valley from 1987-2001. Data source: M. Ross, Oil and gas data, 1932-2011, Harvard Dataverse Network, 2013 provided by the QOG Basic Dataset 2015 (Teorell et al., 2015).

Table 1: Manufacturing ISIC 2-digit Industries from INDSTAT2-UNIDO

ISIC	Industrial sectors	Exportability 1	Exportability 2
15	Food and beverages	1	0
16	Tobacco products	0	0
17	Textiles	1	0
18	Wearing apparel	1	0
19	Leather products and footwear	1	0
20	Wood products except furniture	1	0
21	Paper and paper products	0	0
22	Printing and publishing	0	0
23	Coke, refined petroleum products and nuclear fuel	1	0
24	Chemicals and chemical products	1	0
25	Rubber and plastics products	0	0
26	Non-metallic mineral products	0	0
27	Basic metals	1	0
28	Fabricated metal products	0	0
29	Machinery and equipment	1	1
30	Office, accounting and computing machinery	1	1
31	Electrical machinery and apparatus	0	1
32	Radio, television and communication equipment	0	1
33	Medical, precision and optical instruments	1	1
34	Motor vehicles, trailers and semi-trailers	1	1
35	Other transport equipment	1	1
36	Furniture	0	0
37	Recycling	0	0

Table 2: Number of Giant Oil Discoveries by Year: 1962 to 2003

Year	Number of giant oilfield discoveries	Year	Number of giant oilfield discoveries	Year	Number of giant oilfield discoveries	Year	Number of giant oilfield discoveries	Year	Number of giant oilfield discoveries
1962	9	1971	14	1980	14	1989	7	1998	11
1963	11	1972	9	1981	6	1990	9	1999	15
1964	13	1973	11	1982	7	1991	6	2000	12
1965	16	1974	9	1983	5	1992	8	2001	8
1966	9	1975	12	1984	6	1993	4	2002	7
1967	9	1976	10	1985	7	1994	4	2003	6
1968	9	1977	11	1986	3	1995	9		
1969	12	1978	7	1987	4	1996	7		
1970	11	1979	9	1988	4	1997	4		

Table 3: Number of Giant Oil Discoveries by Country: 1962 to 2003

Country	**Years**	**Country**	**Years**	**Country**	**Years**
Russia	30	India	5	Albania	1
Iran	24	Algeria	4	Azerbaijan	1
Saudi Arabia	24	Argentina	4	Bangladesh	1
Australia	18	Colombia	4	Cote d'Ivoire	1
Nigeria	17	Congo, Rep.	4	Denmark	1
China	16	Kuwait	4	Ecuador	1
United States	16	Qatar	4	Equatorial Guinea	1
Norway	15	Peru	3	France	1
Indonesia	14	Thailand	3	Gabon	1
Brazil	13	Tunisia	3	Germany	1
United Arab Emirates	12	Bolivia	2	Hungary	1
United Kingdom	12	Brunei Darussalam	2	Morocco	1
Iraq	11	Italy	2	Namibia	1
Libya	11	Kazakhstan	2	New Zealand	1
Mexico	10	Myanmar	2	Papua New Guinea	1
Egypt, Arab Rep.	8	Netherlands	2	Philippines	1
Oman	8	Pakistan	2	Romania	1
Angola	7	Sudan	2	Sierra Leone	1
Canada	7	Trinidad & Tobago	2	Spain	1
Malaysia	6	Vietnam	2	Turkmenistan	1
Venezuela	6	Yemen	2		

Table 4: Do political and economic shocks predict giant oil discoveries?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Previous year's polity2 score	0.005 (0.020)					-.0331 (.0403)				
Previous year's real value added in manufacturing		1.57e-11 (1.09e-10)								
Previous year's employment in manufacturing			4.56e-08 (4.20e-08)							
Previous year's growth				-3.58e-14 (9.60e-14)						
4 year lagged oil prices					-.0105 (.0079)	.00402 (.0156)				
Change in income pc							-0.00006 (0.0001)			
Change in government expenditure								-0.0174 (0.228)	-0.0118 (0.0098)	
Change in investments						.0309 (.0216)		0.0359 (0.022)		0.0277 (0.0205)
Observations	2672	24448	27063	2092	2130	384	2256	481	1057	481
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	131	136	136	136	129	129	136	132	132	132
Year	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003

Notes: reported coefficients are from a fixed-effects logit model of the probability of a giant oil discovery occurring in a given year. Robust standard errors in parentheses. Columns 5 and 6 show the impact of lagged oil prices on giant oil discoveries, we chose 4 year lag to allow for the time usually taken between exploration and announcement, however, we did not find any shorter lags significant (3,2,1 years). The only significant oil price lag is 5-year lag but only at the 10% level, this estimate becomes insignificant if we control for variables in column 6. Any lag more than 5 years becomes insignificant as well. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Giant Oil Discoveries and Manufacturing Growth: Value Added

Dependent variable: *annual growth rate of value added in industry i in country c (logged)*							
Outcome in year:	*j=0*	*j=5*			*j=10*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Oil discovery	0.003 (0.007)						
Oil discovery (t+j)		-0.007 (0.007)			-0.018*** (0.007)		
Oil discovery (t+j) *Exportability index (1)			-0.009 (0.009)			-0.015 (0.009)	
Oil discovery (t+j) *Exportability index (2)				-0.006 (0.014)			-0.014 (0.014)
Past discoveries (t-10)	-0.002 (0.002)	-0.006*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.006*** (0.002)	-0.005*** (0.002)	-0.005** (0.002)
Industry share (t-1)	-0.532*** (0.044)	-1.057*** (0.073)	-1.062*** (0.073)	-1.061*** (0.073)	-1.067*** (0.071)	-1.072*** (0.072)	-1.071*** (0.072)
Observations	49481	46416	46416	46416	43908	43908	43908
Cntry, Yr, and Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136
Year	1962-2003	1962-2008	1962-2008	1962-2008	1962-2012	1962-2012	1962-2012

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1, 5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table 6: Giant Oil Discoveries and Manufacturing Growth: Employment

Dependent variable: *annual growth rate of employment in industry i in country c (logged)*

Outcome in year:	*t*	*t+5*			*t+10*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Oil discovery	-0.010**						
	(0.004)						
Oil discovery (t+j)		-0.009**			-0.004		
		(0.004)			(0.004)		
Oil discovery (t+j) *Exportability index (1)			-0.007			-0.005	
			(0.005)			(0.006)	
Oil discovery (t+j) *Exportability index (2)				-0.009			-0.002
				(0.009)			(0.010)
Past discoveries (t-10)	-0.002	0.000	-0.000	-0.000	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry share (t-1)	-0.533***	-0.442***	-0.442***	-0.442***	-0.436***	-0.436***	-0.435***
	(0.033)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
Observations	56192	53010	53010	53010	51723	51723	51723
Cntry, Yr, and Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136
Year	1962-2003	1962-2008	1962-2008	1962-2008	1962-2012	1962-2012	1962-2012

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***,** and * denote significant at 1,5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table 7: Giant Oil Discoveries and Manufacturing Growth: Real Wages

Dependent variable: *annual growth rate of real wages in industry i in country c (logged)*

Outcome in year:	*t*	*t+5*			*t+10*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Oil discovery	0.004						
	(0.006)						
Oil discovery (t+j)		-0.003			-0.022***		
		(0.006)			(0.006)		
Oil discovery (t+j) *Exportability index (1)			0.001			-0.021***	
			(0.007)			(0.008)	
Oil discovery (t+j) *Exportability index (2)				0.002			-0.026**
				(0.011)			(0.012)
Past discoveries (t-10)	-0.002	-0.005***	-0.004***	-0.004***	-0.004***	-0.003**	-0.003*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Industry share (t-1)	-0.433***	-0.508***	-0.508***	-0.508***	-0.306***	-0.309***	-0.307***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.032)	(0.032)	(0.032)
Observations	50577	47503	47503	47503	42396	42396	42396
Cntry, Yr, and Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136
Year	1962-2003	1962-2008	1962-2008	1962-2008	1962-2012	1962-2012	1962-2012

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table 8: Value of Giant Oil Discoveries and Manufacturing Growth: Value Added, Employment and Real Wages

Outcome is:	Value added			Employment			Wages		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Value of giant oil discoveries pc (log)	-0.270***	-0.195*	-0.238	0.030	0.011	0.055	-0.242***	-0.241***	-0.308**
	(0.093)	(0.107)	(0.193)	(0.042)	(0.059)	(0.104)	(0.064)	(0.081)	(0.131)
Past discoveries (t-10)	-0.000	-0.000	-0.000	-0.003**	-0.003**	-0.003**	0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry share (t-1)	-0.557***	-0.559***	-0.559***	-0.514***	-0.518***	-0.518***	-0.387***	-0.389***	-0.389***
	(0.050)	(0.050)	(0.050)	(0.036)	(0.036)	(0.036)	(0.034)	(0.035)	(0.034)
Observations	44462	44508	44540	49684	49742	49782	45370	45428	45468
Cntry, Yr, Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136	136	136
Year	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Independent variable is the log of value of giant oil discoveries per capita sourced from Cotet and Tsui (2013). They use the Association for the Study of Peak Oil (ASPO) data which runs till 2003. They extend it till 2008 using BP Statistical Review of World Energy (BP), Oil and Gas Journal (OGJ), and CIA factbook. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table 9: Oil Discoveries and Manufacturing Growth: Transmission Channels

Outcome is:	Value added			Employment			Wages		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Oil Discovery (t+10)	-0.017***	-0.015	-0.012	-0.003	-0.005	0.005	-0.020***	-0.019***	-0.023***
	(0.007)	(0.009)	(0.015)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.006)
RER	-0.015	-0.013	-0.013	-0.003	-0.002	-0.002	-0.016	-0.014	-0.011
	(0.013)	(0.012)	(0.012)	(0.005)	(0.009)	(0.010)	(0.011)	(0.011)	(0.012)
Past discoveries (t-10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136	136	136
Year	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012
Observations	43058	43058	43058	50628	50628	50628	40678	40678	40678

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation. RER is the log difference between the actual and estimated price levels computed using the Penn World Table (PWT) version 8.

Table 10: Manufacturing Slowdown Episodes and Oil Discoveries

Dependent variable: *manufacturing value added slowdown episodes*	(1) j=0	(2) j=5	(2) j=10
Oil discovery (t+j)	0.001	0.008***	0.007***
	(0.002)	(0.002)	(0.002)
Past discoveries (t-10)	0.003***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)
Industry share (t-1)	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes
Countries	136	136	136
Year	1971-2003	1971-2008	1971-2011
Observations	45587	40096	33096

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1, 5 and 10% level. Past discoveries are the number of years with giant oilfield discoveries from t-10 to t-1. The dependent variable, slowdown episodes, calculated following Freund and Pierola (2012).

Table 11: Treatment Group Countries: Oil Price Boom and Bust

Country	UNIDO	Country	UNIDO
Albania	**Yes**	Libya	Yes
Algeria	Yes	**Malaysia**	**Yes**
Bahrain	Yes	**Mexico**	**Yes**
Bolivia	Yes	Nigeria	Yes
Canada	**Yes**	Oman	Yes
Columbia	**Yes**	Qatar	Yes
Ecuador	Yes	Saudi Arabia	Yes
Egypt	**Yes**	Syria	Yes
Gabon	Yes	Trinidad and Tobago	Yes
Indonesia	Yes	Tunisia	Yes
Iran	Yes	United Arab Emirates	Yes
Iraq	Yes	**United States**	**Yes**
Kuwait	Yes	Venezuela	Yes

Notes: Countries in **bold** font are net importers oil producing countries and are excluded from the main regression; we add them in a separate regression, results are shown in Long Appendix.

Table 12: Impact of Oil Price Boom, Bust and Valley on Manufacturing Growth: Value Added, Employment and Real Wages

	Value added			Employment			Wages		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Boom	-0.088	-0.012	-0.016	-0.170***	-0.006	-0.014	-0.143**	-0.012	-0.026
	(0.070)	(0.024)	(0.036)	(0.060)	(0.018)	(0.024)	(0.061)	(0.020)	(0.028)
Bust	-0.128***	-0.025	-0.065	-0.111***	-0.008	-0.012	-0.141***	-0.004	-0.046
	(0.048)	(0.032)	(0.046)	(0.031)	(0.019)	(0.026)	(0.037)	(0.029)	(0.040)
Valley	-0.088	0.026	0.020	-0.042	-0.006	0.001	-0.059	-0.007	-0.006
	(0.058)	(0.034)	(0.053)	(0.047)	(0.020)	(0.030)	(0.046)	(0.024)	(0.036)
Industry share	-0.388***	-0.394***	-0.387***	-0.411***	-0.411***	-0.410***	-0.326***	-0.323***	-0.325***
	(0.094)	(0.094)	(0.094)	(0.061)	(0.061)	(0.061)	(0.075)	(0.076)	(0.076)
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012
Observations	43908	43908	43908	51723	51723	51723	42396	42396	42396

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Long Appendix (Not for Publication)

Table LA1: Oil Discoveries and Manufacturing Growth: Transmission Channels (Trade Openness)

Outcome is:	Value added			Employment			Wages		
	All (1)	Interacted* Exportability Index 1 (2)	Interacted* Exportability Index 2 (3)	All (4)	Interacted* Exportability Index 1 (5)	Interacted* Exportability Index 2 (6)	All (7)	Interacted* Exportability Index 1 (8)	Interacted* Exportability Index 2 (9)
Oil Discovery (t+10)	-0.014***	-0.012	-0.012	-0.006	-0.007	0.003	-0.017**	-0.014**	-0.016**
	(0.006)	(0.009)	(0.011)	(0.005)	(0.006)	(0.003)	(0.006)	(0.004)	(0.006)
Trade Openness	-0.005	0.003	0.002	-0.003	-0.008	-0.008	-0.016	-0.008	-0.009
	(0.011)	(0.009)	(0.008)	(0.005)	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)
Past discoveries (t-10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	114	114	114	114	114	114	114	114	114
Year	1962-2000	1962-2000	1962-2000	1962-2000	1962-2000	1962-2000	1962-2000	1962-2000	1962-2000
Observations	43229	43229	43229	50732	50732	50732	40881	40881	40881

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation. Trade Openness is measured by the Sachs and Warner trade openness index which takes the value 1 if a country-year is open to trade and 0 otherwise.

Table LA2: Wildcat Drilling and Manufacturing Growth: Accounting for Exploration Effort

Outcome is:	**Value added**			**Employment**			**Wages**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wildcat Drilling (t+10)	0.024	0.019	0.016	0.004	0.006	0.002	0.019	0.016	0.013
	(0.017)	(0.016)	(0.016)	(0.005)	(0.004)	(0.003)	(0.016)	(0.016)	(0.014)
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	63	63	63	63	63	63	63	63	63
Year	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003	1962-2003
Observations	13842	13842	13842	13842	13842	13842	13842	13842	13842

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Independent variable is a dummy taking the value 1 in a country year of wildcat drilling sourced from Cotet and Tsui (2013). Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table LA3: Oil Discoveries and Manufacturing Growth: LIML Instrumental Variable Estimates

Outcome is:	**Value added**			**Employment**			**Wages**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Oil Discovery (t+10)	-0.016***	-0.013	-0.014	-0.008	-0.008	0.004	-0.019**	-0.015**	-0.017**
	(0.005)	(0.008)	(0.010)	(0.006)	(0.006)	(0.003)	(0.005)	(0.004)	(0.007)
Past discoveries (t-10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136	136	136	136
Year	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008	1962-2008
Observations	44462	44508	44540	49684	49742	49782	45370	45428	45468

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Oil discovery is instrumented by log of value of giant oil discoveries per capita. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table LA4: Oil Discoveries and Manufacturing Growth using Nominal Value Added and Wages

Outcome is:	**Value added (Nominal)**			**Wages (Nominal)**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(7)	(8)	(9)
Oil Discovery (t+10)	-0.021***	-0.017*	-0.016*	-0.023***	-0.020***	-0.025**
	(0.008)	(0.009)	(0.009)	(0.008)	(0.007)	(0.011)
Past discoveries (t-10)	Yes	Yes	Yes	Yes	Yes	Yes
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136
Year	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012
Observations	43908	43908	43908	42396	42396	42396

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table LA5: Oil Discoveries and Manufacturing Growth: With INDSTAT4 Data (4-digit Level)

Outcome is:	**Value added**			**Employment**			**Wages**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Oil Discovery (t+10)	-0.011**	-0.009	-0.013*	-0.018	-0.006	-0.028	-0.021**	-0.020**	-0.019*
	(0.005)	(0.005)	(0.006)	(0.011)	(0.014)	(0.023)	(0.010)	(0.009)	(0.010)
Past discoveries (t-10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry share (t-1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	64	64	64	64	64	64	64	64	64
Year	1985-2012	1985-2012	1985-2012	1985-2012	1985-2012	1985-2012	1985-2012	1985-2012	1985-2012
Observations	19061	19061	19061	22521	22521	22521	21642	21642	21642

Notes: All regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Outcome data sourced from UNIDO. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table LA6: Impact of Oil Price Boom, Bust and Valley on Manufacturing Growth: with Oil Producing Net Importers

	Value added			**Employment**			**Wages**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Boom	-0.081	-0.012	-0.015	-0.167***	-0.006	-0.011	-0.144**	-0.012	-0.026
	(0.070)	(0.021)	(0.034)	(0.061)	(0.018)	(0.024)	(0.060)	(0.020)	(0.028)
Bust	-0.128***	-0.025	-0.065	-0.111***	-0.008	-0.009	-0.141***	-0.004	-0.046
	(0.048)	(0.032)	(0.046)	(0.029)	(0.019)	(0.026)	(0.037)	(0.029)	(0.040)
Valley	-0.088	0.026	0.020	-0.042	-0.004	0.001	-0.059	-0.007	-0.006
	(0.058)	(0.034)	(0.053)	(0.049)	(0.020)	(0.030)	(0.046)	(0.024)	(0.036)
Industry share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012
Observations	48714	48714	48714	56847	56847	56847	47326	47326	47326

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.

Table LA7: Impact of Oil Price Boom, Bust and Valley on Manufacturing Growth: boom1 (1974-1980 & 2002-2007) and boom2 (2009-2012)

	Value added			**Employment**			**Wages**		
	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2	All	Interacted* Exportability Index 1	Interacted* Exportability Index 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Boom 1	-0.072	-0.012	-0.014	-0.168***	-0.006	-0.013	-0.141**	-0.011	-0.023
	(0.070)	(0.023)	(0.029)	(0.059)	(0.018)	(0.022)	(0.049)	(0.019)	(0.025)
Boom 2	-0.082	-0.024	-0.053	-0.117***	-0.007	-0.010	-0.124***	-0.006	-0.048
	(0.078)	(0.031)	(0.042)	(0.029)	(0.019)	(0.026)	(0.027)	(0.029)	(0.040)
Bust	-0.128***	-0.025	-0.065	-0.111***	-0.008	-0.012	-0.141***	-0.004	-0.046
	(0.048)	(0.032)	(0.046)	(0.031)	(0.019)	(0.026)	(0.037)	(0.029)	(0.040)
Valley	-0.088	0.026	0.020	-0.042	-0.006	0.001	-0.059	-0.007	-0.006
	(0.058)	(0.034)	(0.053)	(0.047)	(0.020)	(0.030)	(0.046)	(0.024)	(0.036)
Industry Share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country, Yr & Indus FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012	1962-2012
Observations	43908	43908	43908	51723	51723	51723	42396	42396	42396

Notes: all regressions include country, year and industry fixed effects. Robust standard errors clustered at the country level are reported in parenthesis. ***, ** and * denote significant at 1,5 and 10% level. Exportability index (1) is a dummy that takes on a value of 1 if an industry's ratio of exports to value added is greater than the median value and 0 otherwise, from Rajan and Subramanian (2011). Exportability index (2) is a dummy that takes on a value of 1 for ISIC industries 15-21, and 0 otherwise, author calculation.