UNIVERSITY OF EXETER | BUSINESS SCHOOL

Department of Economics Discussion Papers

ISSN 1473-3307

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Paper number 26/08

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This Version: June 2026

Abstract

Can resource windfalls explain the accumulation of productive capabilities? We examine this question using a panel of 140 countries over the period 1995-2023, leveraging plausibly exogenous variation in international commodity prices through countries' predetermined net export structures. We find that resource windfalls have a robust negative effect on productive capabilities. Using our preferred dynamic specifications, a one-standard-deviation increase in resource windfalls is associated with a long-run decline in productive capabilities of approximately 0.10 standard deviations. Beyond the average effect, we document substantial heterogeneity across countries. The adverse effects are concentrated among lower-income and initially less sophisticated economies, while richer and more sophisticated economies exhibit greater resilience to resource windfalls. We also provide evidence suggesting that resource windfalls alter the composition of investment in ways that contribute relatively little to capability accumulation. Our findings suggest that resource windfalls may hinder structural transformation by slowing the accumulation of productive capabilities.

JEL codes: F43; O11; O13; O14; O30; Q32

Keywords: Resource Windfalls; Productive Capabilities; Structural Transformation; Economic Development; Commodity Prices

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1 Introduction

Why do some countries successfully diversify into increasingly sophisticated economic activities while others remain dependent on primary commodities? Understanding the forces that shape structural transformation and long-run development remains a central challenge in economics (Lewis, 1954; Chenery, 1979; Imbs and Wacziarg, 2003; Rodrik, 2013; McMillan et al., 2014; Herrendorf et al., 2014; Diao et al., 2019). A large and influential literature argues that development is fundamentally a process of accumulating productive capabilities—the knowledge, skills, institutions, and organizational capacities required to produce progressively more sophisticated goods and services (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann and Hidalgo, 2011; Hausmann et al., 2014; Hartmann et al., 2017; Hidalgo, 2021). Countries that accumulate these capabilities tend to diversify production, upgrade into more sophisticated activities, and achieve sustained improvements in productivity and living standards (Hartmann et al., 2017; Hidalgo, 2021; Gloria et al., 2024). Yet, while a large literature documents the consequences of productive capabilities for economic development, considerably less is known about the forces that shape their accumulation.

Natural resources, which occupy a central place in development debates, are one potentially important determinant. On the one hand, resource wealth can generate export revenues, fiscal resources, and foreign exchange that relax investment constraints, finance public goods, and support economic development (Van Der Ploeg, 2011; Venables, 2016; Van Der Ploeg and Poelhekke, 2017). On the other hand, a long tradition dating back to Dutch disease arguments suggests that resource booms can hinder industrialization by shifting resources away from tradable sectors, weakening incentives for learning-by-doing, and slowing the diversification process (Corden and Neary, 1982; Sachs and Warner, 1997, 2001; Van Der Ploeg, 2011; Bjørnland et al., 2019). While a vast literature has examined the effects of natural resources on economic growth, institutions, conflict, inequality, and macroeconomic volatility (Deaton and Miller, 1996; Ross, 2001; Brückner and Ciccone, 2010; Collier and Goderis, 2012; Caselli and Tesei, 2016; Gallego et al., 2020), considerably less is known about whether resource windfalls influence the accumulation of productive capabilities themselves. We therefore ask a simple but fundamental question: Do natural resource windfalls shape the accumulation of productive capabilities and, in turn, the process of structural transformation?

This article addresses that question. We examine whether resource windfalls affect the accumulation of productive capabilities using a panel of 140 countries observed between 1995 and 2023. To measure resource windfalls, we exploit plausibly exogenous variation in a country-specific commodity net export price index, which combines movements in world commodity prices with countries' predetermined net export positions across a broad range of commodities. Because international commodity prices are largely determined in world markets, this approach generates quasi-exogenous variation in resource rents across countries and over time. We measure productive capabilities using the Economic Complexity Index (ECI), a widely used measure of the sophistication of a country's productive structure. Our results reveal a robust negative relationship between resource windfalls and productive capabilities. Across a wide range of specifications, resource windfalls are associated with economically meaningful declines in productive capabilities. Using our preferred dynamic specifications, a one-standard-deviation increase in resource windfalls is associated with a long-run decline in productive capabilities of approximately 0.10 standard deviations. The results remain stable across alternative measures of productive capabilities and commodity prices, different functional forms, and a wide range of additional controls. Taken together, these findings suggest that resource windfalls may impede structural transformation by slowing the accumulation of productive capabilities.

More importantly, the average effect masks substantial heterogeneity. We find that the negative effects are concentrated among low-income countries and countries with initially low levels of productive capabilities. By contrast, the relationship largely disappears among richer and initially more advanced economies. These findings suggest that resource windfalls do not affect all economies equally. Instead, their consequences appear to depend on the stage of capability accumulation. Countries that have already developed broad productive capabilities appear more resilient to commodity-driven income shocks, whereas countries that remain in earlier stages of structural transformation are substantially more vulnerable. This pattern is consistent with theories emphasizing path dependence, capability persistence, and stage-dependent development trajectories (Imbs and Wacziarg, 2003; Koren and Tenreyro, 2007; Herrendorf et al., 2014; Bjørnland et al., 2019; Lee, 2023), suggesting that resource windfalls may be particularly harmful in economies where productive capabilities are still being accumulated but less consequential once broad capabilities have already been established.

We also explore the mechanisms underlying these effects. While resource windfalls are associated with higher levels of aggregate investment, the evidence suggests that these investment increases do not translate into stronger capability accumulation. This pattern is consistent with the view that resource windfalls influence not only the level of investment but also its composition, potentially weakening incentives to invest in activities that support technological upgrading and diversification (Corden and Neary, 1982; Van Der Ploeg, 2011; Kim, 2020; Silva et al., 2024). More broadly, our findings suggest that the developmental consequences of resource windfalls may depend less on the income they generate and more on how they shape the accumulation of productive capabilities that underpin structural transformation.

These findings contribute to the literature on structural transformation, long-run development, and productive capability accumulation. First, we contribute to the literatures on structural transformation, long-run development, and the resource curse by showing that resource windfalls can influence development through their effects on the accumulation of productive capabilities. A central theme in the structural transformation literature is that development involves the gradual reallocation of resources toward increasingly productive and sophisticated activities (Imbs and Wacziarg, 2003; Koren and Tenreyro, 2007; Herrendorf et al., 2014; Diao et al., 2019). At the same time, the resource curse literature has traditionally emphasized channels such as exchange-rate appreciation, fiscal volatility, institutional deterioration, and human-capital accumulation (Corden and Neary, 1982; Sachs and Warner, 1997, 2001; Van Der Ploeg, 2011; Caselli and Tesei, 2016; Bjørnland et al., 2019; Gallego et al., 2020). We bridge these literatures by identifying productive capability accumulation as an additional channel through which resource windfalls shape long-run development. By documenting a robust negative relationship between resource windfalls and productive capabilities, we show that natural resources can influence development not only through their effects on income, institutions, and macroeconomic stability, but also through their effects on the productive structures of economies. Moreover, we show that these effects are highly heterogeneous: they are concentrated among low-income and initially less-sophisticated economies, while largely disappearing among richer and more sophisticated countries. These findings help explain why natural resource abundance appears to hinder development in some countries but not in others. They are consistent with theories emphasizing path dependence and capability persistence in the development processes (Hidalgo and Hausmann, 2009; Hausmann and Hidalgo, 2011; Hausmann et al., 2014; Hidalgo, 2021), as well as recent evidence that commodity price volatility can generate heterogeneous and stage-dependent development outcomes (Bjørnland et al., 2019; Lee, 2023).

We also contribute to the emerging literature on the determinants of productive capability accumulation. While previous research has established that productive capabilities are central to economic growth and development (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann and Hidalgo, 2011), considerably less is known about the forces that shape their evolution over time (Hidalgo, 2021). Existing work has highlighted the roles of institutions, policies, connectivity, and demographic characteristics (Sweet and Maggio, 2015; Lapatinas, 2019; Lapatinas et al., 2019; Bahar et al., 2022). We add to this literature by identifying resource windfalls as an important determinant of capability accumulation. We further provide evidence consistent with the view that resource windfalls affect not only the level of investment but also its composition, potentially weakening incentives to invest in activities that support technological upgrading, diversification, and capability accumulation (Corden and Neary, 1982; Kim, 2020; Silva et al., 2024). More broadly, our findings suggest that the developmental consequences of resource windfalls operate not only through their effects on income but also through their influence on the accumulation of productive capabilities.

The remainder of the article proceeds as follows. Section 2 describes the data. Section 3 outlines the empirical framework. Section 4 presents the main results and supporting evidence. Section 5 concludes.

2 Data

Our analysis combines data on resource windfalls, productive capabilities, and a range of additional country-level characteristics.

2.1 Resource Windfalls

We measure resource windfalls using the commodity net export price index (CNEPI) developed by Gruss and Kebhaj (2021).[1] The index is constructed as a weighted average of international commodity prices:

$$\mathrm{CNEPI}_{it} = \sum_{j=1}^{J} P_{jt}\Omega_{ijt} \tag{1}$$

where P_{jt} denotes the logarithm of the real international price of commodity j in year t , and the weights, Ω_{ijt}, reflect predetermined net export positions of countries in individual

[1] The database covers 182 economies from 1962 to 2024 and is constructed using information on 40 internationally traded commodities, spanning energy, metals, food and beverages, and agricultural raw materials. See Gruss and Kebhaj (2021) for complete details.

commodities:

$$\Omega_{ijt} = \frac{X_{ijt-s} - M_{ijt-s}}{\sum_{j=1}^{J} X_{ijt-s} + \sum_{j=1}^{J} M_{ijt-s}} \tag{2}$$

with X_{ijt-s} denoting the export value of commodity j from country i in year t-s and M_{ijt-s} the import value of commodity j by country i in year t-s, such that the weights capture the net exports of each commodity as a share of a country's total trade.

The intuition behind this measure is straightforward. Countries differ in their exposure to commodity price fluctuations because they specialize in different commodities. As world commodity prices change, countries experience differential resource-income shocks depending on their predetermined net export positions. The resulting variation therefore generates differential resource windfalls across countries and over time. An important advantage of this approach is that international commodity prices are largely determined in world markets and can therefore be treated as plausibly exogenous to contemporaneous domestic developments in individual countries (Deaton and Miller, 1996; Aghion et al., 2010; Arezki and Brückner, 2012; Collier and Goderis, 2012; Ricci et al., 2013; Caselli and Tesei, 2016; Oyekola et al., 2024). Consequently, the interaction of world commodity price movements with predetermined country-specific commodity trade structures provides plausibly exogenous variation in resource windfalls.

2.2 Productive Capabilities

We measure productive capabilities using the Economic Complexity Index (ECI), obtained from the Atlas of Economic Complexity maintained by the Growth Lab at Harvard University.[2] The ECI is a widely used proxy for the productive capabilities embedded within an economy. The index combines information on the diversity of a country's export basket and the ubiquity of the products it exports. The underlying idea is that countries differ in the ca-

[2]The dataset covers 145 countries from 1995 to 2023 and is constructed using trade information on approximately 700 products classified under the HS92 system and converted to SITC 4-digit codes. Countries are included if they satisfy minimum population, trade volume, and data quality requirements. See Hidalgo and Hausmann (2009) and Hausmann et al. (2014) for details.

pabilities required to produce and export sophisticated goods. Economies with broader and more advanced capability sets are able to competitively produce a wider range of products, particularly products that relatively few other countries can manufacture. Consequently, higher values of the ECI indicate a greater stock of productive capabilities and a stronger capacity for diversification, industrial upgrading, and structural transformation (Hidalgo and Hausmann, 2009; Hausmann and Hidalgo, 2011; Hausmann et al., 2014; Hidalgo, 2021). We therefore use the ECI as our primary measure of productive capabilities throughout the paper.

2.3 Additional Variables

In addition to our main variables, we collect a range of country-level indicators used in robustness checks and mechanism analyses. Following the literature on productive capabilities, structural transformation, and economic development (Hausmann et al., 2007; Sweet and Maggio, 2015; Lapatinas, 2019; Lapatinas et al., 2019; Hidalgo, 2021), these variables capture economic development, institutional quality, macroeconomic conditions, global integration, human capital, and investment. Data are obtained primarily from the World Development Indicators (WDI) and the Quality of Government (QoG) database.

2.4 Descriptive Statistics

Our analysis is based on an unbalanced panel of 140 countries observed between 1995 and 2023. Depending on the specification, the estimation sample contains between 2,864 and 4,024 country-year observations. The composition of the estimation sample is determined by data availability, particularly the measure of productive capabilities, which has only been available since the mid-1990s.

Figure 1 presents the evolution of the paper's two central variables over time. Panel A plots average resource windfalls, measured by the CNEPI, highlighting the substantial variation generated by fluctuations in international commodity markets. Panel B plots average

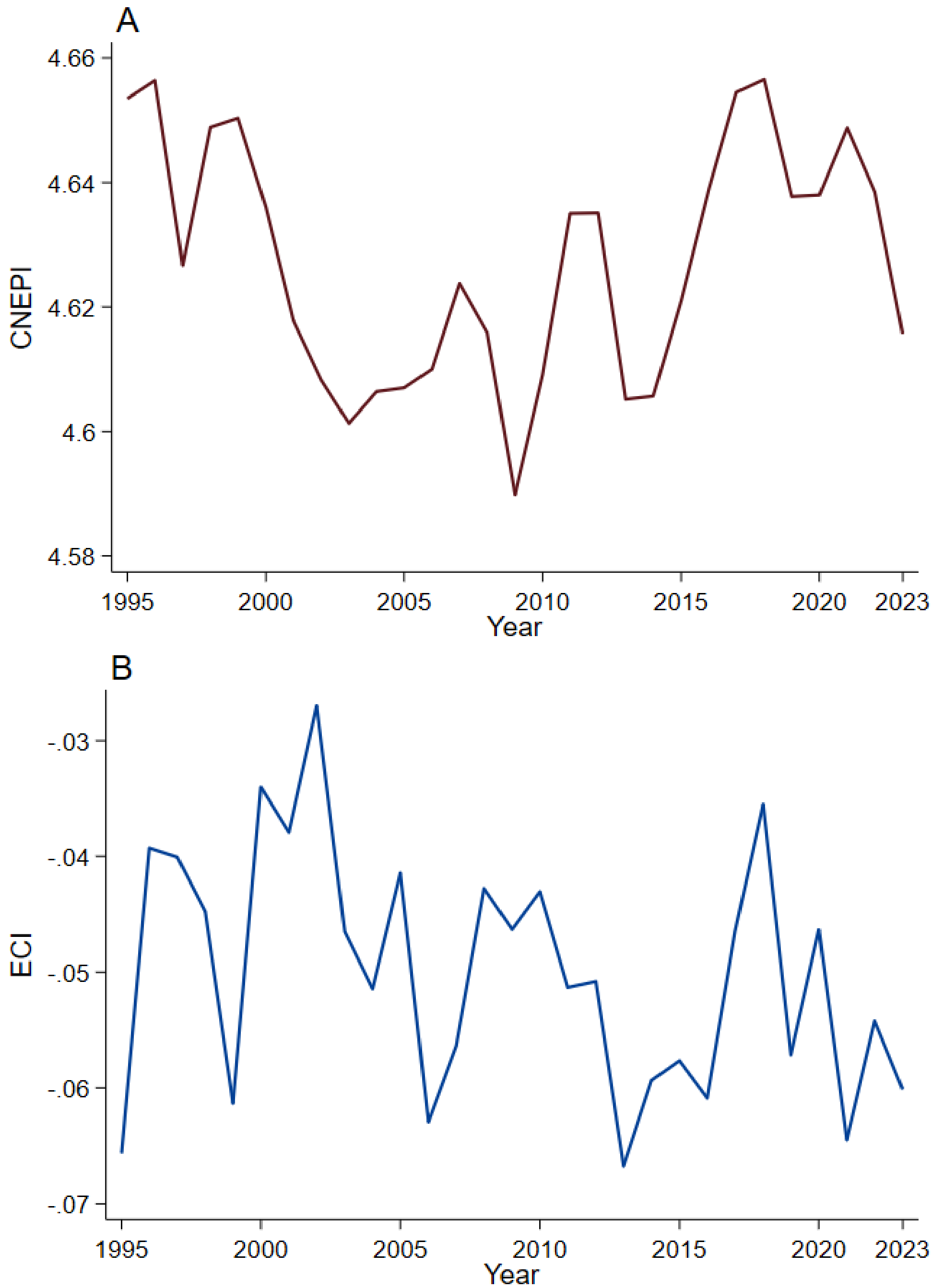

Figure 1: Trends in Resource Windfalls and Productive Capabilities

Notes: Panel **A** plots the average level of resource windfalls, measured by the commodity net export price index (CNEPI), across countries from 1995 to 2023. Panel **B** plots the average level of productive capabilities, measured by the Economic Complexity Index (ECI), across countries from 1995 to 2023.

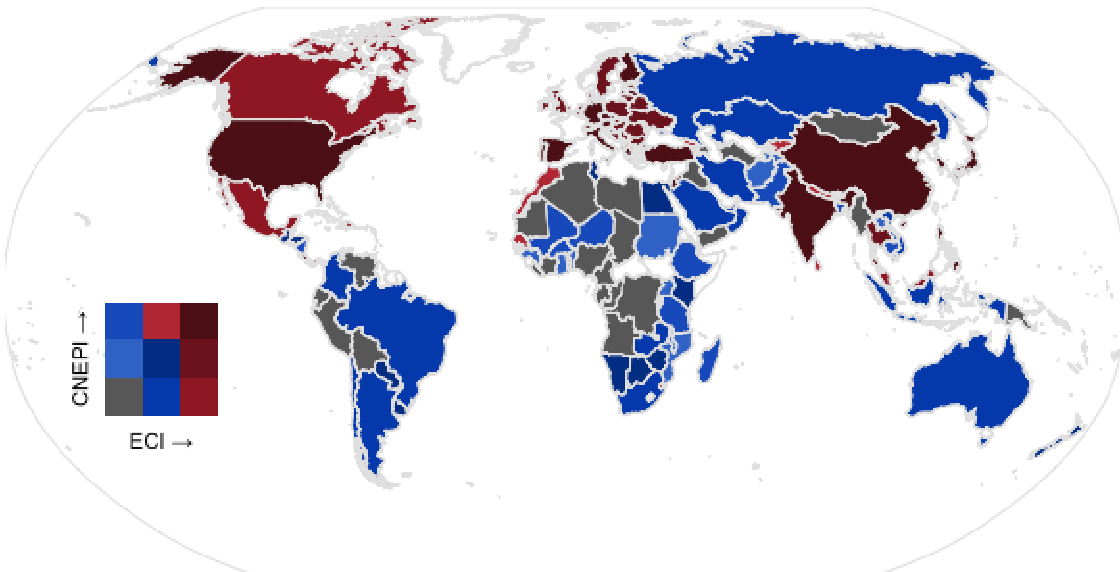

Figure 2: Bivariate Choropleth of Resource Windfalls and Productive Capabilities

Notes: The figure presents a bivariate choropleth map of resource windfalls and productive capabilities across countries in the analysis sample. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Countries are classified into terciles based on their average values of each variable over the period 1995–2023. The bottom-left cell of the legend corresponds to countries in the lowest tercile of both resource windfalls and productive capabilities, while the top-right cell corresponds to countries in the highest tercile of both dimensions.

productive capabilities, measured by the ECI, revealing considerable variation in countries' productive structures throughout the sample period. Figure 2 additionally illustrates the geographic distribution of resource windfalls and productive capabilities across countries. The figure reveals substantial cross-country heterogeneity in both variables, with countries occupying markedly different positions in terms of exposure to resource windfalls and capability accumulation.

Table 1 reports summary statistics for the variables used in the analysis. The average ECI is -0.050, with a standard deviation of 1.008, indicating considerable dispersion in productive capabilities across countries. The average CNEPI is 4.626 with a standard deviation of 0.355, reflecting substantial variation in resource windfalls over time and across countries. The

Table 1: Descriptive Statistics

	N	Mean	SD	Min	p25	Median	p75	Max
Economic complexity index, ECI	4024	-0.050	1.008	-3.127	-0.809	-0.257	0.573	2.993
Economic fitness, EF	3909	1.106	1.380	0.000	0.152	0.624	1.541	10.688
Commodity net export price index, CNEPI	4024	4.626	0.355	2.946	4.548	4.651	4.792	5.718
Commodity net export price index growth, ΔCNEPI	4024	-0.001	0.120	-0.641	-0.063	-0.005	0.054	0.811
Commodity export price index, CEPI	4024	4.287	0.380	2.79	4.074	4.376	4.585	5.184
Real GDP per capita, GDPPC	3970	8.499	1.447	5.347	7.328	8.444	9.667	11.486
Population density, POPDEN	3734	4.114	1.344	0.409	3.298	4.256	4.855	8.983
Agricultural value-added, AGRICVD	3909	11.576	10.931	0.027	2.978	7.939	17.677	79.042
Government size, GS	3702	2.674	0.374	0.716	2.444	2.724	2.946	3.929
Inflation, INF	3761	0.111	0.872	-0.161	0.019	0.04	0.082	41.451
Gross capital formation, GCF	3742	24.022	7.554	0.000	19.625	23.217	27.402	76.782
Secondary school enrolment rate, SECENR	2864	4.273	0.553	1.622	4.077	4.479	4.617	5.100
Economic globalization, EG	3873	56.043	16.359	15.827	43.388	55.165	68.588	94.102

Notes: This table reports summary statistics for the variables used in the empirical analysis.

table also presents descriptive statistics for alternative measures of productive capabilities and resource windfalls, as well as the variables used in robustness checks and mechanism analyses.

3 Empirical Strategy

3.1 Baseline Specification

To examine whether resource windfalls affect the accumulation of productive capabilities, we estimate the following baseline specification:

$$\begin{aligned} \text{Productive Capabilities}_{it} = \; & a_i + b_t + c_i t + \alpha \text{ Productive Capabilities}_{it-1} \\ & + \beta \text{ Resource Windfalls}_{it-1} + \varepsilon_{it} \end{aligned} \tag{3}$$

where productive capabilities are measured using the Economic Complexity Index (ECI) and resource windfalls are measured using the commodity net export price index (CNEPI) described in Section 2. The lagged dependent variable captures the persistence of productive capabilities, reflecting the gradual and path-dependent nature of capability accumulation. The coefficient of interest is β, which captures the effect of resource windfalls on the accumulation of productive capabilities over time.

The specification includes country fixed effects, a_i, which absorb time-invariant country characteristics; year fixed effects, b_t, which absorb global shocks common to all countries; and country-specific linear time trends, $c_i t$, which account for slow-moving country-specific developments that may influence productive capabilities. Standard errors are clustered at the country level (Cameron and Miller, 2015).

3.2 Identification

Identification relies on the fact that countries differ in their exposure to international commodity price fluctuations because they specialize in different commodities. The commodity net export price index combines movements in world commodity prices with predetermined country-specific commodity trade structures, generating variation in resource windfalls across countries and over time. Since commodity prices are largely determined in global markets rather than by economic conditions in individual countries, movements in the CNEPI provide plausibly exogenous variation in resource windfalls (Deaton and Miller, 1996; Brückner and Ciccone, 2010; Collier and Goderis, 2012; Gruss and Kebhaj, 2021; Caselli and Tesei, 2016; Oyekola et al., 2024).

The coefficient β is identified from differential changes in resource windfalls generated by fluctuations in international commodity markets and countries' predetermined commodity trade structures. Intuitively, when world commodity prices rise, countries with larger net export positions in the affected commodities experience larger resource-income gains than countries with smaller or negative net export positions. Conditional on country fixed effects, year fixed effects, and country-specific trends, identification comes from comparing how productive capabilities evolve across countries experiencing different resource-windfall shocks. The identifying assumption is that, conditional on these controls, international commodity price movements affect productive capabilities only through their impact on resource windfalls and are otherwise unrelated to unobserved determinants of capability accumulation.

Several features of the empirical design help mitigate concerns about reverse causality and omitted variable bias. First, commodity prices are determined in international markets and are unlikely to respond contemporaneously to changes in productive capabilities within individual countries. Second, the use of lagged resource windfalls reduces concerns that current productive capabilities influence measured commodity price exposure. Third, country fixed effects, year fixed effects, and country-specific trends absorb a broad set of confounding factors that could jointly influence resource windfalls and the accumulation of productive capabilities.

3.3 Estimation

We begin by estimating the static versions of equation (3) using least-squares fixed effects (LSFE). While informative, static specifications may be inappropriate in this setting because productive capabilities are highly persistent and evolve gradually over time. As such, our preferred specifications include the lagged dependent variable. Estimating dynamic fixed-effects models can introduce the well-known Nickell bias due to the correlation between the lagged dependent variable and the error term (Nickell, 1981). Although this bias diminishes as the time dimension increases, we further address it by estimating bias-corrected fixed-effects (BCFE) models following Bruno (2005a,b).

As an additional robustness exercise, we estimate dynamic panel models using the difference GMM estimator of Arellano and Bond (1991) and the system GMM estimator of Blundell and Bond (1998); Arellano and Bover (1995). These estimators exploit internal instruments constructed from lagged values of the endogenous variables and are designed to address the endogeneity arising from the inclusion of lagged dependent variables in panel settings. Because productive capabilities are highly persistent, we place greater emphasis on the system GMM estimates, which are generally more efficient and better suited to highly persistent series. To avoid instrument proliferation, we collapse the instrument matrix following Roodman (2009). We report the Arellano-Bond tests for first- and second-order serial correlation to assess the validity of the dynamic panel specifications.

4 Results

We begin by examining whether resource windfalls affect the accumulation of productive capabilities. We then assess the robustness of the baseline findings and explore heterogeneity across countries at different stages of development. Finally, we investigate the mechanisms through which resource windfalls may influence productive capabilities.

4.1 Resource Windfalls and Productive Capabilities

Figure 3 presents the baseline estimates of the relationship between resource windfalls and productive capabilities. The figure reports coefficient estimates from both static and dynamic specifications using four estimation approaches: least-squares fixed effects (LSFE), bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM). Following the empirical strategy outlined above, all specifications include country fixed effects, year fixed effects, and country-specific linear time trends. For ease of presentation, the figure reports only the coefficients on resource windfalls.

Across specifications and estimation approaches, resource windfalls are associated with statistically significant reductions in productive capabilities. The estimated coefficients are consistently negative and remain remarkably stable across alternative estimators and model specifications. Following Kotschy and Sunde (2017), comparing estimates across alternative estimators provides useful information regarding the range within which the true coefficient is likely to lie, given that each estimator relies on different identifying assumptions; see also Fortunato and Panizza (2015). Controlling for the persistence of productive capabilities reduces the magnitude of the estimated effects somewhat, with the coefficient on resource windfalls ranging between -0.145 and -0.179 in the dynamic specifications compared to -0.257 in the static model. Nevertheless, the estimated effect remains negative and statis-

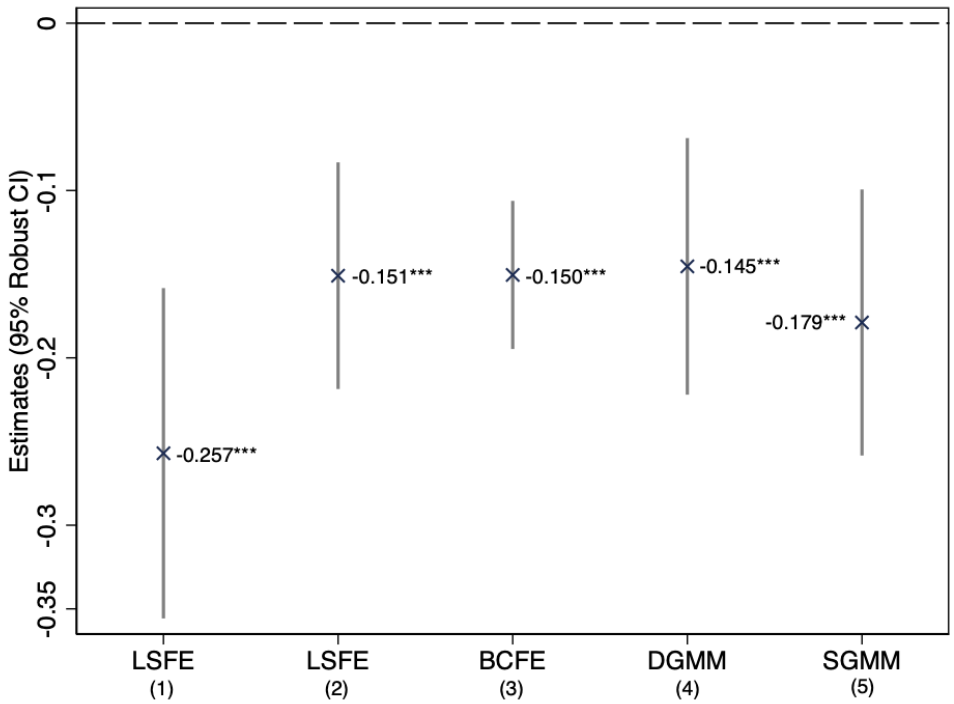

Figure 3: Baseline Estimates: Resource Windfalls and Productive Capabilities

Notes: The figure reports coefficient estimates of the effect of resource windfalls on productive capabilities together with 95% confidence intervals based on standard errors clustered at the country level. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). The first specification is a static model estimated using least-squares fixed effects (LSFE), while the remaining specifications are dynamic models estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM). All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

tically significant across all estimation approaches.

Thus, the results provide consistent evidence that resource windfalls impede the accumulation of productive capabilities. We reject the null hypothesis that the coefficient on resource windfalls is equal to zero at the 1% significance level across all baseline specifications. Economically, a one-standard-deviation increase in resource windfalls (0.355 log points) is associated with a decline in productive capabilities of approximately 0.05 to 0.09 standard deviations. Given the persistence of productive capabilities, the implied long-run effect is larger. Using the preferred dynamic specifications, a one-standard-deviation increase in resource windfalls is associated with a long-run decline in productive capabilities of ap-

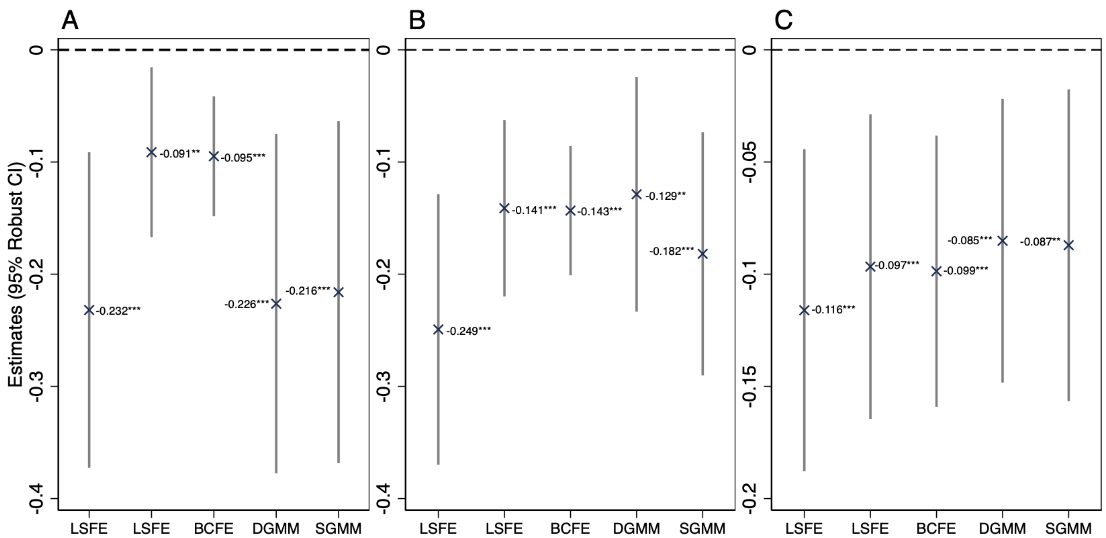

Figure 4: Robustness Analysis I: Alternative Measures and Functional Forms

Notes: The figure reports coefficient estimates together with 95% confidence intervals based on standard errors clustered at the country level. Panel **A** examines the robustness of the results to an alternative measure of productive capabilities, Economic Fitness (EF). Panel **B** uses an alternative measure of resource windfalls based on the commodity export price index (CEPI). Panel **C** examines robustness to an alternative functional form using the annual growth rate of the commodity net export price index (ΔCNEPI). In each panel, the first specification is estimated using least-squares fixed effects (LSFE), while the remaining specifications are estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM). All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

proximately 0.10 standard deviations. This long-run effect corresponds to roughly 7.5% of the interquartile range in productive capabilities. These magnitudes suggest that the effects of resource windfalls on capability accumulation are not only statistically significant but also economically meaningful.

4.2 Robustness Checks

We next examine the robustness of the baseline findings to alternative measures, specifications, and sample compositions. First, we replace the ECI with the Economic Fitness (EF) measure proposed by Tacchella et al. (2012) and obtained from the World Bank (Figure 4A). Second, we replace the CNEPI with the commodity export price index (CEPI) from Gruss and Kebhaj (2021) (Figure 4B). Third, we use the growth rate of commodity net export prices (ΔCNEPI) instead of the benchmark log-transformed measure (Figure 4C). Across all alternative specifications, the estimated effects remain negative and statistically significant.

Fourth, we augment the baseline specification by sequentially controlling for a range of time-varying country characteristics, including GDP per capita, agricultural value-added, government size, inflation, gross capital formation, population density, secondary school enrollment, and economic globalization (Table 2). The estimated coefficients on resource windfalls remain negative, statistically significant, and economically similar to the baseline results. These findings suggest that the estimated effect of resource windfalls on productive capabilities is not driven by the omission of commonly studied determinants of economic development and structural transformation.

Finally, we assess whether the results are sensitive to particular regions, countries, or years. Specifically, we sequentially exclude individual regions, countries, and years from the estimation sample. The resulting estimates remain remarkably stable, with the sign, magnitude, and statistical significance of the coefficient on resource windfalls largely unchanged (Figure A1). These exercises mitigate concerns that the baseline findings are driven by a particular subset of countries, regions, or periods.

4.3 Heterogeneity Across Stages of Development

The baseline results establish a negative relationship between resource windfalls and productive capabilities. However, these average effects may mask substantial heterogeneity across countries. In particular, economies at different stages of development may differ in their ability to absorb resource windfalls and sustain capability accumulation. Consequently, we examine whether the effects of resource windfalls vary across countries with different levels of income and productive capabilities.

Panel A of Table 3 splits the sample according to GDP per capita, while Panel B splits countries according to their initial level of productive capabilities. A clear pattern emerges across all specifications. The adverse effects of resource windfalls are concentrated

Table 2: Robustness Analysis II: Accounting for Potential Confounding Factors

DV: ECI Add. controls:	(1) GDPPC	(2) AGRICVD	(3) GS	(4) INF	(5) GCF	(6) POPDEN	(7) SECENR	(8) EG
	A Static model							
	LSFE							
CNEPI_{t-1}	-0.250***	-0.235***	-0.282***	-0.249***	-0.273***	-0.258***	-0.141***	-0.255***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.420	0.423	0.432	0.417	0.438	0.433	0.449	0.428
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877
	B Dynamic model							
	LSFE							
CNEPI_{t-1}	-0.149***	-0.138***	-0.172***	-0.149***	-0.169***	-0.159***	-0.090***	-0.151***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.000)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.496	0.499	0.501	0.489	0.505	0.502	0.516	0.504
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877
	DGMM							
CNEPI_{t-1}	-0.132***	-0.124***	-0.216***	-0.124***	-0.165***	-0.123***	-0.138**	-0.168***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.000)	(0.003)	(0.015)	(0.000)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
AR(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	0.270	0.259	0.247	0.347	0.235	0.431	0.684	0.344
Countries	139	140	135	138	135	140	136	140
N	3701	3651	3442	3504	3482	3597	2486	3737
	SGMM							
CNEPI_{t-1}	-0.131***	-0.085**	-0.149***	-0.133***	-0.148**	-0.183***	-0.119**	-0.175***
	(0.002)	(0.032)	(0.007)	(0.006)	(0.011)	(0.000)	(0.045)	(0.000)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
AR(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	0.201	0.193	0.165	0.250	0.151	0.372	0.683	0.248
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877

Notes: The table reports estimates of the effect of resource windfalls on productive capabilities. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Each column augments the baseline specification with the additional control variable indicated in the column header. Panel **A** reports estimates from static models estimated using least-squares fixed effects (LSFE). Panel **B** reports estimates from dynamic models estimated using LSFE, difference GMM (DGMM), and system GMM (SGMM). *p*-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

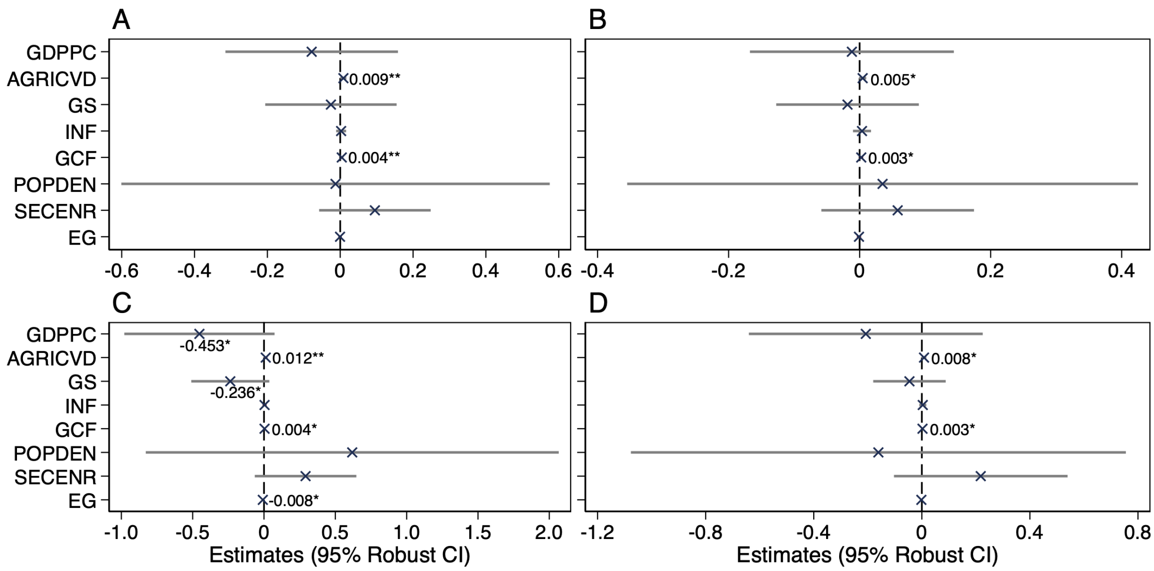

Figure 5: Potential Mechanisms Linking Resource Windfalls and Productive Capabilities

Notes: The figure reports coefficient estimates of the relationship between resource windfalls and a set of potential mechanisms, including investment, human capital, agricultural transformation, government activity, and broader macroeconomic conditions. Coefficients are shown together with 95% confidence intervals based on standard errors clustered at the country level. Resource windfalls are measured using the commodity net export price index (CNEPI). All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

among low-income and initially less sophisticated economies, while they are substantially weaker—and often statistically indistinguishable from zero—among richer and more sophisticated economies. These findings suggest that resource windfalls are particularly harmful in countries that have yet to accumulate a broad base of productive capabilities. In contrast, countries with more advanced productive structures appear better able to absorb commodity price fluctuations without experiencing significant declines in productive capabilities.

4.4 Mechanisms

We next investigate the mechanisms through which resource windfalls may affect the accumulation of productive capabilities. Existing research suggests that resource shocks can affect structural transformation through multiple channels, including investment allocation, human-capital accumulation, sectoral reallocation, government spending, and broader

Table 3: Heterogeneous Effects of Resource Windfalls

	(1) LSFE Low	(2) LSFE High	(3) LSFE Low	(4) LSFE High	(5) DGMM Low	(6) DGMM High	(7) SGMM Low	(8) SGMM High
	A Split by income level							
ECI_{t-1}			0.325***	0.357***	0.344***	0.279***	0.360***	0.223***
			(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.006)
CNEPI_{t-1}	-0.242***	-0.175**	-0.150***	-0.090*	-0.172***	-0.063	-0.174***	-0.049
	(0.000)	(0.011)	(0.001)	(0.099)	(0.000)	(0.322)	(0.000)	(0.489)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.398	0.648	0.458	0.693				
AR(1)					0.000	0.000	0.000	0.000
AR(2)					0.297	0.549	0.257	0.411
Countries	107	48	107	48	107	48	107	48
N	2847	1123	2745	1092	2639	1060	2745	1092
	B Split by complexity level							
ECI_{t-1}			0.267***	0.408***	0.339***	0.450***	0.287***	0.439***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CNEPI_{t-1}	-0.264***	-0.042	-0.175***	-0.006	-0.119**	-0.068	-0.136**	0.009
	(0.000)	(0.511)	(0.000)	(0.890)	(0.015)	(0.461)	(0.012)	(0.897)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.383	0.577	0.431	0.667				
AR(1)					0.000	0.000	0.000	0.000
AR(2)					0.408	0.194	0.445	0.166
Countries	97	92	97	92	94	90	97	92
N	2312	1712	2237	1652	2161	1588	2237	1652

Notes: The table reports estimates of the effect of resource windfalls on productive capabilities across different groups of countries. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Panel **A** splits countries into low- and high-income groups based on whether average GDP per capita is below or above the sample mean ($12,450). Panel **B** splits countries into low- and high-complexity groups based on whether average ECI is below or above the sample mean (-0.048). Columns (1)–(4) report estimates from least-squares fixed effects (LSFE) models, while columns (5)–(8) and (9)–(12) report estimates from difference GMM (DGMM) and system GMM (SGMM) models, respectively. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

macroeconomic adjustments (Corden and Neary, 1982; Sachs and Warner, 2001; Van Der Ploeg, 2011; Alberola and Benigno, 2017; Kim, 2020; Cust et al., 2022; Silva et al., 2024). Accordingly, we examine the same set of country-level variables used in the robustness exercises as potential transmission channels.

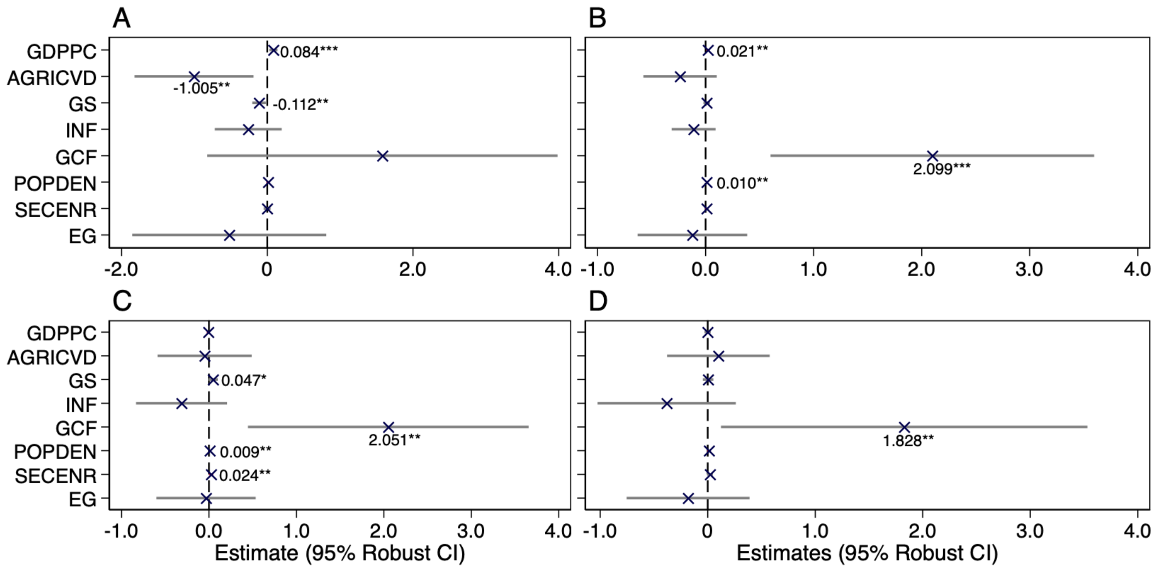

Figure 6: Effects of Resource Windfalls on Potential Mechanisms

Notes: The figure reports coefficient estimates of the effect of resource windfalls on a range of potential mechanisms together with 95% confidence intervals based on standard errors clustered at the country level. Resource windfalls are measured using the commodity net export price index (CNEPI). The mechanism variables include investment, human capital accumulation, agricultural transformation, government activity, and broader macroeconomic conditions. Estimates are reported for both static and dynamic specifications. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

Following Brueckner et al. (2015), we first assess whether controlling for these variables attenuates the estimated effect of resource windfalls on productive capabilities. Comparing the baseline estimates with those reported in Table 2 suggests that secondary school enrollment, agricultural value-added, and gross capital formation account for part of the relationship between resource windfalls and productive capabilities, although the baseline effect remains statistically significant throughout.

We then examine the direct relationship between each potential mechanism and productive capabilities. Figure 5 shows that agricultural value-added and gross capital formation are the only variables that consistently exhibit positive and statistically significant associations with productive capabilities across specifications and estimation approaches.

Finally, we estimate models in which each potential mechanism is treated as an outcome variable and regressed on resource windfalls. Figure 6 shows that resource windfalls are associated with higher levels of aggregate investment, while the evidence for other channels is less consistent across specifications. Taken together, these findings suggest that resource windfalls do not necessarily reduce aggregate investment. Rather, they appear to alter the composition of investment in ways that contribute relatively little to capability accumulation and technological upgrading.

Although these exercises should be interpreted as suggestive rather than definitive evidence, they point toward a mechanism in which resource windfalls redirect resources away from capability-intensive activities and toward sectors that generate fewer opportunities for diversification and structural transformation. This interpretation is consistent with the broader argument that the developmental consequences of resource windfalls depend not only on the amount of investment they generate but also on how that investment is allocated across economic activities (Corden and Neary, 1982; Alberola and Benigno, 2017; Cust et al., 2022; Kim, 2020; Silva et al., 2024).

5 Conclusion

This article examines whether resource windfalls affect the accumulation of productive capabilities. Using a panel of 140 countries over the period 1995-2023 and leveraging plausibly exogenous variation in international commodity prices through countries' predetermined net export structures, we document a robust negative effect of resource windfalls on productive capabilities. Across a wide range of specifications, estimators, and robustness exercises, resource windfalls are associated with economically meaningful declines in productive capabilities. Using our preferred dynamic specifications, a one-standard-deviation increase in resource windfalls is associated with a long-run decline in productive capabilities of approximately 0.10 standard deviations. Beyond the average effect, our results reveal substantial heterogeneity across countries. Economies with higher initial levels of income and productive capabilities exhibit greater resilience to resource windfalls, while the adverse effects of resource windfalls are concentrated among countries at earlier stages of development. These findings suggest that the consequences of resource windfalls depend not only on the magnitude of resource revenues but also on the productive structures and capabilities of the economies receiving them. More broadly, they reinforce a growing literature emphasizing that productive structures constitute a fundamental dimension of economic development, shaping outcomes that extend beyond income growth alone (Hartmann et al., 2017; Hidalgo, 2021). They also align with recent evidence that the consequences of resource windfalls may vary across stages of development (Bjørnland et al., 2019; Lee, 2023) and that economies with stronger productive capabilities are better positioned to escape low-development trajectories and sustain industrialization (Pugliese et al., 2017).

We also provide evidence on the mechanisms underlying these effects. Although resource windfalls are associated with higher levels of aggregate investment, these investment responses do not appear to translate into stronger capability accumulation. Instead, our findings suggest that resource windfalls may alter the composition of investment in ways that contribute relatively little to capability accumulation and technological upgrading. This interpretation is consistent with research emphasizing the importance of investment allocation, rather than investment levels alone, in shaping long-run development outcomes (Corden and Neary, 1982; Alberola and Benigno, 2017; Kim, 2020; Cust et al., 2022; Silva et al., 2024). Taken together, the results suggest that the developmental consequences of resource windfalls depend not only on the amount of investment they generate but also on whether that investment supports learning, diversification, and the accumulation of productive capabilities.

Our findings have important policy implications. For resource-rich economies, the challenge is not only to manage commodity price volatility or smooth consumption over time, but also to ensure that resource revenues support capability accumulation and structural transformation. Policies that strengthen linkages between extractive industries and domestic suppliers, encourage investment in tradable sectors, and improve the allocation of capital across economic activities may help mitigate the adverse effects of resource windfalls on productive capabilities. More broadly, the results highlight the limits of resource-based development strategies in the absence of complementary policies that promote diversification and capability accumulation, particularly in economies that remain highly exposed to commodity price fluctuations.

Future research could extend this analysis by exploring firm-level mechanisms, examining the role of financial frictions and institutional quality in mediating investment responses, or exploiting more granular data on sectoral capital allocation. Such extensions could deepen our understanding of how resource windfalls interact with the processes of capability accumulation and structural transformation that underpin long-run economic development.

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A Additional Tables and Figures

This appendix provides supplementary material supporting the empirical analysis presented in the main text. First, it reports the full regression results underlying the baseline estimates and robustness figures presented in the article. Second, it documents additional robustness analyses examining alternative measures of productive capabilities, alternative measures and functional forms of resource windfalls, and the inclusion of additional country-level controls. Third, it presents supplementary sensitivity analyses designed to assess the stability of the results across alternative samples and specifications.

Table A1: Full Estimates Underlying Figure 3

	(1) LSFE	(2) LSFE	(3) BCFE	(4) DGMM	(5) SGMM
ECI_{t-1}		0.368***	0.490***	0.337***	0.386***
		(0.000)	(0.000)	(0.000)	(0.000)
CNEPI_{t-1}	-0.257***	-0.151***	-0.150***	-0.145***	-0.179***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country fixed effects	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
R-squared	0.433	0.504			
AR(1) p-value				0.000	0.000
AR(2) p-value				0.359	0.267
Countries	140	140	140	140	140
N	4024	3889	3889	3749	3889

Notes: The table reports the full regression results underlying Figure 3. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Column (1) reports estimates from a static model estimated using least-squares fixed effects (LSFE). Columns (2)–(5) report estimates from dynamic models estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM), respectively. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. For the GMM specifications, AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

Table A2: Full Estimates Underlying Figure 4, Panel A

	(1) LSFE	(2) LSFE	(3) BCFE	(4) DGMM	(5) SGMM
EF_{t-1}		0.642***	0.776***	0.579***	0.585***
		(0.000)	(0.000)	(0.000)	(0.000)
$CNEPI_{t-1}$	-0.232***	-0.091**	-0.095***	-0.226***	-0.216***
	(0.001)	(0.018)	(0.000)	(0.004)	(0.006)
Country fixed effects	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
R-squared	0.636	0.773			
AR(1) p-value				0.014	0.014
AR(2) p-value				0.855	0.850
Countries	140	140	140	140	140
N	3909	3771	3772	3630	3771

Notes: The table reports the full regression results underlying Figure 4, Panel A. Productive capabilities are measured using Economic Fitness (EF), while resource windfalls are measured using the commodity net export price index (CNEPI). Column (1) reports estimates from a static model estimated using least-squares fixed effects (LSFE). Columns (2)–(5) report estimates from dynamic models estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM), respectively. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. For the GMM specifications, AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

Table A3: Full Estimates Underlying Figure 4, Panel B

	(1) LSFE	(2) LSFE	(3) BCFE	(4) DGMM	(5) SGMM
ECI_{t-1}		0.381***	0.503***	0.352***	0.396***
		(0.000)	(0.000)	(0.000)	(0.000)
CEPI_{t-1}	-0.249***	-0.141***	-0.143***	-0.129**	-0.182***
	(0.000)	(0.000)	(0.000)	(0.016)	(0.001)
Country fixed effects	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
R-squared	0.422	0.500			
AR(1) p-value				0.000	0.000
AR(2) p-value				0.311	0.236
Countries	140	140	140	140	140
N	4024	3889	3889	3749	3889

Notes: The table reports the full regression results underlying Figure 4, Panel B. Resource windfalls are measured using the commodity export price index (CEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Column (1) reports estimates from a static model estimated using least-squares fixed effects (LSFE). Columns (2)–(5) report estimates from dynamic models estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM), respectively. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. For the GMM specifications, AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

Table A4: Full Estimates Underlying Figure 4, Panel C

	(1) LSFE	(2) LSFE	(3) BCFE	(4) DGMM	(5) SGMM
ECI_{t-1}		0.397***	0.519***	0.385***	0.436***
		(0.000)	(0.000)	(0.000)	(0.000)
ΔCNEPI_{t-1}	-0.116***	-0.097***	-0.099***	-0.085***	-0.087**
	(0.002)	(0.005)	(0.001)	(0.009)	(0.014)
Country fixed effects	YES	YES	YES	YES	YES
Country time trends	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
R-squared	0.409	0.496			
AR(1) p-value				0.000	0.000
AR(2) p-value				0.206	0.142
Countries	140	140	140	140	140
N	4019	3884	3884	3744	3884

Notes: The table reports the full regression results underlying Figure 4, Panel C. Resource windfalls are measured using the annual growth rate of the commodity net export price index (ΔCNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Column (1) reports estimates from a static model estimated using least-squares fixed effects (LSFE). Columns (2)–(5) report estimates from dynamic models estimated using LSFE, bias-corrected fixed effects (BCFE), difference GMM (DGMM), and system GMM (SGMM), respectively. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. For the GMM specifications, AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

Table A5: Full LSFE Estimates Underlying Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$CNEPI_{t-1}$	-0.250***	-0.235***	-0.282***	-0.249***	-0.273***	-0.258***	-0.141***	-0.255***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
$GDPPC_{t-1}$	0.005							
	(0.962)							
$AGRICVD_{t-1}$		0.006*						
		(0.090)						
GS_{t-1}			-0.091					
			(0.295)					
INF_{t-1}				-0.000				
				(0.951)				
GCF_{t-1}					0.004**			
					(0.047)			
$POPDEN_{t-1}$						0.067		
						(0.762)		
$SECENR_{t-1}$							0.095	
							(0.213)	
EG_{t-1}								-0.001
								(0.652)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.420	0.423	0.432	0.417	0.438	0.433	0.449	0.428
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877

Notes: The table reports the full least-squares fixed effects (LSFE) estimates underlying Panel A of Table 2. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Each column augments the baseline specification with the additional control variable shown in the row labels. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

Table A6: Full Dynamic LSFE Estimates Underlying Panel B of Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ECI_{t-1}	0.366***	0.367***	0.354***	0.356***	0.350***	0.349***	0.336***	0.369***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CNEPI_{t-1}	-0.149***	-0.138***	-0.172***	-0.149***	-0.169***	-0.159***	-0.090***	-0.151***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.000)
GDPPC_{t-1}	0.033							
	(0.648)							
AGRICVD_{t-1}		0.004						
		(0.173)						
GS_{t-1}			-0.059					
			(0.300)					
INF_{t-1}				0.002				
				(0.787)				
GCF_{t-1}					0.003*			
					(0.086)			
POPDEN_{t-1}						0.080		
						(0.617)		
SECENR_{t-1}							0.059	
							(0.317)	
EG_{t-1}								-0.001
								(0.434)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.496	0.499	0.502	0.489	0.505	0.502	0.516	0.504
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877

Notes: The table reports the full dynamic least-squares fixed effects (LSFE) estimates underlying Panel B of Table 2. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Each column augments the baseline specification with the additional control variable shown in the row labels. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.

Table A7: Full Difference GMM Estimates Underlying Panel B of Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ECI_{t-1}	0.346***	0.347***	0.303***	0.318***	0.298***	0.338***	0.336***	0.335***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CNEPI_{t-1}	-0.132***	-0.124***	-0.216***	-0.124***	-0.165***	-0.123***	-0.138**	-0.168***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.000)	(0.003)	(0.015)	(0.000)
GDPPC_{t-1}	-0.465*							
	(0.093)							
AGRICVD_{t-1}		0.012**						
		(0.037)						
GS_{t-1}			-0.244*					
			(0.078)					
INF_{t-1}				0.003				
				(0.672)				
GCF_{t-1}					0.004*			
					(0.057)			
POPDEN_{t-1}						0.547		
						(0.367)		
SECENR_{t-1}							0.350*	
							(0.051)	
EG_{t-1}								-0.008**
								(0.026)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.270	0.259	0.247	0.347	0.235	0.431	0.684	0.344
Countries	139	140	135	138	135	140	136	140
N	3701	3651	3442	3504	3482	3597	2486	3737

Notes: The table reports the full difference GMM (DGMM) estimates underlying Panel B of Table 2. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Each column augments the baseline specification with the additional control variable shown in the row labels. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

Table A8: Full System GMM Estimates Underlying Panel B of Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ECI_{t-1}	0.386***	0.374***	0.345***	0.358***	0.347***	0.372***	0.335***	0.385***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$CNEPI_{t-1}$	-0.131***	-0.085**	-0.149***	-0.133***	-0.148**	-0.183***	-0.119**	-0.175***
	(0.002)	(0.032)	(0.007)	(0.006)	(0.011)	(0.000)	(0.045)	(0.000)
$GDPPC_{t-1}$	-0.271							
	(0.227)							
$AGRICVD_{t-1}$		0.007*						
		(0.081)						
GS_{t-1}			-0.095					
			(0.157)					
INF_{t-1}				0.002				
				(0.740)				
GCF_{t-1}					0.002			
					(0.122)			
$POPDEN_{t-1}$						0.337		
						(0.425)		
$SECENR_{t-1}$							0.240	
							(0.158)	
EG_{t-1}								-0.004
								(0.144)
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.201	0.193	0.165	0.250	0.151	0.372	0.683	0.248
Countries	139	140	135	138	135	140	138	140
N	3840	3793	3580	3643	3619	3737	2818	3877

Notes: The table reports the full system GMM (SGMM) estimates underlying Panel B of Table 2. Resource windfalls are measured using the commodity net export price index (CNEPI), while productive capabilities are measured using the Economic Complexity Index (ECI). Each column augments the baseline specification with the additional control variable shown in the row labels. p-values based on country-clustered standard errors are reported in parentheses. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends. AR(1) and AR(2) report the p-values of the Arellano–Bond tests for first- and second-order serial correlation.

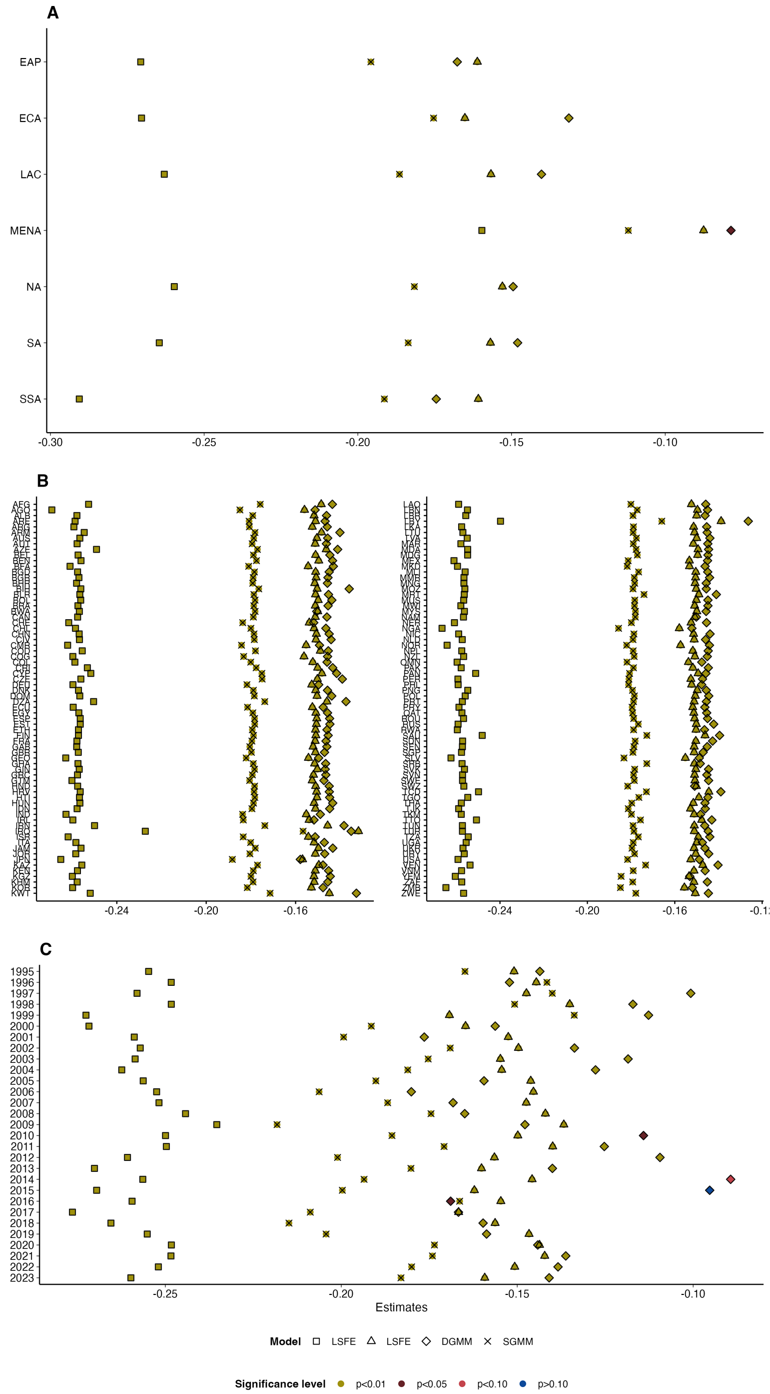

Figure A1: Leave-One-Out Sensitivity Analysis

Notes: The figure reports leave-one-out sensitivity analyses of the baseline relationship between resource windfalls and productive capabilities. Panel **A** sequentially excludes individual regions, Panel **B** sequentially excludes individual countries, and Panel **C** sequentially excludes individual years. Hollow squares denote estimates from the static least-squares fixed effects (LSFE) specification, while the remaining markers correspond to the dynamic LSFE, difference GMM (DGMM), and system GMM (SGMM) specifications. All specifications include country fixed effects, year fixed effects, and country-specific linear time trends.