Bulletin of Applied Economics, 2026, 13(2), 17-31
https://doi.org/10.47260/bae/1322

Manufacturing Exports, Institutional Qualities, and Dutch Disease in Post-Soviet Economies

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Abstract

Post-Soviet economies have experienced challenges due to the imperfect shift toward a market-based framework, influenced by the adverse legacies of the Soviet Union. This study evaluates the export values of manufactured goods in post-Soviet economies using a structural gravity trade model and analyzes the quantitative contributions of institutional immaturity and Dutch Disease to the underperformance of their manufacturing exports. The main findings are highlighted as follows. Most of post-Soviet economies have demonstrated subpar performance in their manufacturing exports compared to the benchmark economies of Estonia, Latvia, and Lithuania. Institutional immaturity concerning government effectiveness represents approximately 30% of this underperformance, whereas the Dutch Disease effect contributes 10% to this underperformance in some resource-rich economies, such as Azerbaijan, Kazakhstan, and Mongolia. The analyses suggest policy implications that enhancing government effectiveness in post-Soviet economies to the benchmarks of Estonia, Latvia, and Lithuania could potentially expand the respective economies' manufacturing exports.

JEL classification: F14, O57.
Keywords: Post-Soviet economies, manufacturing exports, institutional qualities, Dutch Disease, structural gravity trade model.

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Article Info: Received: July 10, 2026. Revised: July 18, 2026. Published online: July 21, 2026.

1. Introduction

Following the dissolution of the Soviet Union in 1991, the 15 post-Soviet nations and Mongolia (hereafter, post-Soviet economies) transitioned their economies from a centrally planned model to a market-oriented framework. During the initial phases of change, their economies experienced significant difficulties amid extensive market-oriented reforms. Since that time, they have made substantial advancements in their transition to a market-oriented economy and in establishing connections with the global economy. Currently, they are categorized into high- and middle-income groups based on the World Bank's income classification for 2023. Despite their historical, geographical, cultural, and linguistic similarities, their profiles are varied, as demonstrated in Table 1[2]. The economies are categorized into distinct income groups due to significant disparities in their populations and per capita gross domestic product (GDP) levels. Estonia, Latvia, and Lithuania are classified as high-income economies and are members of the European Union (EU) and the Organization for Economic Co-operation and Development (OECD), while Kyrgyzstan, Tajikistan, and Uzbekistan are categorized as lower-middle-income, with the other economies designated as upper-middle-income. The degree of their industrialization, expressed as the ratio of manufacturing exports to GDP, varies according to income levels, with larger ratios in high-income nations and lower ratios in middle-income economies. Moreover, economies such as Azerbaijan, Kazakhstan, and Mongolia boast a wealth of natural resources, evidenced by the elevated ratio of their mining sector value-added to GDP.

Table 1: Profile of Post-Soviet Economies

	Population in 2023 (in thousand)	GDP per capita in 2023 (in US$)	Income class in 2023	Manufacturing exports in 2023 % of GDP	Economic Complexity Index in 2023 Ranking among 133 countries	Mining & utilities value-added in 2023 % of GDP
Armenia	2,943	8,228	Upper-Middle	11.2	57	6.4
Azerbaijan	10,318	7,012	Upper-Middle	1.9	86	38.1
Belarus	9,116	7,883	Upper-Middle	35.7	33	5.1
Estonia	1,367	30,201	High	31.9	-	4.9
Georgia	3,807	8,020	Upper-Middle	12.5	58	4.5
Kazakhstan	20,330	13,000	Upper-Middle	5.7	72	15.6
Kyrgyz	7,074	1,977	Lower-Middle	5.6	67	4.1
Latvia	1,882	22,444	High	25.5	-	5.5
Lithuania	2,854	27,956	High	33.2	32	3.4
Moldova	3,067	5,393	Upper-Middle	10.9	70	3.2
Mongolia	3,432	5,790	Upper-Middle	0.9	125	33.3
Russia	145,441	13,809	High	5.2	50	13.3
Tajikistan	10,390	1,161	Lower-Middle	3.6	101	8.4
Turkmenistan	7,364	8,132	Upper-Middle	2.5	95	1.9
Uzbekistan	35,652	2,549	Lower-Middle	8.0	75	5.5
Average	-	-	-	13.0	71	10.2
Malaysia	35,126	11,377	Upper-Middle	53.5	27	11.1
Thailand	71,702	7,182	Upper-Middle	38.8	29	5.5

Sources: Population, GDP per capita, manufacturing exports, and mining & utilities value-added: UNCTAD Stat, https://unctadstat.unctad.org/EN/
Income class: World Bank, https://datahelpdesk.worldbank.org/knowledgebase/articles/906519
Economic Complexity Index: The Observatory of Economic Complexity, https://oec.world/en/rankings/eci/hs6/hs96?tab=table

[2] Table 1 and the succeeding analyses incorporate Mongolia, as it transitioned from a centrally planned economy to a market-based economy in the early 1990s, similar to other post-Soviet nations, despite not being a member of the Soviet Union. Table 1 and the following analyses exclude Ukraine due to significant economic damages incurred during the wartime since 2022.

A prevalent concern among the 15 post-Soviet economies is the underdevelopment of the manufacturing sector. Several metrics signify manufacturing development, including the share of manufacturing value added to GDP, the share of manufacturing employment, and the ratio of manufacturing exports to GDP. This study focuses on manufacturing exports as a proportion of GDP in Table 1 and as absolute values in the subsequent analyses. This focus is based on the premise that the manufacturing base catering to domestic markets in post-Soviet countries may be affected by over-industrialization, a negative legacy of the Soviet Union's planned economy. Blanchard [1] posited that the transition process of Central and Eastern European economies in the 1990s necessitated an extended duration due to the pre-transition regime of central planning, which had significantly distorted resource allocation, resulting in over-industrialization through sectoral protection and subsidization. Consequently, prioritizing manufacturing exports would be advantageous as it mitigates the effects of over-industrialization, while the international competitiveness in export activities accurately reflects the true sense of industrialization. Table 1 demonstrates that the average manufacturing exports-to-GDP ratios of the post-Soviet economies, at 12.5%, significantly lag behind those of Malaysia (53.5%) and Thailand (38.8%), which are representative of emerging Asian economies.[3] The Economic Complexity Index ranking, which reflects the diversity and sophistication of countries' exports, closely aligns with the performance of manufacturing exports: Lithuania achieves the highest ranking of 32, whilst the average ranking of post-Soviet economies is 71.

The manufacturing sector is regarded as an engine of economic expansion, particularly in developing economies, as illustrated by Kaldor's law [2]. Rodrik [3] contended that the manufacturing sector exhibits unconditional labor productivity convergence, accommodates a greater proportion of unskilled labor compared to other sectors, and is not hindered by demand restrictions of a domestic market due to its tradability in international markets. Consequently, the lethargic manufacturing in the post-Soviet economies may hinder their sustainable economic development.

A hypothesis that may elucidate the underdevelopment of the manufacturing sector pertains to institutional qualities unique to post-Soviet economies [4,5]. The markedly lower manufacturing exports-to-GDP ratios in the post-Soviet economies compared to emerging Asian economies, as shown in Table 1, indicate that the developmental trajectories of the post-Soviet economies diverge dramatically from those of the emerging Asian economies. The origins may lie in the post-Soviet economies' attempts to undergo a drastic transition from a centrally planned model to a market-oriented system, yet they continue to experience challenges due to the imperfect shift toward a market-based framework, influenced by the adverse legacies of the Soviet Union, despite variations in the transformation processes among these economies.

Another hypothesis regarding the underdevelopment of the manufacturing sector is the Dutch Disease for resource-rich economies, as evidenced by some of the post-Soviet economies illustrated in Table 1. *The Economist* introduced the term “Dutch Disease” in a November 1977 publication, influenced by the effects of natural gas discoveries in the Netherlands during the late 1950s. Corden and Neary [6] established the theoretical foundation for this concept by demonstrating the reallocation of resources from the tradable sector to the non-tradable sector, prompted by innovations in the natural resource sector. Numerous empirical studies have confirmed the presence of Dutch Disease in resource-abundant economies [7,8].

Arguments exist that connect the hypothesis of institutional qualities with that of Dutch Disease. Van der Ploeg [9] contended that an effective institution can convert a resource-dependent economy from a resource curse, including the Dutch Disease, into a blessing: when an institution is robust and fosters productive entrepreneurship, fewer individuals participate in rent-seeking behaviors, leading to increased engagement in productive endeavors, such as manufacturing with economies of scale. Empirical studies demonstrate that an effective institutional framework in resource-dependent economies enhances the performance of the manufacturing sector [10].

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[3] A straightforward comparison of the manufacturing exports-to-GDP ratio requires caution, as the ratio may be influenced by the scale of economies and the extent of participation in global value chains.

Numerous studies have examined the connection between institutional qualities and industrialization as well as the negative effects of Dutch Disease. However, only a small number of studies have concentrated on those problems in post-Soviet economies. Closing this research gap is the driving force behind this study. This study aims to evaluate the export values of manufactured goods in the post-Soviet economies through a structural gravity trade model and to analyze the quantitative contributions of institutional immaturity and Dutch Disease to the underperformances of their manufacturing exports. The novelties of this study are to elucidate how institutional qualities and Dutch Disease affect manufacturing exports quantitatively and to apply a structural gravity trade model, a comprehensive and theoretically consistent econometric framework, with a focus on the post-Soviet economies. These challenges have rarely been addressed in the existing literature.

The remainder of the paper is structured as follows. Section 2 reviews the literature and highlights the contribution of this study. Section 3 performs empirical evaluations of the manufacturing exports of post-Soviet economies utilizing a structural gravity trade model. Section 4 provides a summary and conclusion.

2. Literature review and Contribution

This section reviews the literature related to the linkage of the export performances with institution qualities and Dutch Disease effects.

The institutional qualities matter for economic development. A considerable number of studies have investigated the impact of institutional factors on economic development broadly [11–15]. The direct linkage between the institutional qualities and export performance has also been empirically studied. From a microeconomic perspective, institutional determinants have been found to positively influence export performances at the firm level in China [16–18] and in Vietnam [19]. From a macroeconomics standpoint, the positive correlations between institutional qualities and export performance, encompassing export diversity and quality, have been substantiated across multiple countries [20–22] as well as in Cambodia [23], Indonesia [24], and Colombia [25].

Concerning the literature on Dutch Disease, grounded in the theoretical framework established by Corden and Neary [6], a number of empirical studies have corroborated the existence of Dutch Disease in resource-rich economies [7,8,26–28]. Conversely, several research has demonstrated little evidence of a natural resource curse and even positive effects of natural resources [29–31]. As one of the transmission mechanisms of resource curse, while detrimental impacts of natural resources on institutional quality are highlighted [7], a weak and minimal linkage between natural resources and institutions is evidenced [29,30]. Another perspective on Dutch Disease posits that effective institutions mitigate the consequences of Dutch Disease [9,10,32,33].

Regarding post-Soviet economies, a limited number of studies have addressed institutional qualities in the context of their effects on industrialization. Institutional factors in post-Soviet countries have been examined concerning premature deindustrialization [5] and logistics performance within global value chains [34]. To the best of our knowledge, however, no empirical research has addressed the direct linkages between manufacturing exports and institutional attributes. Regarding Dutch Disease effects, the research findings have been inconclusive, hence this study aims to enhance the evidence in post-Soviet countries. As for the linkage between national resources and institutions, this study aligns with the assertions of Alexeev and Conrad [29,30]—little linkage between them—based on the assumption of the apparent persistence of institutional quality even within transitioning economies. Thus, this study posits that institutional quality and natural resources independently influence the performance of manufacturing exports, and that natural resources affect manufacturing exports not through an institutional channel but through a resource reallocation channel proposed by Corden and Neary [6].

3. Empirical Analyses

This section empirically evaluates the manufacturing exports of post-Soviet economies. The analyses target the following 15 economies: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz, Latvia, Lithuania, Moldova, Mongolia, the Russian Federation, Tajikistan, Turkmenistan, and Uzbekistan.

3.1 Descriptive Analysis

This section delineates the connections among critical variables in the sample economies for 2023: manufacturing exports, GDP per capita, government effectiveness, and the value-added of mining and utilities. The data on manufacturing exports (as a proportion of GDP), GDP per capita (in US dollars), and the value-added of mining and utilities (as a percentage of GDP) are sourced from the statistics of the United Nations Conference on Trade and Development (UNCTAD Stat). Government effectiveness is a component of the Worldwide Governance Indicators compiled by the World Bank, with the index spanning from -2.5 (denoting bad governance) to 2.5 (denoting excellent governance), while the worldwide mean is almost zero.

In Figure 1, we observed a positive correlation between manufacturing exports and GDP per capita, excluding the outlier of Belarus: a high GDP per capita corresponds with a high ratio of manufacturing exports. Estonia, Latvia, and Lithuania, as high-income economies, demonstrate a notable proportion of manufacturing exports. Figure 2 illustrates a demonstrated positive correlation between manufacturing exports and government effectiveness; a high degree of government effectiveness corresponds with a high ratio of manufacturing exports. Estonia, Latvia, and Lithuania, as high-income economies, have significant government effectiveness. Figure 3 displays a negative link between manufacturing exports and the value-added of mining and utilities: a high ratio of value-added in mining and utilities corresponds with a low ratio of manufacturing exports. This is typically exhibited in Azerbaijan and Mongolia. This negative association suggests that mining development crowds out manufacturing, indicating the presence of Dutch Disease.[4]

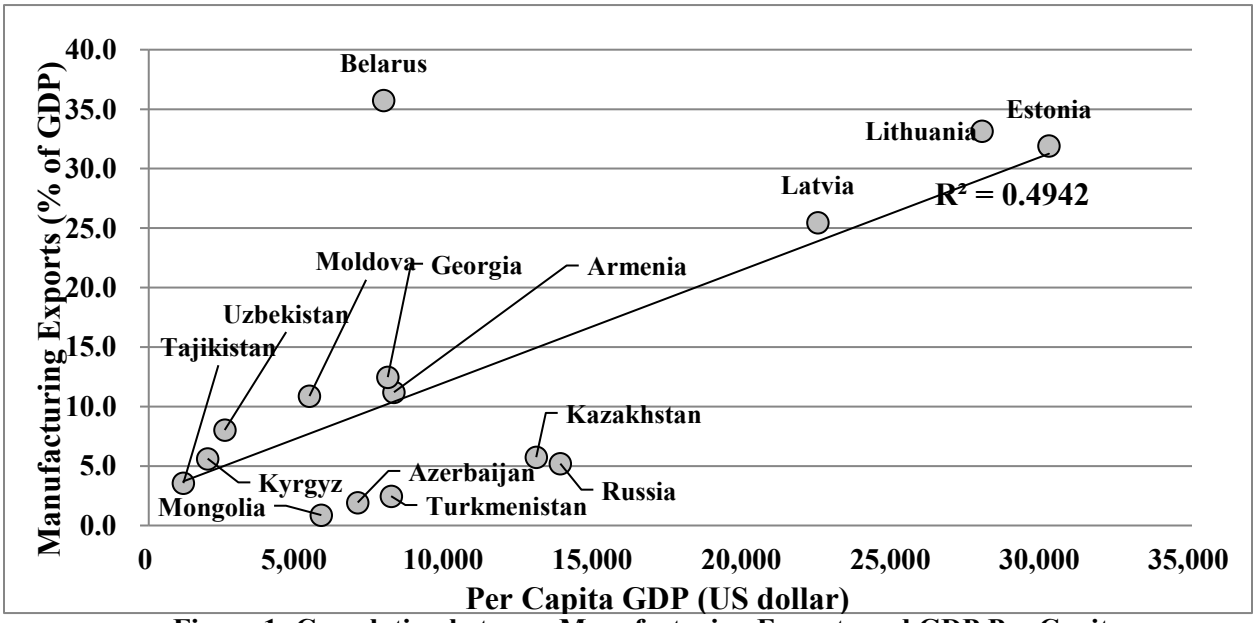

Figure 1: Correlation between Manufacturing Exports and GDP Per Capita

Source: UNCTAD Stat, https://unctadstat.unctad.org/EN/

[4] In all figures, the R^2 values are notably low, below 0.5, as the figures represent solely the bilateral relationship between the chosen two variables, disregarding additional variables that influence them. However, the figures remain significant for observing general trends (merely positive or negative).

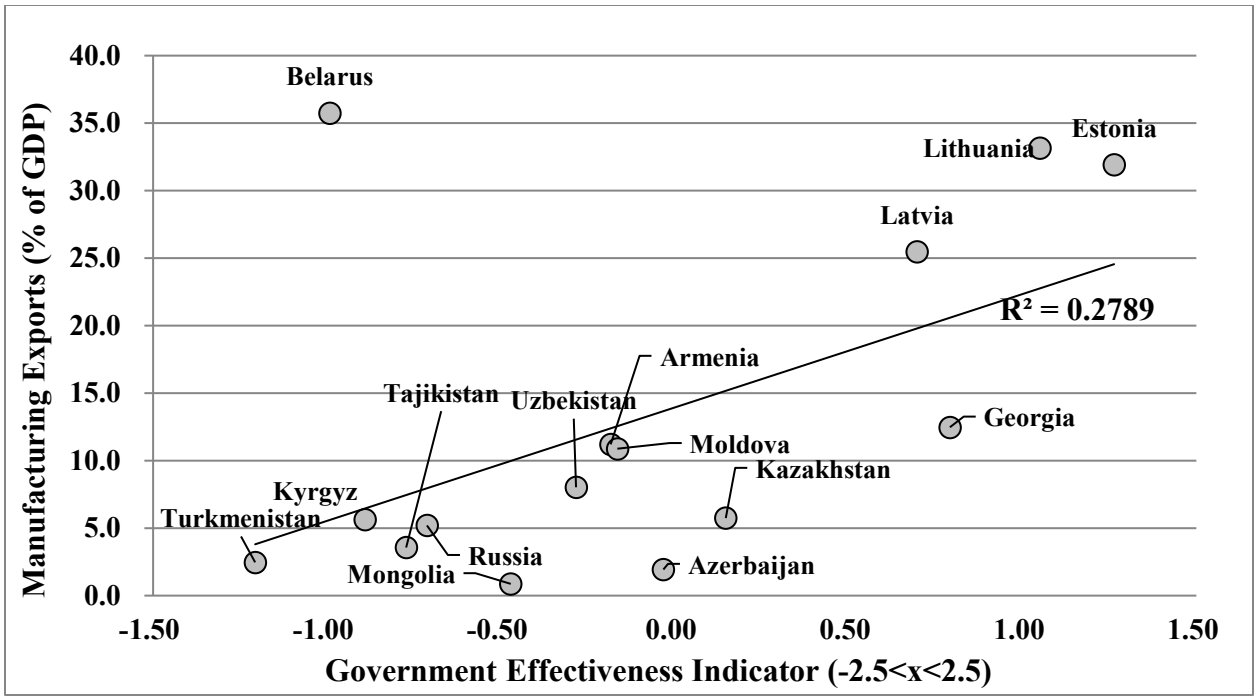

Figure 2: Correlation between Manufacturing Exports and Government Effectiveness

Source: UNCTAD Stat: https://unctadstat.unctad.org/EN/
Worldwide Governance Indicators (World Bank):
https://www.worldbank.org/en/publication/worldwide-governance-indicators

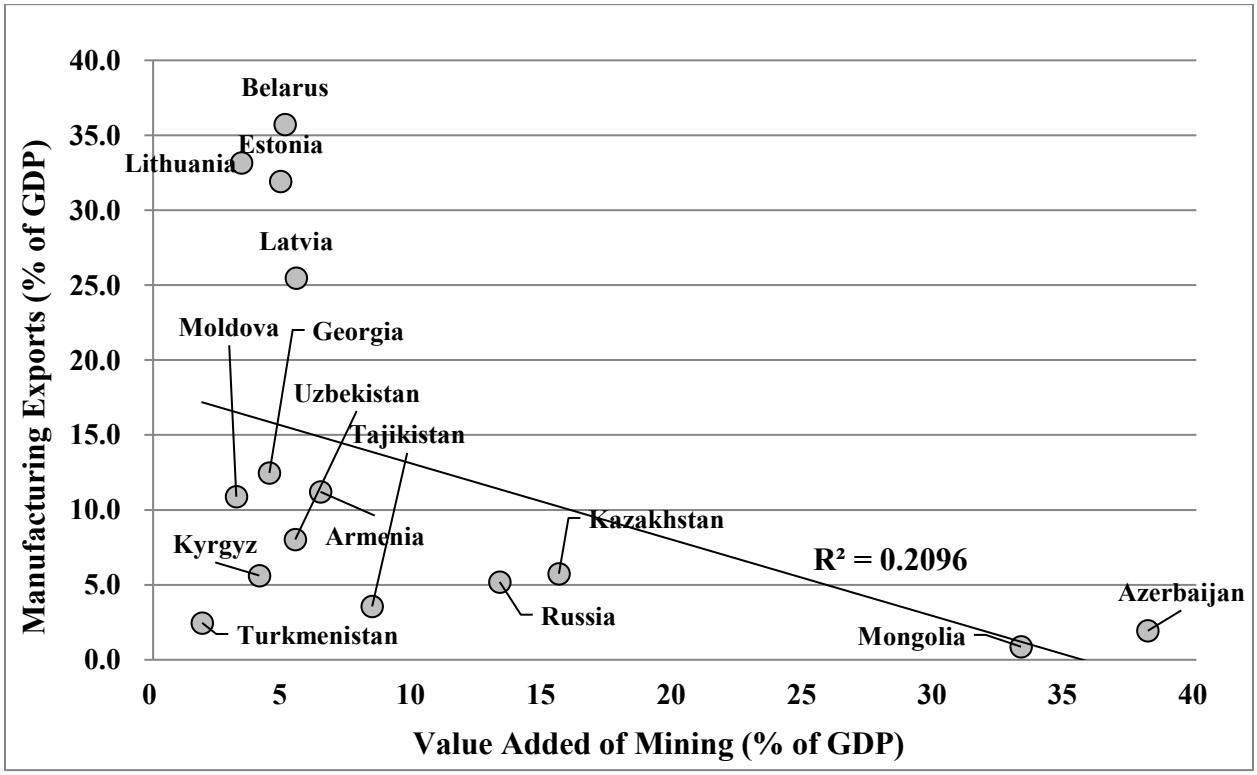

Figure 3: Correlation between Manufacturing Exports and Value-Added of Mining and Utilities

Source: UNCTAD Stat, https://unctadstat.unctad.org/EN/

These discoveries prompt us to examine the quantitative contributions of institutional qualities and Dutch Disease to manufacturing exports in sample economies, utilizing a more advanced econometric approach, specifically a structural gravity trade model.

3.2 Econometric Analysis: Structural Gravity Model

This section conducts econometric analyses of the manufacturing exports of post-Soviet economies using a structural gravity trade model. The gravity trade model is the predominant analytical framework utilized in empirical analyses of international trade flows. The model was derived from Tinbergen [35] and Poyhonen [36], who were the pioneers in applying "Newton's Law of Gravitation" to international commerce flows. The primary purpose of the gravity trade equation was to elucidate bilateral trade flows based on the economic magnitude of two economies and the distance separating them. Since Anderson [37] first assigned theoretical foundations to the gravity trade model, it has been recognized as congruent with trade theories derived from models of imperfect competition and the Heckscher-Ohlin model [38–40]. Anderson and van Wincoop [41] developed a method that consistently and efficiently calculated a theoretical gravity model by incorporating a multilateral price resistance term. Piermartini and Yotov [42] constructed a comprehensive and theoretically coherent econometric gravity model, termed a structural model, which integrates advancements from prior research.

3.2.1 Specification of the Model

This study employs the structural gravity model estimation approach developed by Piermartini and Yotov [42], utilizing panel data with bilateral time-invariant fixed effects and multilateral time-varying price resistance terms. This study's model comprises two specifications: one incorporating directional fixed effects (Equation 1) and the other utilizing worldwide governance indicators (*wgi*) and the value-added of mining and utilities (*min*) in lieu of the exporter's fixed effects (Equation 2).

The worldwide governance indicators (*wgi*) in Equation 2 comprises four components: government effectiveness (*wgi_gve*), regulatory quality (*wgi_req*), rule of law (*wgi_rol*), and control of corruption (*wgi_coc*). The indicators originally encompass the additional two indices: "voice and accountability" and "political stability and absence of violence/terrorism." This study omits these factors as it concentrates exclusively on the institutional attributes of the government rather than the political components.

$$mex_{ij,t} = \exp\left[\pi_{i,t} + \chi_{j,t} + \mu_{ij}\right] + \varepsilon_{ij,t} \quad (1)$$

$$mex_{ij,t} = \exp\left[\alpha \times (wgi_{i,t}, \text{ or } min_{i,t}) + \pi_i + \chi_{j,t} + \mu_{ij}\right] + \varepsilon_{ij,t} \quad (2)$$

where the subscripts i, j, and t represent post-Soviet economies as exporters, partner economies as importers, and trade years at five-year intervals from 2003 to 2023, respectively; *mex* denotes manufacturing exports from post-Soviet economies to their principal trading partners; π and χ signify the fixed effects of economies i and j, respectively; μ indicates the pair fixed effects between countries i and j; *wgi* refers to the worldwide governance indicators of exporters; *min* represents the value-added of mining and utilities of exporters; ε is an error term; and α is the estimated coefficient.

The variables of *wgi* and *min* in Equation 2 are inserted separately as independent regressors due to the existence of a multicollinearity problem between them. The variance inflation factors (VIFs), the method for measuring the level of collinearity between regressors, reveal elevated values significantly exceeding the collinearity threshold of 10 points, thereby suggesting the presence of multicollinearity: 118.6 for *wgi_gve*, 207.5 for *wgi_req*, 235.7 for *wgi_rol*, 133.6 for *wgi_coc*, and 12.6 for *min*.

The alignment of this estimator's specification in Equation 1 with the structural gravity model estimation method established by Piermartini and Yotov [42] must be validated here. They propose six recommendations: (i) Utilize panel data to facilitate the treatment and estimation of time-invariant bilateral trade costs; (ii) Employ interval data to accommodate adjustments in trade flows; (iii) Incorporate intra-national trade flows to maintain consistency with gravity theory; (iv) Apply directional time-varying fixed effects to account for unobservable multilateral resistances; (v) Implement pair fixed effects to mitigate

endogeneity and address time-invariant bilateral trade costs; and (vi) Estimate gravity via the Poisson pseudo maximum likelihood (PPML) technique. The conventional approach is the ordinary least squares (OLS), which minimizes estimation errors; yet, PPML also tackles challenges associated with heteroskedasticity and null trade flows in the dataset.

Equation 1 satisfies recommendations (i), (ii), (iv), (v), and (vi). Our estimation fulfills criteria (i) and (ii) as it employs the panel data with five-year intervals, as detailed in Section 3.2.2. This study does not implement (iii) as it concentrates on the comparative analysis of manufacturing exports among post-Soviet economies. Concerning (iv), we implement directional time-varying fixed effects as utilized in π and χ. In the fixed effects of post-Soviet economies, we use the high-income economies of Estonia, Latvia, and Lithuania as benchmark economies due to their superior performance in manufacturing exports and government effectiveness, as seen in Section 3.1. We integrate (v) with respect to μ, considering the influence of all time-invariant bilateral trade costs. Regarding recommendation (vi), we utilize OLS estimators as well as PPML in Equation 1 as a robustness check, in accordance with Head and Mayer [43]. For a coefficient covariance method, we applied a cross-section cluster to remove the biases on the estimated significance levels.

This study evaluates the manufacturing exports of post-Soviet economies and examines the quantitative contributions of institutional immaturity and Dutch Disease to the subpar performance of their manufacturing exports. The primary issue with the estimates in Equation 1 is the negative volume of the fixed effects (π) for the post-Soviet economies, indicating the extent of their manufacturing exports' underperformance relative to benchmark economies. Subsequently, Equation 2 substitutes the fixed effects (π) with the worldwide governance indicators (*wgi*) and the value-added of mining and utilities (*min*) in post-Soviet economies. Equation 2 also contains time-invariant fixed effects for the exporters (π_i) to absorb a wide range of unobserved time-invariant supply-side factors. The coefficients of *wgi* are expected to be significantly positive, whereas that of *min* is anticipated to be significantly negative. Utilizing these estimated coefficients, we can compute the quantitative contributions of the variables of *wgi* (representing institutional immaturity) and *min* (indicating Dutch Disease effects) to the negative volume of the fixed effects (associated with the underperformance of manufacturing exports) in post-Soviet economies.

3.2.2 Data

Table 2 delineates the variables alongside their respective data sources. The data for manufacturing exports, measured in thousands of US dollars (*mex*), and the value added of mining and utilities as a percentage of GDP (*min*) are sourced from UNCTAD Stat, while the governance indicators for exporters (*wgi*) are obtained from the Worldwide Governance Indicators of the World Bank, as described in Section 3.1. The sample economies and timeframes are established as follows. The exporters consist of the 15 post-Soviet economies outlined in Section 3.1, whereas the importers are selected from ten principal trading partners of the exporters, as shown in Table 3, which represents around 70-90% of the total export values for the majority of exporters. For the sample period, we chose five distinct years: 2003, 2008, 2013, 2018, and 2023, in accordance with the recommendation (ii) of Piermartini and Yotov [42]. The rationale for commencing in 2003 is to eliminate the tumultuous periods of the 1990s in post-Soviet economies following their independence from the Soviet Union. Subsequently, we compiled panel data spanning five years, encompassing 150 combinations of exporters and importers ($5 \times 150 = 750$) for the estimation process. We discovered several mission observations inside the dataset of manufacturing exports. In that scenario, we managed them to ensure a minimal count (1.1), allowing us to establish a balanced panel dataset.

Table 4 presents the descriptive statistics of the sample data for each variable, including the number of observations, median values, standard deviations, and minimum and maximum values.

Table 2: List of Variables and Data Sources

Var.	Description	Sources
Dependent Variable		
mex	*Manufacturing exports from post-communist economies to partners, thousand US dollars*	UNCTAD STAT
Explanatory Variables		
wgi_gve	*Worldwide governance indicator, government effectiveness, from -2.5 (weak) to 2.5 (strong)*	WB WGI Data
wgi_req	*Worldwide governance indicator, regulatory quality, from -2.5 (weak) to 2.6 (strong)*	
wgi_rol	*Worldwide governance indicator, rule of law, from -2.5 (weak) to 2.7 (strong)*	
wgi_coc	*Worldwide governance indicator, control of corruption, from -2.5 (weak) to 2.8 (strong)*	
min	*Value-added of mining and utilities, % of GDP*	UNCTAD STAT

Source: Authors' description

Table 3: Major Trading Partners of Post-Soviet Economies

Expoters	Sample Partners of Exports					Total Exports (mil. USD) / Samples % of Total Exports
Armenia	Russia	UAE	Netherlands	Germany	Georgia	2,691
	Belarus	Italy	Slovakia	Kazakhstan	US	91.4
Azerbaijan	Russia	Turkiye	Georgia	Romania	Kazakhstan	1,476
	Ukraine	Turkmenistan	Kenya	Italy	Uzbekistan	76.3
Belarus	Russia	UAE	China	Taiwan	Poland	25,591
	Kazakhstan	Lithuania	Brazil	Uzbekistan	Norway	89.2
Estonia	Finland	Sweden	Lithuania	Latvia	Germany	12,864
	Norway	Russia	US	Netherlands	Poland	71.2
Georgia	Azerbaijan	Kyrgyzstan	Armenia	Kazakhstan	Turkiye	3,725
	Russia	Uzbekistan	US	Peru	China	86.6
Kazakhstan	Russia	China	Uzbekistan	Japan	US	14,943
	Kyrgyzstan	Canada	France	Tajikistan	Poland	85.2
Kyrgyzstan	Russia	Kazakhstan	Uzbekistan	Belarus	UAE	683
	Turkiye	US	Iran	Germany	Belgium	93.6
Latvia	Lithuania	Estonia	Germany	Sweden	Russia	10,870
	Denmark	US	Poland	UK	Netherlands	68.4
Lithuania	Germany	Latvia	Poland	Russia	Belarus	25,820
	Netherlands	Sweden	Estonia	US	UK	61.2
Moldova	Romania	Italy	Germany	Czechia	Poland	1,811
	Ukraine	Turkiye	Russia	Hungary	UK	82.6
Mongolia	Russia	China	US	Ecuador	France	175
	Japan	Korea	Germany	Italy	Kyrgyzstan	84.1
Russia	Kazakhstan	China, Taiwan	Belarus	Turkiye	Brazil	103,102
	China	India	Algeria	Uzbekistan	Ukraine	52.3
Tajikistan	Uzbekistan	Mauritius	Russia	Italy	Afghanistan	419
	Turkiye	UAE	China	Kazakhstan	Iran	87.4
Turkmenistan	China	Turkiye	Iran	India	Romania	1,692
	Ukraine	Italy	Uzbekistan	Argentina	Georgia	86.7
Uzbekistan	Russia	Kazakhstan	Turkiye	China	Kyrgyzstan	7,183
	Tajikistan	Brazil	France	Turkmenistan	Poland	80.2

Source: Authors' calculation

Table 4: Descriptive Statistics

Variables	Obs.	Median	Std. Dev.	Min.	Max
Dependent Variable					
mex	750	$7.012 * 10^4$	$1.796 * 10^6$	1.001	$2.492 * 10^7$
Explanatory Variables					
wgi_gve	750	-0.452	0.727	-1.415	1.263
wgi_req	750	-0.333	0.953	-2.132	1.545
wgi_rol	750	-0.620	0.808	-1.487	1.426
wgi_coc	750	-0.665	0.746	-1.429	1.538
min	750	5.060	11.059	0.000	57.020

Source: Authors' calculation

3.2.3 Estimation Outcomes and Discussions

Tables 5 and 6 present the estimation results of the structural gravity trade model, with Table 5 corresponding to Equation 1 and Table 6 to Equation 2. The PPML estimation is displayed in column (i) of Table 5 and columns (iii) to (vii) of Table 6, whereas the OLS estimation is found in column (ii).

Table 5: Estimation Outcomes of Equation 1

Estimation	**(i)**	**(ii)**
Equation	**(1)**	**(1)**
Methodology	**PPML**	**OLS**
Dummy: Armenia	-4.133 ***	-8.909 ***
	(0.788)	(2.559)
Dummy: Azerbaijan	-3.787 ***	-8.380 ***
	(0.757)	(2.681)
Dummy: Belarus	-0.576	-3.085
	(0.457)	(1.986)
Dummy: Georgia	-2.241 ***	-6.155 **
	(0.706)	(2.421)
Dummy: Kazakhstan	-1.175 **	-7.656 ***
	(0.487)	(0.980)
Dummy: Kyrgyz	-2.437 ***	-9.229 ***
	(0.551)	(1.443)
Dummy: Moldova	-1.401 **	-5.316 **
	(0.706)	(2.421)
Dummy: Mongolia	-3.932 ***	-7.847 ***
	(0.706)	(2.421)
Dummy: Russia	-0.532	-6.843 ***
	(0.467)	(1.588)
Dummy: Tajikistan	-2.974 ***	-10.273 ***
	(0.596)	(1.349)
Dummy: Turkmenistan	-3.051 ***	-8.894 ***
	(0.634)	(3.292)
Dummy: Uzbekistan	-1.207 **	-7.264 ***
	(0.488)	(1.382)
it Fixed Effects	Yes	Yes
jt Fixed Effects	Yes	Yes
i,j Fixed Effects	Yes	Yes

Note: Standard errors are in parentheses. ***, ** and * denote statistical significance at the 99, 95, and 90 percent levels, respectively. Source: Authors' estimation

Table 6: Estimation Outcomes of Equation 2

Estimation	**(iii)**	**(iv)**	**(v)**	**(vi)**	**(vii)**
Equation	**(2)**	**(2)**	**(2)**	**(2)**	**(3)**
Methodology	**PPML**	**PPML**	**PPML**	**PPML**	**PPML**
wgi_gve	0.582 ***				
	(0.000)				
wgi_req		0.086 ***			
		(0.000)			
wgi_rol			0.567 ***		
			(0.002)		
wgi_coc				0.304 ***	
				(0,000)	
min					-0.013 ***
					(0.000)
it Fixed Effects (time invariant)	Yes	Yes	Yes	Yes	Yes
jt Fixed Effects	Yes	Yes	Yes	Yes	Yes
i,j Fixed Effects	Yes	Yes	Yes	Yes	Yes

Note: Standard errors are in parentheses. *** denotes statistical significance at the 99 percent level.
Source: Authors' estimation

The primary focus in Table 5 is the coefficients of the fixed effects in post-Soviet economies (the coefficients displayed in Table 5 correspond to the year 2023, while those in 2003, 2008, 2013, and 2018, together with the coefficients of other fixed effects, are excluded for conciseness). Negative fixed effects with a significance level exceeding 95% are observed in all sample economies, excluding Belarus and the Russian Federation, in the PPML estimation. This indicates that these economies have inferior performance in their manufacturing exports compared to the benchmark economies of Estonia, Latvia, and Lithuania. For instance, the coefficient for Armenia, -4.133, indicates a downward deviation from the benchmarks by exp. (-4.133) = 0.016.

Turning to the outcomes of Equation 2 in Table 6, replacing the fixed effects with the worldwide governance indicators (*wgi*) and the value-added of mining and utilities (*min*), the coefficients of all four governance indicators (*wgi_gve*, *wgi_req*, *wgi_rol*, and *wgi_coc*) exhibit significantly positive values, as expected. Among them, the coefficient of government effectiveness (*wgi_gve*) possesses the greatest magnitude. As for the coefficient of the value-added of mining and utilities (*min*), it is significantly negative as anticipated. The significantly positive coefficients of *wgi* and the negative coefficient of *min* suggest that institutional qualities and Dutch Disease in post-Soviet economies affect their manufacturing export performances. These results prompt an examination of the statistical significance of the contributions of the institutional immaturities and Dutch Disease effects to the fixed effects on post-Soviet economies that reflect the degree of the subpar performance in their manufacturing exports.

Tables 7 and 8 present the computational analysis of the quantitative contributions of institutional and Dutch Disease factors on manufacturing exports in post-Soviet economies, respectively. The analysis focuses on the economies exhibiting significantly negative fixed effects as presented in Table 5: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Tajikistan, Turkmenistan, and Uzbekistan. Belarus and the Russian Federation are excluded from this study due to their negative fixed effects being insignificant in the PPML estimation. Concerning the governance indicators, we select government effectiveness (*gve*), which possesses the highest coefficient in Table 6.

Table 7: Analysis of Institutional Effects on Manufacturing Exports

	Exporters' Fixed Effects	gve	gve (b) - Benchmark gve	(c) × 0.582 [coefficient]	(d) / (a)
	(a)	(b)	(c)	(d)	(e)
Armenia	-4.133	-0.184	-1.188	-0.691	0.167
Azerbaijan	-3.787	-0.033	-1.036	-0.603	0.159
Georgia	-2.241	0.791	-0.212	-0.123	0.055
Kazakhstan	-1.175	0.147	-0.857	-0.498	0.424
Kyrgyz	-2.437	-0.891	-1.894	-1.102	0.452
Moldova	-1.401	-0.165	-1.168	-0.680	0.485
Mongolia	-3.932	-0.472	-1.475	-0.858	0.218
Tajikistan	-2.974	-0.772	-1.776	-1.033	0.347
Turkmenistan	-3.051	-1.206	-2.210	-1.286	0.422
Uzbekistan	-1.207	-0.284	-1.287	-0.749	0.620
				Average (e)	0.335

Source: Authors' estimation

Table 8: Analysis of Dutch Disease Effects on Manufacturing Exports

	Exporters' Fixed Effects	min	min (b) - Benchmark min	(c) × -0.013 [coefficient]	(d) / (a)
	(a)	(b)	(c)	(d)	(e)
Armenia	-4.133	6.420	1.830	-0.024	0.006
Azerbaijan	-3.787	38.140	33.550	-0.443	0.117
Georgia	-2.241	4.460	-0.130	-	-
Kazakhstan	-1.175	15.560	10.970	-0.145	0.123
Kyrgyz	-2.437	4.070	-0.520	-	-
Moldova	-1.401	3.190	-1.400	-	-
Mongolia	-3.932	33.280	28.690	-0.379	0.096
Tajikistan	-2.974	8.400	3.810	-0.050	0.017
Turkmenistan	-3.051	1.880	-2.710	-	-
Uzbekistan	-1.207	5.450	0.860	-0.011	0.009
				Average (e)	0.061

Source: Authors' estimation

In Tables 7 and 8, column (a) displays the coefficients of the dummies as the fixed effects of exporters in 2023 in estimation (i) of Table 5; column (b) presents the 2023 values for government effectiveness (*gve*) and the value-added of mining and utilities (*min*); column (c) calculates their deviations from the averages of Estonia, Latvia, and Lithuania (benchmark economies); column (d) presents the quantitative contributions of *gve* and *min* by multiplying their deviations by their estimated coefficients in estimations (iii) and (vii) of Table 6; and column (e) determines the contribution ratios of *gve* and *min* to the exporters' fixed effects by dividing (d) by (a), with the final row of this column indicating the average contribution ratios of the targeted post-Soviet economies.

The analytical results in Table 7 indicate that the contribution ratios of government effectiveness (*gve*) to the exporters' fixed effects range from 0.620 in Uzbekistan to 0.055 in Georgia, with an average ratio of 0.335 across ten economies. The results in Table 8 reveal that the average contribution ratios of the value-added of mining and utilities (*min*) to the fixed effects are 0.061, with Azerbaijan, Kazakhstan and Mongolia exhibiting higher ratios of 0.117, 0.123, and 0.096, respectively.

The aforementioned estimation results are summarized as follows. Most of post-Soviet economies have experienced underperformance in their manufacturing exports relative to benchmarks (Estonia, Latvia, and Lithuania). The institutional immaturity regarding government effectiveness constitutes nearly 30% of this

underperformance. The effects of Dutch Disease have been minimal on the manufacturing exports of the average sample economies; however, in certain economies, such as Azerbaijan, Kazakhstan, and Mongolia, these effects contribute to around 10% of the underperformance in their manufacturing exports. These results align with the limited studies conducted by Taguchi and Abdullaev [5] and Abdullaev [34], which also contend that manufacturing performance varies among post-Soviet economies and that institutional factors, including logistics performance, significantly influence their outcomes.

The analyses suggest policy implications for exploring the potential of enhancing the performance of manufacturing exports for the post-Soviet economies with institutional immaturity: improving government effectiveness in post-Soviet economies with institutional immaturity to the level of benchmarks such as Estonia, Latvia, and Lithuania could potentially increase the size of their manufacturing exports by nearly 30%. The outstanding concern for post-Soviet economies is how institutional changes might be associated with manufacturing exports. Sachs [44] contended that effective institutions upholding the rule of law would enable the government to utilize and allocate its revenues for public investment in economic infrastructure and enhance the productivity of manufacturing sectors. In this perspective, post-Soviet economies could facilitate reforms toward a market-oriented framework and mitigate the negative legacies of the Soviet Union, enhancing the performance of manufacturing exports. Institutional enhancements may also aid in alleviating the effects of Dutch Disease, as shown by van der Ploeg [9], in resource-abundant economies such as Azerbaijan, Kazakhstan and Mongolia.

4. Concluding Remarks

This study assessed the export values of manufactured goods in post-Soviet economies using a structural gravity trade model and analyzed the quantitative contributions of institutional immaturity and Dutch Disease to the underperformance of their manufacturing exports. This study enhanced the literature by clarifying the quantitative contributions of institutional qualities and Dutch Disease to manufacturing exports, utilizing a structural gravity trade model, a comprehensive and theoretically consistent econometric framework, with an emphasis on post-Soviet economies.

The principal conclusions of this study are summarized as follows. Most of post-Soviet economies have demonstrated subpar performance in their manufacturing exports compared to the benchmark economies of Estonia, Latvia, and Lithuania. Institutional immaturity concerning government effectiveness represents approximately 30% of this underperformance, whereas the Dutch Disease effect contributes 10% to this underperformance in some resource-rich economies, such as Azerbaijan, Kazakhstan, and Mongolia. The analyses suggest policy implications that enhancing government effectiveness in post-Soviet economies to the benchmarks of Estonia, Latvia, and Lithuania could potentially expand their manufacturing exports.

A limitation of this study is the absence of detailed analysis on specific economies. Analyzing the effectiveness of government policies in particular economies via case studies will facilitate the formulation of precise, country-specific suggestions for improving manufacturing export performance.

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