Wage Bargaining, Inequality, and the Dutch Disease

JONAS B. BUNTE

University of Texas at Dallas

The theory of the "Dutch Disease" predicts that income from oil and other natural resources produces negative economic consequences through two different mechanisms. The "Resource Movement Effect" suggests that workers leave manufacturing for higher-paying jobs in other sectors. The "Spending Effect" implies that spending resource wealth domestically leads to exchange rate appreciation. The combination of these processes results in the contraction of the export sector. This article explores how, and why, a country's institutions may prevent the Dutch Disease before it starts. Incorporating insights from the "Varieties of Capitalism" literature, I find that the Dutch Disease is significantly less severe in countries with a high degree of wage bargaining coordination and with low income inequality. The former interrupts the Resource Movement Effect as it limits workers' incentives to move out of the tradable sector. The latter moderates the Spending Effect because it prevents appreciation of the real exchange rate.

Participation in global markets exerts pressures on individual countries for policy convergence. Yet, these pressures have not eliminated cross-national diversity in economic outcomes. Rather, "Domestic institutions play an important role in mediating pressures from the global economy" (Mosley 2005, 355). For example, tax competition results in different tax rate changes depending on the level of democracy (Jensen 2013). The electoral system determines whether increased capital mobility leads to higher minority-shareholder protection (Kerner and Kucik 2010). Similarly, the number of veto players influences the reaction to international pressures for privatizing pensions (Brooks 2005).

An impressive body of research demonstrates the role domestic institutions play in mediating the effects of economic interdependence. Yet recent work on countries participating in the global market for natural resources largely ignores its insights. For example, Wacziarg (2012, 642), Brückner, Ciccone, and Tesei (2012, 390), and Brückner, Chong, and Gradstein (2012, 1026) multiply international oil price with countries' quantity of oil exports to ascertain the effect of natural resources on economic and political variables. They assume that—conditional on the volume of oil sold—price increases or decreases affect all oil producers in the same manner.

However, this is not the case. Some resource-rich industrialized economies suffer negative consequences from natural resources, while others do not. While rent-seeking and political patronage shapes the effects of natural resource wealth in many developing counties, dynamics associated with the Dutch Disease predominate in developed countries. For example, Canada and Australia have recently been diagnosed with the Dutch Disease (Lama and Medina 2012; Shakeri, Gray, and Leonard 2012; Beine, Bos, and Coulombe 2012). In contrast, resource-rich Organisation for Economic Co-operation and Development (OECD) countries such as Norway, Sweden, and Denmark appear to have escaped it (Larsen 2006; Cappelen and Mjøset 2009).

What explains this difference across industrialized economies? Standard arguments concerning the "quality" of domestic institutions fail to explain this variation in this subset of countries. I unbundle "good" institutions to identify the causal mechanisms through which they operate. I combine insights from the previously unrelated literatures on the Varieties of Capitalism and the Dutch Disease. Building on prior work concerning wage coordination institutions (Kenworthy 1996) and inequality (Pontusson 2005), I examine how both affect the severity of the Dutch Disease.

The Dutch Disease operates through two distinct transmission channels. First, the boom allows the resource and service sector to offer higher wages, therefore drawing labor away from the manufacturing sector. Second, spending the resource rents produces an appreciation of the exchange rate. This severely damages the position of countries in international markets, as nonresource exports become less competitive.[1]

Insights from the Varieties of Capitalism literature help explain how both transmission channels can be interrupted. First, coordinated wage bargaining correlates with wage moderation across sectors. Therefore, sudden inflows of natural resource rents do not translate into higher wages in some sectors relative to others. As a consequence, workers lack incentive to seek employment in higher-paying sectors. This limits the Resource Movement Effect by preventing labor from leaving manufacturing for other sectors that offer higher wages. Second, the level of inequality interrupts the Spending Effect. In unequal societies, an increase in income via natural resources results in a disproportionate rise in demand for services. In turn, the exchange rate appreciates, which causes exports to become more expensive. In contrast, egalitarian societies are characterized by a lower elasticity of demand for

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[1]Henceforth, I will use exports and nonresource exports synonymously.

nontradables, which undermines the transmission mechanism suggested by the Spending Effect.

I find empirical support for both causal mechanisms: A high degree of wage coordination and a low level of societal inequality prevent the Dutch Disease. In short, the severity of the Dutch Disease differs systematically across resource-rich industrialized economies.

Arguments about the effect of domestic institutions on economic phenomena often lack precision: Many argue that institutions matter, but I explain how domestic institutions mediate economic interdependence. I identify a way in which specific institutional characteristics shape economic outcomes. Akin to process tracing in the qualitative literature, I derive observable implications of distinct points in the causal process. Consistent findings for all links of the underlying causal chain increase confidence in the results. I conclude by arguing that unbundling institutions will crucially advance theoretical debates about institutions and economics.

The Dutch Disease and Institutions

A variety of transmission mechanisms supposedly link natural resource wealth to negative economic consequences. Those who focus on rent-seeking mechanisms propose that natural resources distort incentives of entrepreneurs. For instance, they might engage in rent-seeking instead of pursuing economically productive activities (Torvik 2002; Mehlum, Moene, and Torvik 2006). A second transmission mechanism suggests that politicians may use natural resource rents for political patronage (Ross 2012; Andersen and Aslaksen 2008). The Dutch Disease is a third mechanism that posits negative economic effects due to the particular adjustment process of wages and exchange rates after resource windfalls (Corden and Neary 1982; Krugman 1987; Sachs and Warner 2001; Torvik 2001).

Of these three transmission mechanisms, rent-seeking and political patronage are unlikely to play a role in industrialized economies. Countries such as Canada, Australia, and Norway all have strong institutions that discourage these activities. In contrast, the Dutch Disease transmission mechanism does operate in industrialized economies. While the Resource Curse literature focuses on countries dependent on natural resources (primarily developing countries), the Dutch Disease analyzes macroeconomic effects of natural resources in countries with large manufacturing bases (industrialized countries).

For example, Lama and Medina (2012, 6) examine Canada's resource boom. They show that the real effective exchange rate appreciated by 25 percent. As a consequence, the share of manufacturing production over GDP declined by 4 percent. As a result, 11 out of 18 industry groups experienced a decline in output due to exchange rate appreciation (Shakeri, Gray, and Leonard 2012, 15). Ten out of twenty-one Canadian manufacturing industries have experienced 100,000 permanent job losses between 2002 and 2008 (Beine, Bos, and Coulombe 2012, 487). These developments imply deep structural changes in the Canadian economy: "In the year 2000, manufacturing accounted for 18 percent of GDP, not much lower than the share in Germany; by 2013, this dropped to 10 percent, about the level in Britain and the United States" ("Canada's Economy" 2015).

Canada is by no means the only industrialized economy struggling with the Dutch Disease. For example, Australia experienced a mining boom in the 2000s that affected both exchange rate and average wages (Corden 2012, 293): the Australian dollar appreciated by 31 percent, while real employee compensation per hour worked rose by 3.5 percent per annum. The combined effect of exchange rate appreciation and wage increases led to a collapse of nonmining exports.

The collapse of manufacturing due to the Dutch Disease has long-term consequences. The traded sector is considered the engine of growth as most learning-by-doing occurs in this sector, generating human capital spillovers into other sectors of the economy (Krugman 1987, 41). In addition, its exposure to external competition is an important source of positive externalities. Contracting exports may lower productivity of the economy as a whole and therefore stunt economic growth (Torvik 2001). Furthermore, Krugman (1987, 40) suggests that contraction of manufacturing below certain critical levels is difficult to reverse, preventing countries from fully recovering after a resource boom.

However, the Dutch Disease does not affect all resource-rich industrialized countries. Descriptive statistics of resource-rich OECD countries illustrate this puzzle. Figure 1 displays the change in nonresource exports of industrialized economies with above-average nontax revenues. Consistent with the Dutch Disease, a significant number of observations exhibit a reduction in exports. In contrast, in other countries, natural resources are associated with an increase in nonresource exports. OECD countries exhibit similar variation with respect to exchange rate appreciation. Figure 2 shows that the real exchange rate increases significantly in a number of OECD countries with above-average nontax revenues. Yet others do not experience such an appreciation. Lastly, wage growth of industrialized economies differs as well. Assuming that average wages grow in line with inflation, Figure 3 shows that—consistent with the Dutch Disease—in some countries, wages increase far above expected wage growth. Yet wage growth remains low in other OECD countries. What explains the differential performance of resource-rich countries?

The reference to "good" institutions does not explain the diverging performance of industrialized economies, as they all have good institutions in comparison to developing countries. A more promising approach focuses on analyzing causal mechanisms by which institutions moderate negative effects of natural resources.

For example, Andersen and Aslaksen (2008) analyze whether the form of democracy—rather than the difference between democracies and autocracies—shapes the effect of resources. They find that presidential systems are less representative and therefore offer more degrees of freedom to the president, resulting in lower-quality policies following the discovery of natural resources. In contrast, parliamentary democracies appear better suited at using resource revenues to promote growth. Boschini, Pettersson, and Roine (2013) distinguish between property rights institutions, which prevent expropriation, and contracting institutions, which ensure that contracts between citizens are honored. They find that the former are more effective at preventing the resource curse than the latter. Amundsen (2014) presents a similar approach: she differentiates between institutions of extraction and institutions for redistribution. I contribute to this literature by analyzing how wage coordination institutions may interrupt the Dutch Disease.

Similar to institutions, inequality shapes the "economic rules of the game." For example, Persson and Tabellini
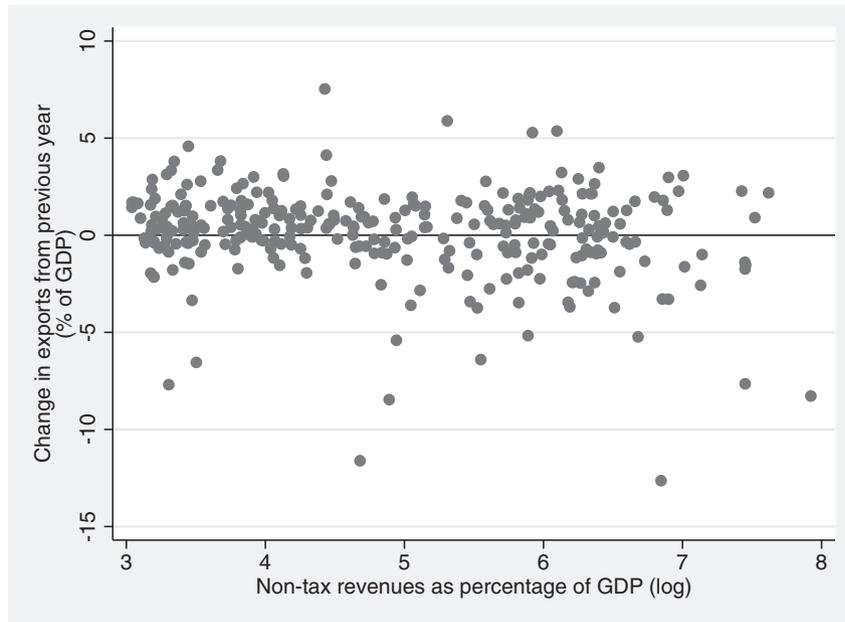
Figure 1. Scatterplot of nontax revenues and the corresponding changes in nonresource exports. Includes only observations with above-average nontax revenues
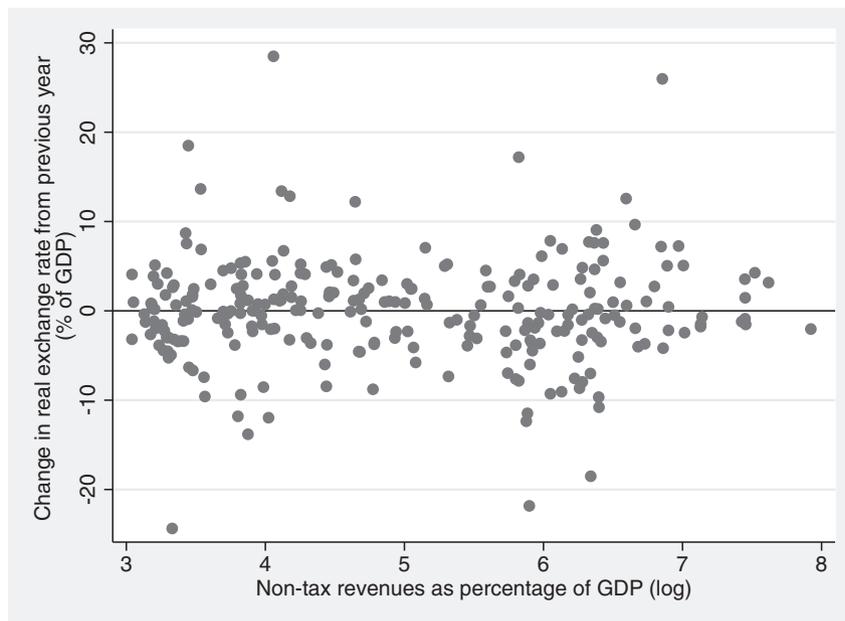

Figure 2. Scatterplot of nontax revenues and the corresponding changes in the real exchange rate. Includes only observations with above-average nontax revenues

(1994) and Alesina and Rodrik (1994) argue that political decisions in unequal societies produce economic policies that undermine growth-promoting activities and instead focus on redistributing income. Gylfason (2001, 579) adds that inequality causes "a regular boiling over of collective bargaining agreements, sending inflation soaring and disrupting production and the labor market—with the ensuing inefficiency these circumstances cause, in turn, impeding economic growth." Perotti (1996) notes that inequality contributes to sociopolitical instability and reduced investment in human capital. Both effects have negative consequences for economic growth. I argue that

inequality affects consumption patterns of economies. For these reasons, inequality may be an important characteristic affecting transmission mechanisms of the Dutch Disease.

Causal Mechanisms Preventing the Dutch Disease

The Dutch Disease operates through two distinct channels: the Resource Movement Effect and the Spending Effect (Corden and Neary 1982). I identify two causal mechanisms that interrupt the sequence of both effects (see Figure 4).
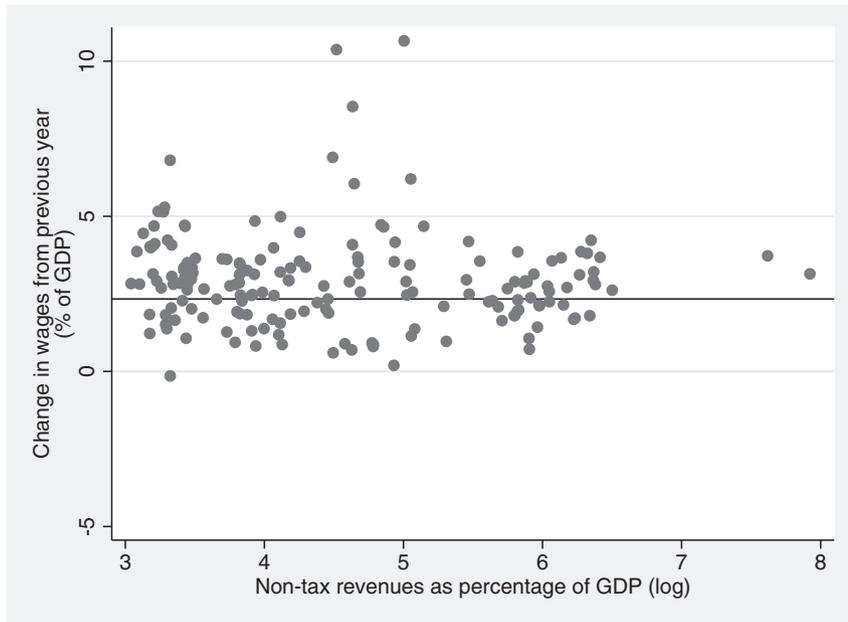
Figure 3. Scatterplot of nontax revenues and the corresponding changes in wages. Vertical line indicates average inflation. Includes only observations with above-average nontax revenues
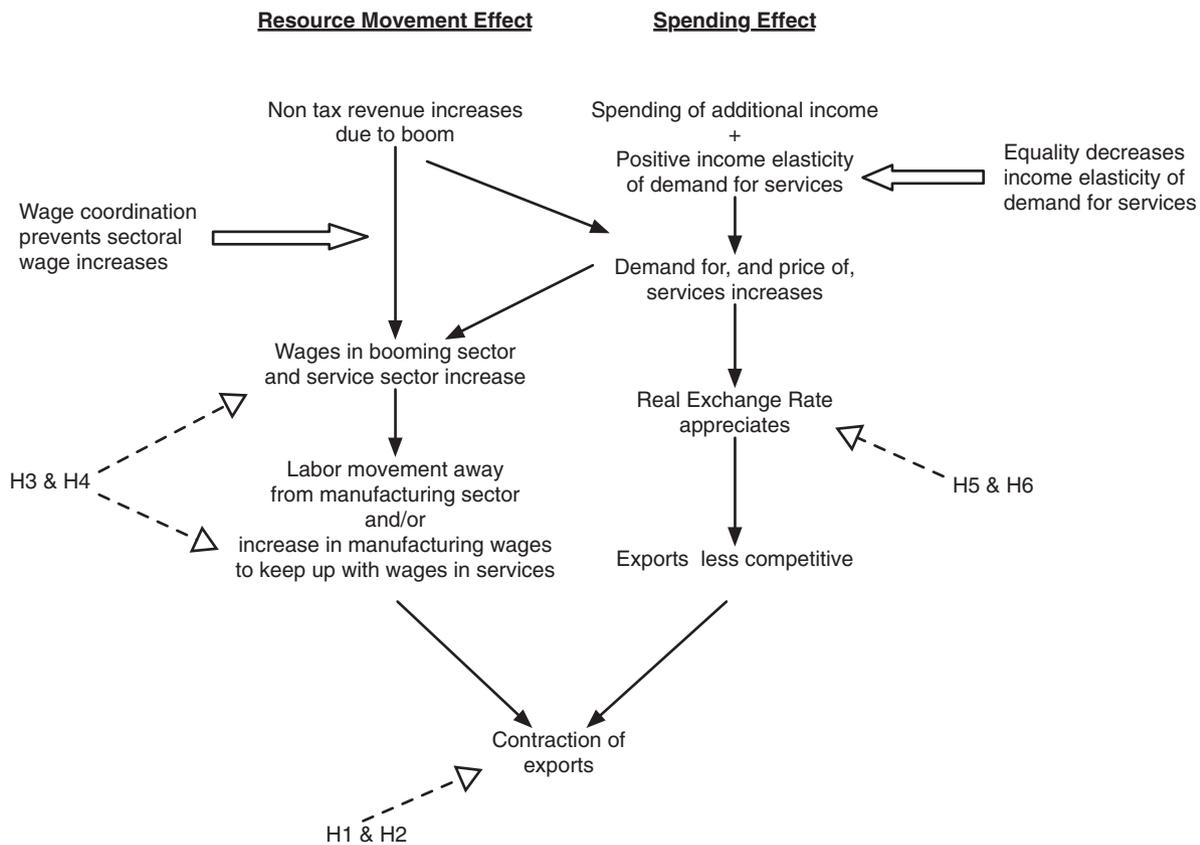

Figure 4. Illustration of causal mechanisms suggested by the Dutch disease theory and hypotheses derived in this study

The Resource Movement Effect and Wage Bargaining Coordination

The Resource Movement Effect hypothesizes labor moving away from the tradable sector to either the resources sector or the nontradable sector. Because of the availability of natural resources, the marginal product of labor rises in the resources sector when natural resources are

discovered. Therefore, this sector offers higher wages. In addition, the new wealth increases demand for nontradable goods like services. This results in increased wages in the service sector.[2] As these models assume that labor is fully mobile, workers move from manufacturing to the

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[2]For this reason, the Resource Movement Effect can occur even if the natural resource sector itself is not labor-intensive.

resource and service sectors. As a consequence, the tradable sector contracts.

Note that the causal chain underlying the Resource Movement Effect assumes two steps. In a first step, wages in resource and service sectors will increase relative to wages in manufacturing. In a second step, wages in the tradable sector will match the higher wages offered in other sectors to prevent labor from moving away. Dutch Disease models assume that unions will succeed in negotiating wage agreements that provide lagging manufacturing sectors with the same wage as in booming sectors.

For example, Enders and Herberg (1983, 474) write that sheltered sectors can afford to pay, and will pay, higher nominal wages. Intersectoral competition for labor or central bargaining will raise wages in the exposed sector as well. Hoel (1981, 270) adds that "the justification for this assumption is that local wage settlements are strongly influenced by wage rates elsewhere in the economy." Thus, Dutch Disease models assume that the highest market-clearing wage rate in any sector is the wage rate for all other sectors. While this higher wage rate might be appropriate for the recourse and service sectors, it is too high for the tradable sector. This has negative effects: unemployment rises as wages in the export sector increase, without corresponding increases in productivity. In addition, higher wages increase prices of exports, thereby reducing the competitiveness of the tradable sector.

However, I argue that the Dutch Disease overlooks a large variation across countries regarding how unions operate and how wage bargaining systems are organized. Some countries—such as the United States and Australia—have a decentralized wage bargaining system with thousands of industry- or firm-specific unions. The wage equilibration process of traditional Dutch Disease models described above seems plausible in such an institutional environment. Australia provides an example: the real employee compensation per hour worked rose by 3.5 percent per year during the resource boom of the early 2000s, compared with 1.3 percent during nonboom times. The increased production costs seriously impeded competitiveness of Australian exports (Corden 2012, 293).

In contrast, countries like Norway feature a coordinated wage bargaining system. In these systems, the actors are not individual firms and unions. Rather, large employer associations represent companies. For example, the largest employer association in Norway is the Confederation of Norwegian Enterprise (NHO). It represents 24,000 firms ranging from family-owned businesses to multinational companies. Workers are also represented by large organizations. Most prominent is the Norwegian Federation of Trade Unions (LO) that represents 900,000 workers. This corresponds to about 35 percent of Norway's working-age population.

These differences in size matter for union behavior: nominal wage increases secured by unions expand monetary supply. The resulting inflation is an externality. The real wage of union members increases as inflationary costs are outweighed by nominal wage increases, while the real wage of nonunion members declines. Therefore, small unions free-ride on nonunion members. However, this becomes more difficult with larger unions as the externality of inflation resulting from nominal wage increases is internalized. For this reason, larger unions have an incentive to moderate wage demands.[3]

In addition, the process of wage bargaining between employers and unions differs. In decentralized systems, individual firms can negotiate wages directly with their workers without constraints such as maximum wage increases. In contrast, norms concerning maximum wage increases exist in coordinated wage bargaining systems. Norway follows a trend-setting industries model. Here, unions and employer associations representing manufacturing are first to negotiate a wage agreement. This agreement sets an upper limit on wage increases in other sectors—including the oil sector (Nou 2013).

The norms operate across different sectors of the economy, as no agreements are signed before a settlement is reached for trend-setting industries (Van Gyes and Schulten 2015, 146). In addition, the same norms shape negotiations across different levels of bargaining: the hierarchical structure of the Norwegian system implies that local bargaining outcomes cannot contradict agreements concluded at a higher level (Nergaard 2014, 8). As a consequence, wages in the oil sector do not rise significantly above wages in other sectors. This process allows for controlling "the militancy of privileged 'maverick' unions and restore cost-competitiveness to Norwegian industry" (Iversen 1996, 428).[4]

I argue that the presence of coordinated wage bargaining systems has significant implications for the Resource Movement Effect. In countries with decentralized wage bargaining systems, wage increases in resource and service sectors relative to the tradable sector are likely. Given sufficient labor mobility, wages will equalize on the level of the highest wage across all three sectors. Thus, with decentralized wage bargaining systems, natural resource revenues have effects consistent with the Dutch Disease. In contrast, wage moderation in countries with centralized wage bargaining systems interrupts the Dutch Disease: wages in booming sectors will not rise above the level of wages in lagging sectors. This difference in relative wage increases shapes the resource movement effect: high-coordination countries should see less labor movement from the lagging manufacturing sector to resource and service sectors than low-coordination countries.

The Spending Effect and Inequality

In addition to the Resource Movement Effect, the Dutch Disease theory suggests that spending natural resource rents within the domestic economy has negative consequences. An increase in rents from natural resources implies that citizens have more money to spend. This would not affect a country's money supply or demand for domestically produced goods if citizens would use their new wealth to purchase only imports. However, this is unrealistic. Instead, with every dollar of resource rents spent domestically, the demand for nontradable goods increases. Examples are education, construction, and retail services.

At this point, the Spending Effect assumes a positive income elasticity of demand for nontradable goods such as services. For example, a 10 percent increase in income due to natural resources would increase the quantity of nontradable goods demanded by 15 percent.[5] This

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[3]See Section 1 of the Supplementary Files for a numerical example.

[4]See Section 1 of the Supplementary Files for more detailed information on the process of coordinated wage bargaining. Section 2 provides a case study.

[5]In this case, the income elasticity would equal 15 percent/10 percent = 1.5. For example, a positive income elasticity implies that with an increase in income I eat more often at restaurants rather than cooking at home.

disproportionate increase in demand causes prices of nontradables to increase in relation to manufacturing goods because prices for the latter are set internationally, so they cannot change. This amounts to an increase in the real exchange rate, implying that exports become more expensive to foreign buyers. Consequently, domestic exports contract for two reasons: first, there is less foreign demand for a country's exports as they are now more expensive to foreigners; second, labor shifts to the nontraded sector, accommodating higher demand for services.

The existing literature models the income elasticity of services—the core of the Spending Effect—as constant across nations: An income shock of a certain size is assumed to have the same effect on the demand for services across countries. More specifically, the Dutch Disease assumes that the income elasticity of demand for services is a linear function. This implies that increasing the income of a poor person by $1000 results in an increase of demand for services by this person that is identical to the increase in demand for services when $1000 is given to a rich person.

In contrast, I argue that the societal increase in demand for services differs systematically across countries. I suggest that the degree of income inequality determines changes in societal demand after an aggregate income shock. The more unequal the society, the higher the increase in demand for services after an increase in natural resource rents. In contrast, more equal societies exhibit a smaller increase in demand for services. The reason is that high-income earners exhibit a high elasticity of demand for services, while low-income earners show a low elasticity of demand for services.

This claim is consistent with empirical studies of consumer behavior. High-income earners spend a larger share of income for services and a lower share on tradable necessities than low-income earners (Bowman and Nilsson 2006, 6). Accordingly, studies find that consumer preferences are nonhomothetic. That is, demand for goods and services depends on relative income rather than relative prices (Deaton and Muellbauer 1980). The causal mechanism underlying these findings suggests that opportunity costs of various income groups differ. Mazzolari and Ragusa (2013, 74) show that wage gains for high-income workers increase their opportunity costs of doing service-related tasks themselves. High-income earners consume more skill-intensive services (such as education), as well as less skill-intensive services (such as household chores), than low-income earners. This microlevel evidence suggests that the elasticity of demand for services should be modeled as a convex, rather than linear, function. This functional form accounts for the fact that high-income earners have a relatively higher income elasticity of demand for services than low-income earners.

Applying this insight to the study of the Dutch Disease explains why demand for services following an income shock differs across nations. Assuming a convex function of income elasticity of demand for services has implications for the average consumption of services after an income shock: it will be larger in a country divided into a high- and a low-income group than average consumption of services in an equal society.

Figure 5 illustrates this argument. Assume that Country A is an egalitarian country with two citizens, both earning mean income. In contrast, Country B represents an unequal society with two citizens, one poor and another rich. Both countries are characterized by the same convex

functional form of income elasticity of demand for services. Following an income shock, the two hypothetical countries exhibit different responses with respect to their aggregate demand for services. In Country A, the entire population experiences the same income shock. As both citizens are located at the same level of income, their resulting change in demand for services is identical. In the hypothetical example of Figure 5, the two citizens' demands for services increases by $1,142 following the income shock, resulting in a total increase of $2,284.

However, the same income shock will have different consequences in Country B with a population split into low- and high-income segments. In the hypothetical example of Figure 5, the demand for services of the low-income citizen increases by only $155. The increase in demand for nontradable services is low because most of the new income is spent on necessities that are mostly tradable goods. In contrast, the same increase in income to the high-income citizen results in a disproportionately large increase of $8,445 in demand for services. This is because high-income citizens have higher opportunity costs for performing tasks like housework and childcare. Consequently, they will spend most of the income shock on nontradable services. The aggregate increase in demand for services in Country B will therefore total $8,600. Thus, the total increase in demand for services in unequal Country B will be larger than the aggregate increase in demand for services in egalitarian Society A.

In summary, following an increase in natural resource rents, the subsequent increase in demand for services differs between equal and unequal societies. More equal societies exhibit a lower aggregate increase in the demand for services following an increase in natural resource rents. The Spending Effect should therefore be less severe in these countries. In contrast, unequal societies should experience a stronger Spending Effect, and therefore a more severe Dutch Disease.

Empirical Implications

These theoretical considerations yield several testable implications. First, both the Resource Movement Effect and the Spending Effect result in reduced exports. If the Dutch Disease is less severe in countries that have a high degree of wage bargaining and low inequality, this should be reflected in the export performance of countries.

> **H1:** *In comparing countries, those with low wage bargaining coordination have lower exports following an increase in natural resource rents than those with high wage bargaining coordination.*
> **H2:** *In comparing countries, those with high inequality have lower exports following an increase in natural resource rents than those with low inequality.*

In addition to analyzing the overall effect of natural resources on exports, I examine the causal mechanisms through which this effect operates. I test two links in the causal chain. In terms of wages, I argue that wage coordination interferes with the Resource Movement Effect by limiting the initial increase in wages of resource and services sectors. This prevents a "race to the top" where manufacturing wages are required to match prevailing wages in the nontradable sector to keep workers in the exporting sector. A high degree of wage coordination should
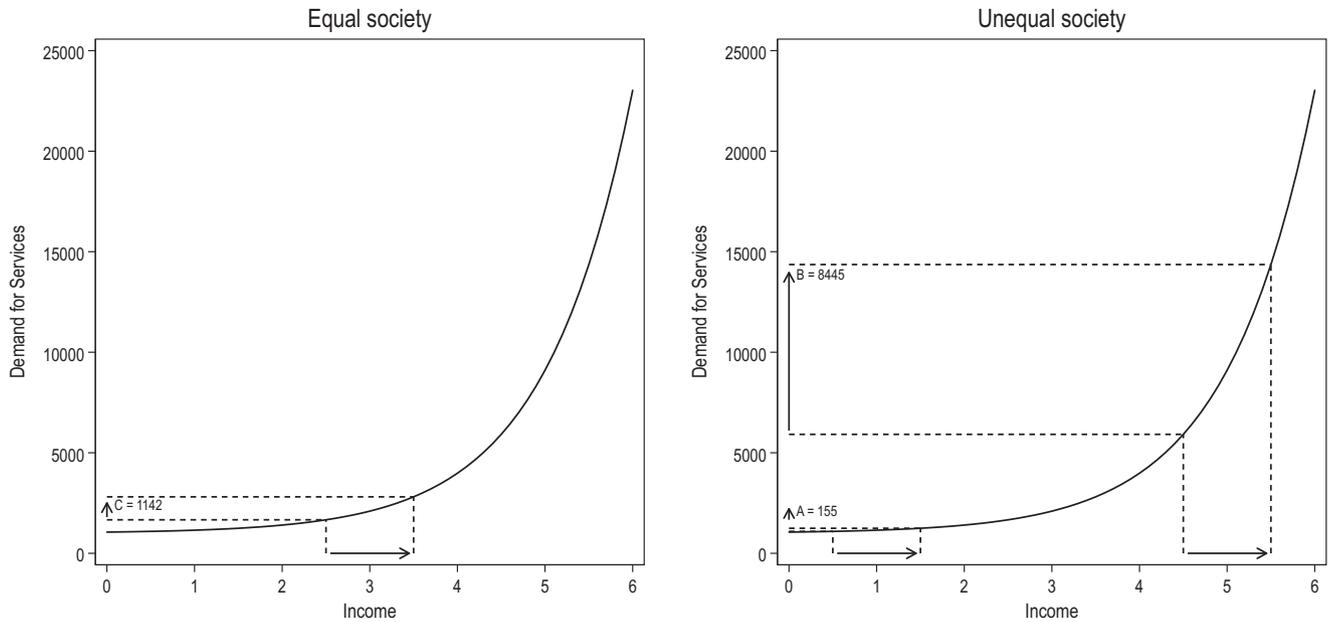
Figure 5. Illustration of the assumption that an income shock has different consequences for the demand for services in equal and unequal societies

result in a lower wage level, while the opposite is the case in countries without wage coordination. In addition, I argue that low inequality moderates the increase in demand for services. The lack of excess demand prevents an increase in prices of nontradables in relation to manufacturing goods. In turn, this moderates wage demands in the nontradable sector relative to manufacturing. Low inequality therefore results in a lower wage level, while the opposite is the case in high-inequality countries.

> **H3:** *In comparing countries, those with low wage bargaining coordination have higher wage levels following an increase in natural resource rents than those with high wage bargaining coordination.*
> **H4:** *In comparing countries, those with high inequality have higher wage levels following an increase in natural resource rents than those with low inequality.*

With respect to the real exchange rate, I argue that equality decreases the income elasticity of demand for services following an increase in natural resource rents. Therefore, the demand for and price of services do not increase significantly in comparison to the demand and price of the tradable sector. This prevents an appreciation of the real exchange rate. In addition, wage coordination moderates wage levels, which limits citizens' ability to purchase nontradables. Consequently, the demand for nontradables does not change in relation to tradables, thwarting an appreciation of the real exchange rate.

> **H5:** *In comparing countries, those with low wage bargaining coordination experience a higher appreciation of the real exchange rate following an increase in natural resource rents than those with high wage bargaining coordination.*
> **H6:** *In comparing countries, those with high inequality experience a higher appreciation of the real exchange rate following an increase in natural resource rents than those with low inequality.*

Data and Method

Data

The Resource Curse literature focuses on developing countries dependent on income from natural resource rents. In contrast, the Dutch Disease theory was developed in the context of industrialized countries. It assumes the presence of a large manufacturing sector typical of industrialized economies while natural resources are present. Examples include oil in Norway, the United Kingdom, Canada, and the United States; natural gas in Denmark and the Netherlands; and minerals in Australia and Germany. In addition, I analyze the impact of institutions that only exist in advanced industrialized economies. Therefore, my empirical analysis focuses on industrialized countries, utilizing panel data for nineteen OECD economies from 1970–2000.

To capture the effect of natural resources, scholars such as Sachs and Warner (2001, 830) use the export value of natural resources as a fraction of GDP. However, this measure ignores production costs, re-exports, and domestic consumption of natural resources. Instead, I use Total Resource Rents Per Capita, developed by Dunning (2008).

This measure subtracts production costs from natural resources prices and then multiplies the unit-rent by the overall production volume. I utilize the Summary Measure of Centralization of Wage Bargaining provided by Visser (2011) to capture the degree of wage bargaining coordination. To measure inequality, I use the Gini coefficient obtained from the OECD. I consciously chose the Gini coefficient after taxes and transfers, accounting for the possibility of a government using natural resource revenues to make society more equitable.

Method

My argument suggests that the effect of natural resource rents is conditional on certain country characteristics. Therefore, I specify an interaction model of the following form:

$$Y_{i,t} = \alpha + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \beta_3 XZ_{i,t} + \beta_c Controls_{i,t} + \beta_d \gamma_i + \varepsilon_{i,t}$$

$$(1)$$

where $Y_{i,t}$ are dependent variables representing exports, wages, or the real exchange rate. $X_{i,t}$ are natural resource rents. $Z_{i,t}$ represents either the degree of wage coordination or inequality, depending on the hypothesis tested. The conditional nature of my hypotheses warrants including the interaction effect $XZ_{i,t}$.

It is paramount to account for country-specific unobserved differences. I include country fixed effects, γ_i, for several reasons. First, I study the Dutch Disease in the subset of OECD countries only. As such, I would violate the random effects assumption that countries are randomly drawn from a larger set of cases. Further, I expect that country-specific characteristics matter for determining the severity of the Dutch Disease. Therefore, it is reasonable to expect that the unobserved effects $E_{i,t}$ and the independent variables are correlated. This would also violate a fundamental assumption of random effects models.

Further, Beck and Katz (1995) show that FGLS might provide standard error estimates that are too small. In order to avoid overconfidence in the estimated coefficients, I estimate the model with panel-corrected standard errors. In addition, I assume an AR1 error structure of the following form to account for serial correlation:

$$\varepsilon_{i,t} = \rho \varepsilon_{i,t-1} + \nu_{i,t} \qquad (2)$$

where $\nu_{i,t}$ are mean-zero variables independently distributed across time.

Findings

Overall Effect: Exports

The main symptom of the Dutch Disease is reduced exports. Both Resource Movement and Spending Effect ultimately result in the contraction of exports (see Figure 4). I use three different export measures as dependent variables to ensure that the results are robust across different operationalizations. Export data as a percentage of GDP are readily available. However, employing total exports as the dependent variable is problematic as it includes exports of natural resources. I therefore create two variables that capture nonresource exports. First, I subtract oil rents as a percentage of GDP from total exports as a percentage of GDP. Second, to account for rents from natural resources besides oil, I subtract total natural resource rents as a percentage of GDP from exports as a percentage of GDP. Third, I use manufacturing exports as a percentage of total merchandize exports to measure the export performance of the manufacturing sector directly.

I control for various factors that might affect exports. I include GDP per capita growth to account for the state of the domestic economy. I capture the effect of the labor market on exports by controlling for unemployment, labor productivity, and mean income of wage employees. As the competitiveness of exports also depends on the exchange rate, I control for the nominal effective exchange rate. In addition, I include an indicator differentiating between a de facto peg, de factor crawling peg, managed floating, or freely floating exchange rate regime.[6]

The Dutch Disease suggests that the marginal effect of natural resource rents on exports is negative in all circumstances. In contrast, I argue that the effect of natural resources on exports depends on the degree of wage coordination and inequality. In particular, Hypotheses 1 and 2 suggest that the effect of natural resource rents on exports remains negative in countries with low levels of wage bargaining coordination and high inequality. In contrast, I hypothesize that this negative effect is not present in countries with high levels of wage bargaining coordination and low inequality.

To test these hypotheses, I estimate equation (1) with the data described above. The results are presented in Figures 6 and 7. Figure 6 displays the marginal effect of natural resource rents on exports, $\frac{\partial Y}{\partial X} = \beta_1 + \beta_3 Z$. The top row illustrates size, direction, and statistical significance of natural resource rents' coefficient over the range of values for wage coordination. The bottom row depicts how the coefficient of natural resource rents changes as a function of inequality.[7]

The results are similar across three dependent variables: consistent with the Dutch Disease, the marginal effect of natural resource rents is negative and statistically significant with low wage coordination. However, in countries with a high degree of wage bargaining coordination, the negative effect of natural resource rents on exports disappears. In fact, for two dependent variables, the effect of natural resources on exports becomes positive and statistically significant at high levels of wage coordination. The findings for inequality are consistent with those for wage coordination. The marginal effect of natural resources on exports is negative and statistically significant, but only under conditions of high inequality. However, the effect becomes statistically insignificant with reduced inequality. These results provide support for Hypotheses 1 and 2.

The change in the coefficient of natural resource rents across different levels of wage coordination is related to, but different from, the outcome of the process described by the marginal effects. Figure 7 depicts predicted exports, $\widehat{y}$, under various combinations of wage coordination, inequality, and natural resources. The top row of Figure 7 displays the predicted values of exports across the range of natural resource rents for two hypothetical countries. The dotted line with a dark confidence interval represents predicted exports for a hypothetical country in the 20th percentile of the distribution of wage coordination scores. This corresponds to the United Kingdom. The solid line with also seems to be missing an article lighter confidence interval illustrates predicted exports for a country in the 80th percentile of wage coordination, which is comparable to Sweden. The results show that the export performance of a high-coordination country surpasses that of a low-coordination country across the range of natural resource rents.

I repeat this exercise for inequality. Unequal societies (the 80th percentile of the range of Gini coefficients, which corresponds to New Zealand) exhibit a decline in exports as natural resource rents increase. In contrast, the export sector in equal societies (the 80th percentile of Gini scores, such as Austria) is unaffected by an increase in natural resource rents. In sum, substantial empirical evidence supports the hypotheses that a higher degree of wage bargaining coordination and lower inequality diminish the adverse impact of natural resources on exports.

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[6]The sources of all data as well as summary statistics are available in Section 3 of the Supplementary Files.

[7]The tables on which these figures are based are presented in Section 4 of the Supplementary Files.
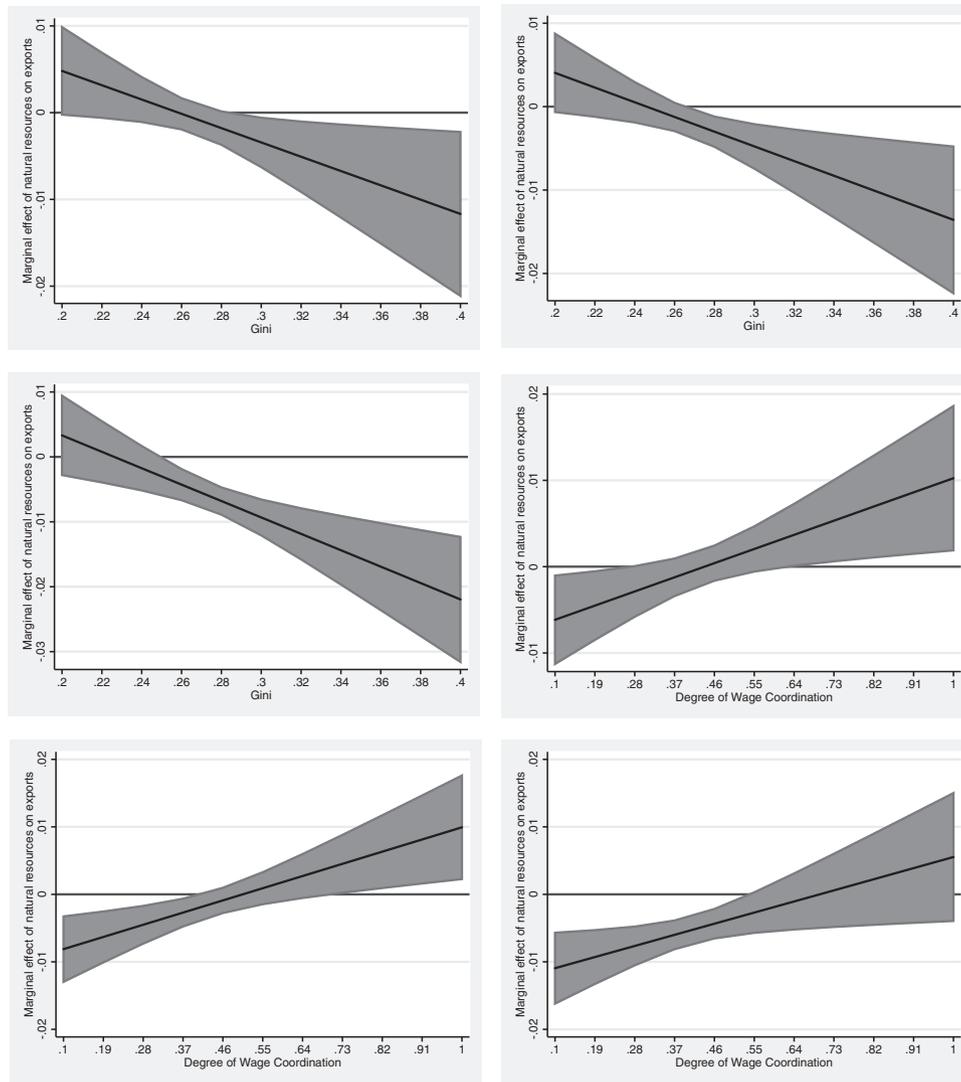
Figure 6. Marginal effect of natural resource rents on exports. Natural resources have a negative effect on exports when wage coordination is low, but they have a positive impact with high wage coordination. Conversely, natural resource rents have a negative impact on exports if inequality is high, while this effect disappears as inequality is reduced. Effects based on Table B

Notes: References to Tables and Figures denoted by capitalized letters are available in the Supplementary Materials.

Interestingly, the empirical findings indicate that coordinated wage bargaining and income equality not only mitigate the Dutch Disease, but result in a small positive effect on exports. Why do natural resources have a virtuous—rather than a vicious—effect if wage bargaining coordination is high and inequality is low? There are two reasons for this.

First, when threatened by de-industrialization due to the Dutch Disease, wage coordination and low inequality can be catalysts for transforming domestic economy. For example, the Rehn-Meidner model suggests that low wages are a subsidy to inefficient capital.

> Wage compression... boosts productivity growth by squeezing corporate profits selectively. On the one hand, a concerted union effort to provide low-wage workers with higher increases than market forces dictated would squeeze the profits of less efficient firms (sectors) and force them to

either rationalize production or to go out of business. On the other hand, the wage restraint by well-paid workers implied by the principle of wage solidarity would promote the expansion of more efficient firms (sectors). The net effect of this differentiated pressure on firms would be to raise average productivity in the economy and thereby make it possible for average wages to rise without threatening macro-economic stability (Pontusson 2005, 63).

Government policy in oil-rich Norway has been guided by this principle: "Coordination wage developments contribute to more equal wages in companies and sectors that use the same type of labor, even if companies have different productivity.... It provides incentives for investment and modernization" (Nou 2013, 130).

Second, discoveries of natural resources can be used to create spillovers into the domestic manufacturing sector. For example, Norwegian governments stimulated the
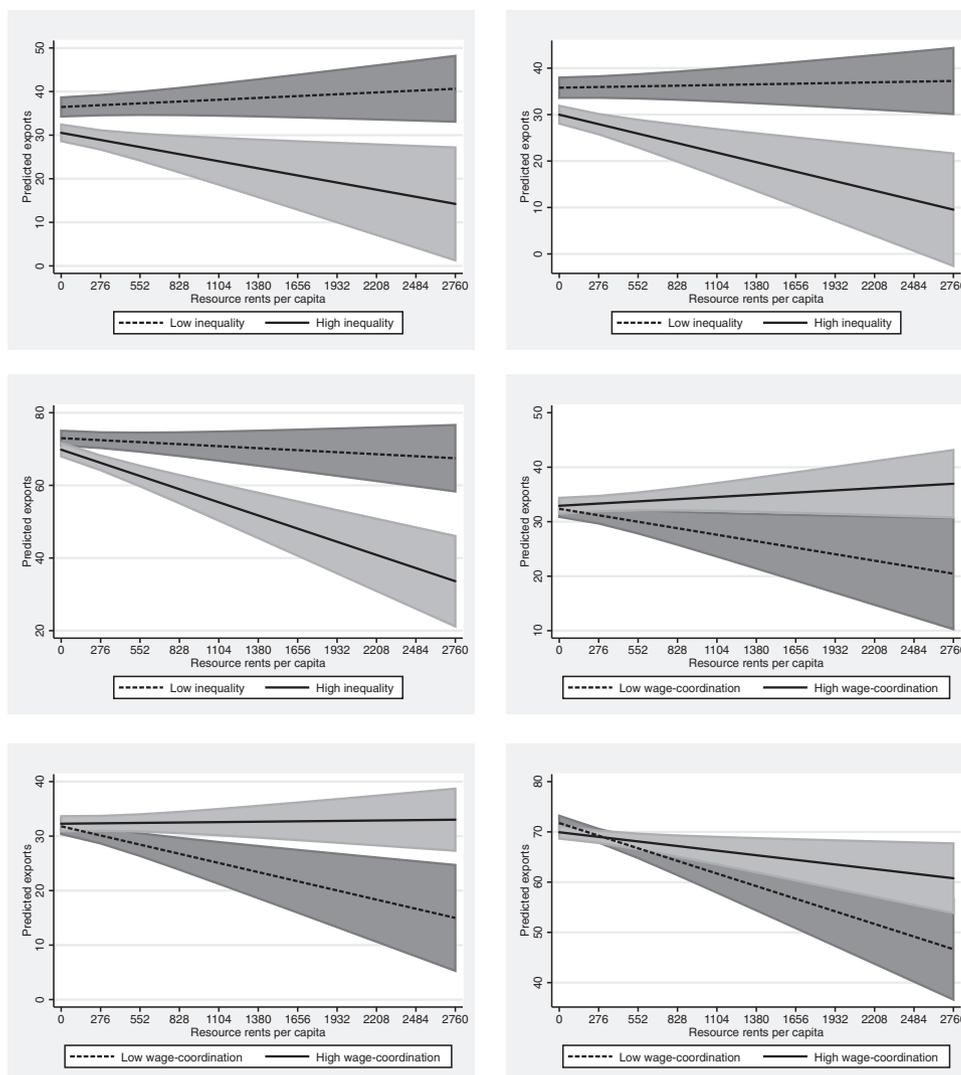
Figure 7. Predicted values of exports as a function of natural resource rents. A country with high wage coordination has higher exports across the range of natural resource rents than a country with low wage bargaining coordination. Conversely, if natural resources increase, exports of a country with high inequality decrease, while exports of a low inequality country remain unaffected. Effects based on Table B

development of a Norwegian supplier industry. This way, oil investments would also create jobs, especially in engineering-based manufacturing (Mjøset and Cappelen 2011, 181). The coordination between unions, employers, and government officials played a crucial role in transforming parts of the Norwegian manufacturing industry into an engineering supply industry. This industry benefits from specialized knowledge in the production of deep-sea oil drilling equipment, platforms, pipelines, and supply ships (Cappelen and Mjøset 2009, 186). In a speech, Norway's Energy Minister Ola Borten Moe (2013) noted:

> The engagement and interaction between oil companies, industry and research institutions have been fundamental in finding solutions to technological challenges. I am truly proud of the way these players have collaborated and are bringing world-class technology and technological solutions to the market.... This is also reflected in the international success of Norwegian companies. We see that the Norwegian subsea industry is expanding on the global market, and we find

examples in countries such as Australia, Angola and Brazil.... According to the Norwegian company Rystad Energy, the global market share is close to 80 percent on drilling equipment and 50 percent on seismic and subsea equipment. Not bad for a nation of 5 million people.

Causal Mechanism 1: Wages

The previous section shows that the symptoms of the Dutch Disease—reduced exports—occur under conditions of decentralized wage bargaining and high inequality. However, further analysis is necessary for two reasons. First, I need to identify precise mechanisms through which coordinated wage bargaining and equality operate. As shown in Figure 4, the Dutch Disease operates via increases in wages, as well as an appreciation of the real exchange rate, only then resulting in lower exports. Therefore, I examine two additional dependent variables—wages and the real exchange rate—to test these transmission channels. Second, some might argue that

differential export performance is driven by unobservable differences across countries. For instance, firms in coordinated market economies might compete in export markets on the basis of quality rather than cost. A research design that yields consistent findings across three dependent variables—rather than just exports—helps eliminate such alternative explanations.

With respect to the effect of natural resources on wages, Hypotheses 3 and 4 suggest that a high degree of wage coordination and low inequality will limit wage increases. This would interrupt one causal mechanism through which the Dutch Disease operates.

I utilize three different measures of wage levels as dependent variables to obtain robust findings. First, I use a wage index that compares overall wage levels across countries. Second, I use wage rates that specify workers' earnings in different countries who are employed for a specified time at a comparable task. Third, I use wage rates calculated for the manufacturing sector.

To account for other factors that might affect wages, I control for GDP per capita growth to account for the state of the overall economy. Increased labor productivity should have a positive impact on wages, warranting the inclusion of a labor productivity index. In contrast, workers' negotiation position is weakened if a large pool of unemployed workers exists, so I include a control for the unemployment rate. It is also affected by the degree to which workers are organized, which I capture by controlling for net union density. Lastly, wages are hypothesized to respond to changes in inflation, as workers facing higher consumer prices might demand higher wages. Therefore, I control for the annual percentage change in inflation.

Figure 8 presents the marginal effect of natural resource rents conditional on the value of wage coordination (top row) and inequality (bottom row). The results are consistent across three dependent variables: natural resources tend to increase wages under conditions of low wage coordination. In contrast, natural resources have a negative and statistically significant effect on wages if the degree of wage coordination is high. In addition, inequality moderates the effect of natural resources on wages. Natural resource rents exert a positive and statistically significant effect on wages when inequality is high, while they exert a negative or insignificant effect if inequality is low.
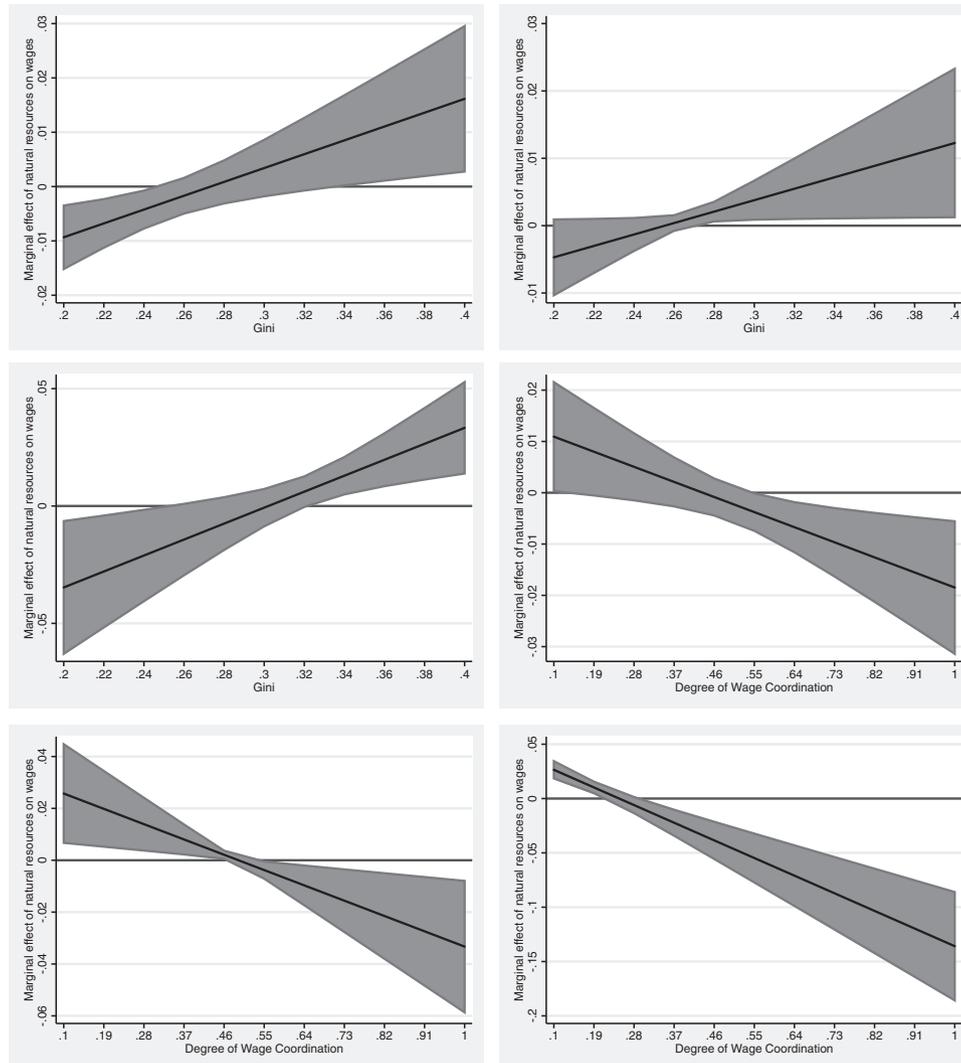

Figure 8. Marginal effect of natural resource rents on wages. Natural resources have a positive effect on exports when wage coordination is low, but they have a negative impact under conditions of high wage coordination. Conversely, natural resource rents have a negative impact on exports if inequality is low, while they contribute to wage increases under conditions of high inequality. Effects based on Table C
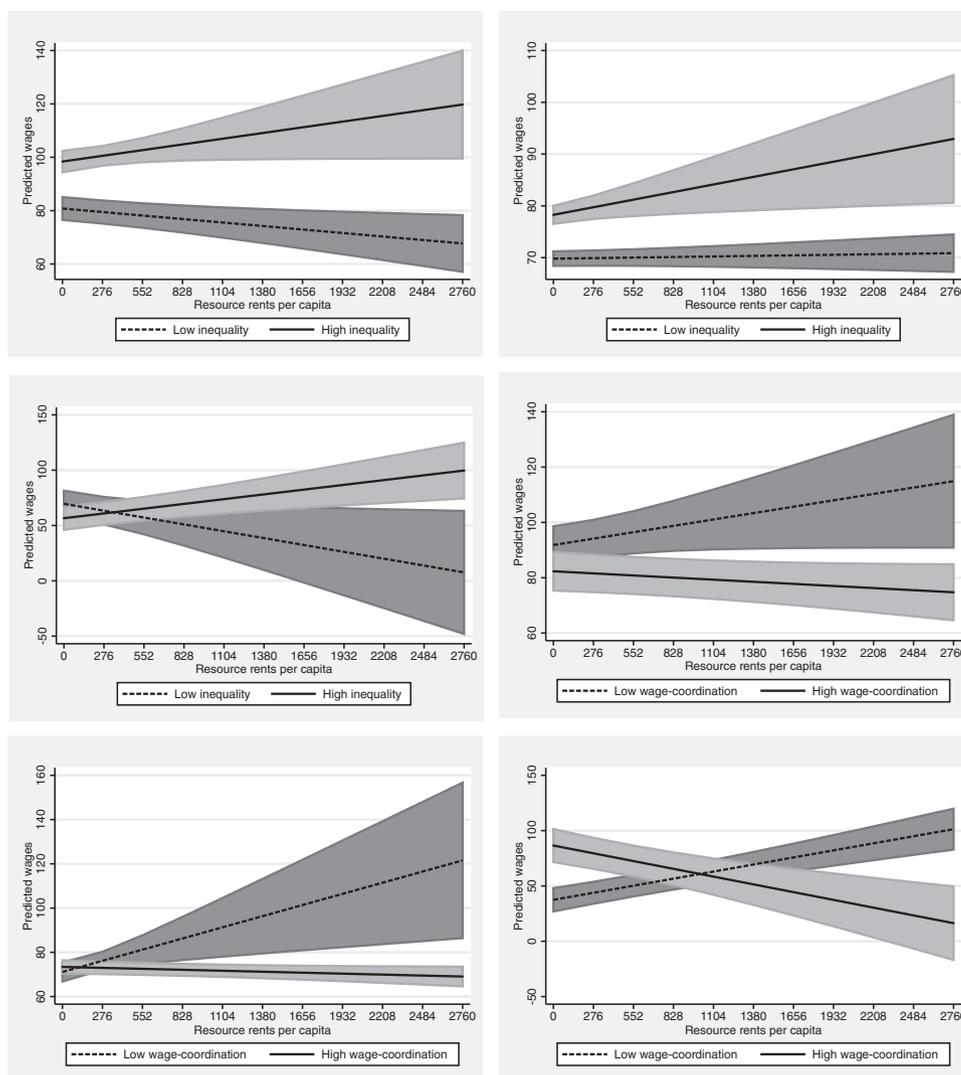
Figure 9. Predicted values of wages as a function of natural resource rents. Predicted wages for a country with high wage coordination remain constant as natural resources increase. In contrast, countries with low wage coordination experience severe increases in their wages. Conversely, wages are moderated as natural resource rents increase with low inequality, while the opposite is the case under conditions of high inequality. Effects based on Table C

Subsequently, I estimate predicted wage levels for countries at different levels of wage coordination and inequality. Figure 9 displays predicted wage levels, $\widehat{y}$, for low- and high-coordination countries (top row), as well as low- and high-inequality countries (bottom row). As natural resource rents increase, wages in low-coordination countries appear to rise significantly (dotted line, dark confidence interval). At the same time, wage levels in high-coordination countries remain unaffected by an increase in natural resources (solid line, light confidence interval). Conversely, wages in high-inequality countries increase with an increase in natural resource rents; in contrast, wages either decrease or remain steady in low-inequality countries as natural resources increase. In summary, there is strong empirical evidence for Hypotheses 3 and 4.

Causal Mechanism 2: Real Effective Exchange Rate

In addition to higher wages, the Dutch Disease is hypothesized to lead to an appreciation of the real exchange rate. Hypotheses 5 and 6 suggest that a high degree of wage coordination and low inequality will limit this appreciation.

This would interrupt a second causal mechanism through which the Dutch Disease operates.

To capture the effect of natural resources on the real exchange rate, I utilize two dependent variables. First, the real effective exchange rate is calculated based on unit labor costs, which captures exchange rate movements from a producer's perspective. The second measure calculates the real effective exchange rate from a consumer perspective.

I control for several factors that might affect the dependent variables. Movements in the nominal exchange rate affect the real exchange rate. I also include an indicator for the type of exchange rate regime. As the real exchange rate effectively captures the purchasing power of a unit of foreign currency for domestic goods, I control for the domestic price level by including the annual change in consumer prices as a proxy for inflation. I also account for the degree of Central Bank independence, as its monetary policy can affect exchange rates. I also control for the relative productivity of manufacturing to the service sector. Here, I include the ratio of value added (as a percentage of GDP) in manufacturing and service sectors.
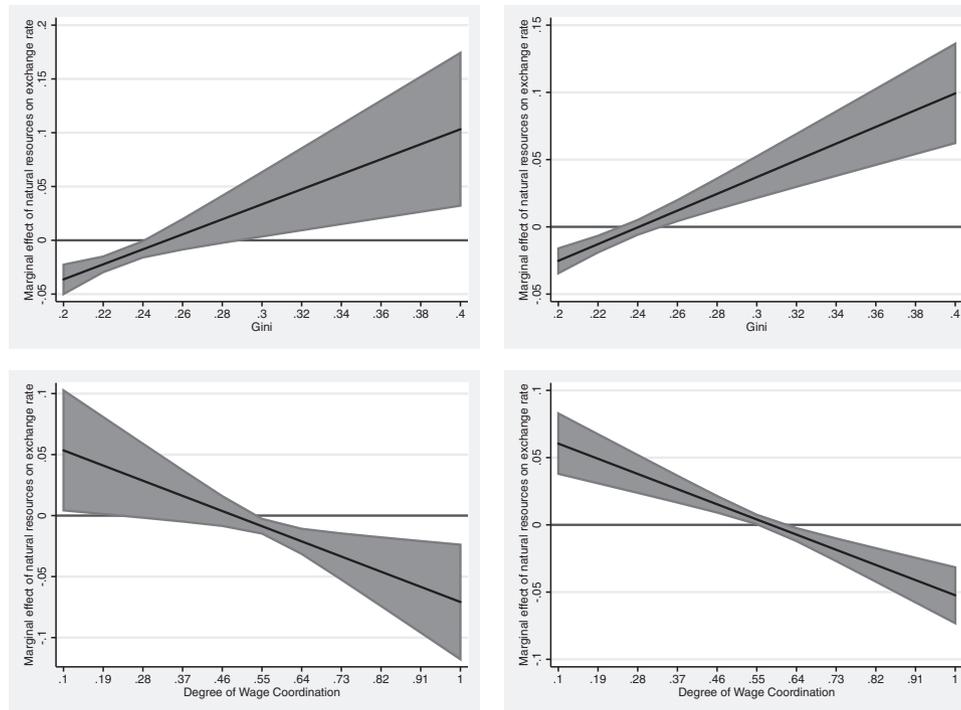
Figure 10. Marginal effect of natural resource rents on the real effective exchange rate. Natural resources contribute to the appreciation of the real exchange rate when wage coordination is low, but reduce the real exchange rate with high wage coordination. In contrast, natural resource rents have a negative impact on the real exchange rate if inequality is low. However, this effect changes into the opposite as inequality increases. Effects based on Table D

Lastly, I include GDP per capita growth to account for the state of the economy.

The estimation results of natural resources' effect on the real exchange rate conditional on wage coordination and inequality are presented in Figure 10. It displays how the coefficient capturing the effect of natural resources on the real exchange rate changes as a function of wage coordination (top row) and inequality (bottom row). Natural resources have a positive effect on the real exchange rate when wage coordination is low, thereby contributing to the appreciation of the real exchange rate. In contrast, under conditions of high wage bargaining coordination, natural resources actually exert a negative effect on real exchange rate appreciation. The inequality results are also consistent with the hypotheses: natural resource rents have a positive effect on the real exchange rate if inequality is high, while they lower the real exchange rate with low inequality.

I subsequently calculate predicted real exchange rate, $\widehat{y}$, as a function of natural resource rents. If wage coordination is in the 80th percentile—like Sweden—increases in natural resource rents do not affect the real exchange rate (solid line, light confidence interval). In contrast, a country like the United Kingdom in the 20th percentile of wage coordination experiences an appreciation of its real exchange rate as natural resources increase (dotted line, dark confidence interval). If inequality is high (in the 80th percentile, such as New Zealand—see solid line, light confidence interval), the real exchange rate appreciates with an increase in natural resource rents. Conversely, equal societies such as Austria—in the 20th percentile (dotted line, dark confidence interval)—do not experience an appreciation of the real exchange rate. In sum, these results confirm Hypotheses 5 and 6.

Robustness Checks

The previous section presented evidence that high wage bargaining coordination and low inequality prevent the Dutch Disease. The results are robust across three different dependent variables for exports, three different dependent variables for wages, and two different dependent variables for the real exchange rate. This section summarizes additional robustness tests that are fully presented in the Supplementary Materials.

Alternative Measures of Natural Resources

A key independent variable is nontax revenues obtained from natural resources. The results presented above use natural resource rents per capita in real USD developed by Dunning (2008). Section 5 of the Supplementary Materials re-estimates all models using several alternative measures of natural resource rents: oil rents per capita in real USD (Dunning 2008), oil rents (percent GDP) and fuel exports (percent merchandise exports), all from the World Development Indicators. In addition, oil rents per capita were calculated using oil reserves instead of oil production (Humphreys 2005), and oil rents per capita were calculated as the prices of resources produced minus the production costs obtained from Hamilton and Clemens (1999). The findings remain unaffected by these changes.

Alternative Measures of Wage Coordination and Inequality

In addition to natural resources, the other two key independent variables are wage coordination and inequality. Section 6 of the Supplementary Materials re-estimates all models using alternative measures for these variables. First, instead of a summary measure of centralization of wage
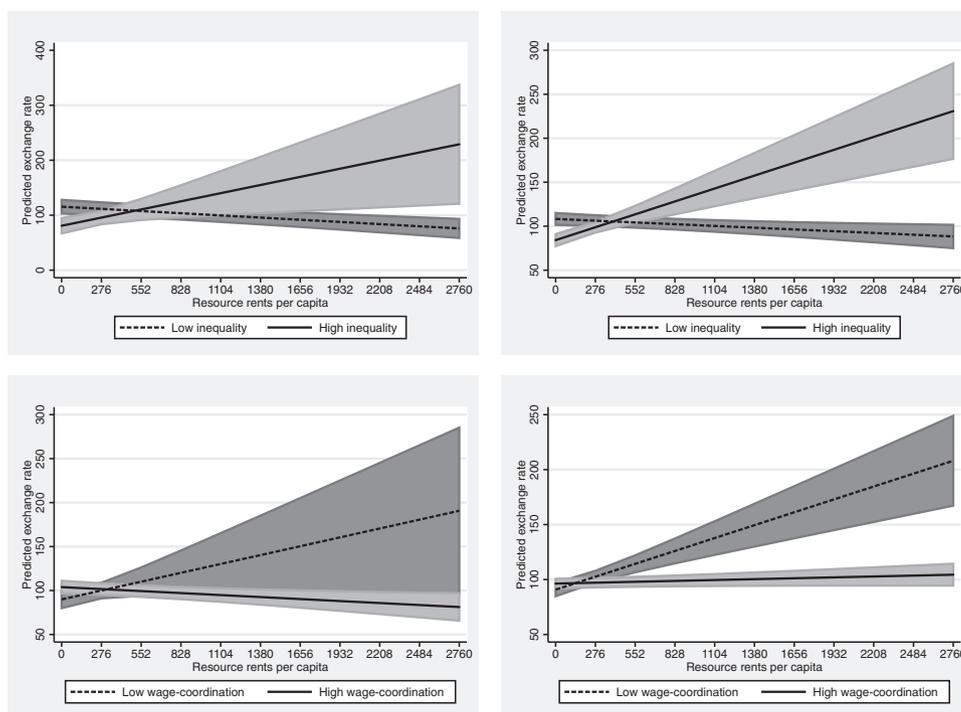
Figure 11. Predicted values of the real effective exchange rate as a function of natural resource rents. The real exchange rate appreciates with an increase in natural resources only in countries with low wage coordination. In contrast, the exchange rate remains unaffected in countries with high wage coordination scores. Conversely, under conditions of high inequality, an increase in natural resources corresponds with an appreciated real exchange rate, while the opposite is the case with low inequality. Effects based on Table D

bargaining provided by Visser (2011), I re-estimate the models using a wage coordination index by Hall and Gingerich (2009). Second, I replace the Gini coefficient of the total population after taxes obtained from the OECD with the SIDD1 Gini estimate (Babones and Alvarez-Rivadulla 2007). The results are robust to these changes.

Additional Control Variables

The results presented above include a battery of control variables, ranging from GDP per capita, unemployment, and labor productivity to the exchange rate regime. In addition, public spending is relevant considering that Nordic countries seem to handle resource booms relatively well. Their welfare states might function as automatic stabilizers, curbing consumption and possibly movement into over-heated sectors during booms. Section 7 of the Supplementary Materials accounts for this possibility by controlling for six different measures: total social expenditure (percent of GDP, per capita), unemployment assistance (percent of GDP, per capita), and spending on active labor market policies (percent of GDP, per capita). Data are obtained from the OECD. Additionally, I control for enrollment in vocational training programs (percent of total secondary education), obtained from UNESCO. The findings are not affected by the inclusion of these variables.

Outliers

Among industrialized economies with natural resources, Norway is an influential case as it features high natural resources, high wage bargaining coordination, and low inequality. In Section 8, I re-estimate all models presented above while excluding Norway from the sample. The results remain robust to the exclusion of outliers.

Interaction between Wage Coordination and Inequality

The results presented above test the effect of wage coordination and inequality separately. Section 9 of the Supplementary Materials examines the joint effect of both variables in two ways.

First, if both wage coordination and inequality are included in the model, does one lose statistical significance? Table W and Figure B show that this is not the case: both wage coordination and inequality exert an independent and significant effect on the dependent variable.

Second, the effect of wage coordination might not only be conditional on natural resources but also on inequality. I therefore estimate a model with triple interaction between natural resources, coordinated wage bargaining, and inequality. Figure C illustrates that the findings of the triple interaction model also indicate that the best outcomes are achieved with high coordination and low inequality.[8]

Multicollinearity

Wage bargaining coordination and equality are correlated with a host of other coordinating institutions. Examples are proportional representation (as opposed to majoritarian) electoral systems, parliamentary (versus presidential) political systems, and closed (versus open) lists of

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[8]I argue above that inequality leads to more demand for services, resulting in wage increases, which in turn decrease exports. In addition, I argue that coordinated wage bargaining moderates wage increases in the face of a resource boom. However, it might also moderate wage increases associated with inequality by keeping wages in services lower and therefore preventing them from outdistancing manufacturing wages. If this is the case, my theory would predict a negative sign on the interaction term between coordinated wage bargaining and inequality. Table X shows that—as predicted—the interaction between wage coordination and inequality is negative and statistically significant.

candidates. Considering multicollinearity between different institutions that promote coordination, it is important to examine the relative impact of complementary institutions.

For this reason, I estimate a Least Absolute Shrinkage and Selection Operator (Lasso) regression (Tibshirani 1996). This approach identifies the most informative predictors among a set of multicollinear variables. It estimates a linear regression but introduces a penalty function that reduces coefficients to zero quickly if the associated independent variables do not provide much explanatory value. In contrast, coefficients of informative variables withstand higher penalties.

Section 10 of the Supplementary Materials provides more details on the method as well as findings. In short, wage coordination and inequality are the most informative predictors. Their explanatory value trumps that of the electoral system (proportional representation versus majoritarian), political system (presidential versus parliamentary), mean district magnitude, checks and balances, and party candidate system (closed versus open list). All variables were obtained from Keefer (2013).

Endogeneity

Lastly, the within-country variation of wage coordination and inequality might be endogenous to nontax revenues. For example, countries might impose centralized wage bargaining to repress wages only after symptoms of the Dutch Disease were discovered. Similarly, politicians might use nontax revenues to decrease inequality.

For this reason, I estimate a panel vector autoregression (PVAR) that endogenizes natural resources, wage coordination, and inequality. This method allows for analyzing whether a sudden increase in one variable has a causal effect on the level of another variable. The findings are presented Section 11 of the Supplementary Materials. The results show that natural resources do not granger-cause systematic changes in wage coordination or inequality in this sample.

Conclusion

Ross (2012, 215) notes that many studies suffer from the "fallacy of unobserved burdens" as they do not account for the fact that the difficulty of dealing with effects of natural resources varies across countries. In this spirit, I show that the severity of the Dutch Disease differs across countries. Wage coordination and low inequality interrupt the causal mechanisms underlying the Dutch Disease. More specifically, the negative effect of natural resources on outcomes associated with the Dutch Disease—reduced exports, increased wages, and appreciated real exchange rate—occurs only under conditions of low wage bargaining coordination and high inequality.

These insights point to policy recommendations concerning income from natural resources. Existing advice primarily points to measures that would moderate the negative effects of the Dutch Disease once states have contracted it. Examples include countercyclical fiscal policy, fiscal tightening during resource booms, and absorbing domestic liquidity. In contrast, I suggest that steps can be taken to avoid the Dutch Disease in the first place. Others point to this possibility as well, but with different recommendations: the World Bank recommends that oil producers "remove supply-side bottlenecks such as labor market rigidities [that] can improve the economy's flexibility…thereby speeding up the adjustment process" (Kojo 2014, 17). In contrast, I suggest that it is precisely "labor market rigidities" such as limits on wage increases and egalitarian wage policies that prevent the Dutch Disease.

In developing my argument, I draw heavily on the Varieties of Capitalism literature. So far, this body of work has been domestically oriented, asking why countries cluster into groups of similar institutions and domestic policies. Yet, the momentum of the Varieties of Capitalism literature has slowed in recent years, partially because the focus on the domestic arena has been exhausted. At the same time, deepening globalization means that individual countries find themselves increasingly exposed to global markets. However, observers note that developments in these global markets produce divergent outcomes in individual countries. As mentioned in the Introduction, scholars have been quick to point to different institutional arrangements as an explanation for this cross-national variation. Yet we know little about the specific causal mechanisms by which domestic institutions mediate economic interdependence.

At this point, both literatures could benefit from cross-pollination: the Varieties of Capitalism's detailed understanding of specific institutional characteristics allows for microlevel analyses of specific causal mechanisms. Using these studies would allow International Relations scholars to avoid broad generalizations when analyzing how different institutions produce different patterns in terms of filtering global economic pressures. After all, pointing to the difference between democracies and autocracies provides limited help; these concepts are quite broad. At the same time, adding an international dimension to the Varieties of Capitalism literature will reinvigorate it. In short, my proposed approach can narrow the gap between International and Comparative Political Economy.

There are already a handful of studies that follow this approach. For one, Johnston and Regan (2015) analyze why some countries experienced housing bubbles and others did not, despite common credit supply shocks following the liberalization of housing markets. They find that countries with coordinated labor market institutions experience more restrained income growth, which reduces the likelihood of housing bubbles. Johnston, Hancké, and Pant (2014) investigate why some countries were hit harder during the financial crisis of 2008. They find that wage moderation in countries with corporatist institutions helped to retain competitiveness, produced positive trade balances, and hence reduced the need for significant international borrowing. As a consequence, these countries were less exposed to speculative pressures.

These examples illustrate how internationalizing the Varieties of Capitalism literature can help identify the causal mechanisms through which institutions operate in the context of international markets. Future work might investigate the effects of migration due to the Syrian War. Here, differences in labor markets and pension systems might determine why labor productivity or anti-immigrant public opinions differ across countries. Others might analyze whether countries' negotiation strategies with respect to trade and investment treaties differ conditionally on the way domestic electoral systems aggregate citizens' preferences.

Supplemental Information

Available at [http://www.utdallas.edu/~bunte/]and at ISA Online.

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