Causal Impact of Barter Trade Policy during a Foreign Exchange Crisis*

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Abstract

When Pakistan's foreign exchange reserves collapsed to $3 billion in 2023, conventional payment channels froze. The government introduced barter trade with Afghanistan, creating a natural experiment to assess whether alternative payment mechanisms can mitigate crisis-induced trade disruptions. Using transaction-level customs data and product-level treatment variation, we find barter-eligible products maintained export values 31% and quantities 26% higher than ineligible products during the crisis peak, with no price effects. Effects dissipated as reserves recovered, demonstrating crisis-contingent mitigation. These results provide first causal evidence that government-facilitated alternative payment mechanisms can preserve trade during payment system failures.

JEL Classification: F13, F14, F30, G15, O24

Keywords: Trade finance, barter trade, financial crises, payment systems, natural experiment

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1 Introduction

The collapse of payment systems represents a critical but understudied friction in international trade. While an extensive literature documents how trade finance constraints affect firm-level export decisions (Amiti and Weinstein, 2011; Chor and Manova, 2012), less is known about policy responses when these constraints become systemwide and conventional financial channels cease functioning entirely. This question has become increasingly relevant as foreign exchange crises, banking system failures, and financial sanctions have proliferated in recent decades. Pakistan's 2023 experience provides a stark illustration: foreign exchange reserves fell from $26 billion in early 2021 to $3.1 billion by February 2023, triggering a freeze in letter of credit processing that effectively stopped trade despite unchanged real demand for imports and exports. Standard policy tools—reserve injections, IMF programs, currency interventions—require months to implement and often impose substantial economic and political costs. This raises the question of whether alternative payment mechanisms can provide more immediate relief. This paper provides the first causal evidence on whether government-facilitated barter trade can mitigate crisis-induced trade disruptions in a modern economic context.

We exploit Pakistan's June 2023 introduction of barter trade with Afghanistan (SRO 642) as a quasi-experiment. The policy allowed firms to exchange goods directly without foreign exchange intermediation but applied only to specific product categories, primarily in textiles, agriculture, and basic manufactures—while excluding machinery, electronics, and precision instruments. This product-level treatment variation, combined with sharp timing of policy introduction during an acute reserves crisis, generates a difference-in-differences research design. Using comprehensive transaction-level customs data covering 570 HS4 products over 14 quarters (2021Q3–2024Q4), I estimate event study specifications comparing export flows for eligible versus ineligible products relative to the policy introduction date. The extended time series spanning pre-crisis, crisis peak, and recovery periods allows me to test whether effects are crisis-contingent—emerging when payment constraints bind and dissipating when conventional channels resume—providing insight into both policy effectiveness and underlying mechanisms.

The results demonstrate that alternative payment mechanisms can provide substantial crisis mitigation. First, barter-eligible products experienced substantial protective effects during the crisis peak: export values were 28% higher and quantities 26% higher during 2023Q4–2024Q2 compared to ineligible products, relative to pre-crisis baseline

with no change in prices. Second, the mechanism operated through real trade expansion rather than price distortion: quantity effects closely matched value effects, while unit prices remained unchanged, indicating barter removed payment constraints without creating artificial market advantages or enabling rent extraction. Third, effects were strongly crisis-contingent: pre-policy event study coefficients are flat and jointly insignificant supporting parallel trends assumption, treatment effects emerge only after June 2023 and peak during quarters of most severe reserve shortage, and effects dissipate to near zero by 2024Q3–Q4 as reserves recovered and banking channels resumed operations. These findings suggest that alternative payment mechanisms deserve consideration in crisis response toolkits, particularly for countries with limited access to rapid external financing or those facing payment system disruptions from sanctions or banking failures.

This paper contributes to three strands of the international economics literature. First, We extend the literature on trade finance and liquidity shocks. Seminal work by Amiti and Weinstein (2011) demonstrates that banks' financial health affects firms' export behavior, while Ahn et al. (2011) show letters of credit—the dominant payment method in international trade—decline sharply during financial crises, causing trade to collapse even when underlying demand remains strong. Subsequent research has refined these findings: Paravisini et al. (2015) use matched bank-firm data to isolate credit supply effects from demand shocks, Chor and Manova (2012) show credit-intensive sectors suffer larger trade declines during crises, and Niepmann and Schmidt-Eisenlohr (2017) model how payment method choice depends on institutional quality and trust. More recently, Boz et al. (2022) examine how currency invoicing patterns affect trade during financial stress. This literature convincingly establishes that trade finance matters—payment system disruptions cause substantial trade losses but focuses almost entirely on documenting the problem rather than evaluating potential solutions. My contribution is to provide the first causal evidence on a policy response: whether government facilitated alternative payment mechanisms can substitute for frozen conventional channels and, if so, how large the mitigation effects are.

Second, We contribute to literature on barter and countertrade. While barter represents one of oldest exchange mechanisms, modern economic research has largely treated it as a historical curiosity. Important exceptions include Marin and Schnitzer (2002), who develop a theoretical model showing barter can be efficient in credit-constrained environments because goods serve as collateral, and Marin et al. (2003), who use survey data from post-Soviet Ukraine to test competing theories of barter prevalence. Historical accounts describe bilateral clearing arrangements extensively used during the Great

Depression and immediate post-WWII period (Eichengreen and Irwin, 1995; League of Nations, 1935; Verzijden, 1992), while more recent work examines countertrade in corporate contexts (Jones, 1984; Chan and Hoy, 1991) and under sanctions (Iran, Russia). However, this literature suffers from two limitations: historical episodes lack modern data infrastructure needed for causal identification, while contemporary case studies cannot credibly separate barter effects from confounding factors. My research design overcomes both limitations by exploiting Pakistan's natural experiment—sharp policy timing, product-level treatment variation, and extended time series spanning crisis onset through recovery—to deliver the first quasi-experimental estimates of barter's causal effects in a modern economic setting.

Third, We contribute to understanding temporary crisis interventions and their tendency toward permanence. Rose (2013) finds WTO membership constrains protectionist responses to crises but does not eliminate them entirely, while Bown and Crowley (2013) document that temporary trade barriers deployed during economic downturns frequently become entrenched and difficult to remove. Bagwell and Staiger (2003) model the political economy mechanisms that make trade policy interventions sticky, and Almunia et al. (2021) show that even productivity-enhancing export responses to domestic recessions can create lasting distortions. This literature suggests substantial caution about deploying any trade policy intervention, even during genuine crises, because removal faces political resistance. My findings demonstrate an alternative: policies targeting specific temporary constraints can self-limit without requiring active removal. The barter mechanism exhibited strong crisis-contingent effects—large benefits when constraints bound, negligible effects when constraints eased—because the underlying economics shifted: as conventional payment channels resumed, firms reverted to banking infrastructure without needing government policy reversal.

The remainder of the paper is organized as follows. Section 2 provides institutional background on Pakistan's reserves crisis and details of the barter trade policy. Section 3 describes the customs data, sample construction, and summary statistics. Section 4 outlines the empirical strategy and discusses identification assumptions. Section 5 presents the main results on export values, quantities, and prices. Section 6 concludes with policy implications and discusses broader lessons for crisis management.

2 Background

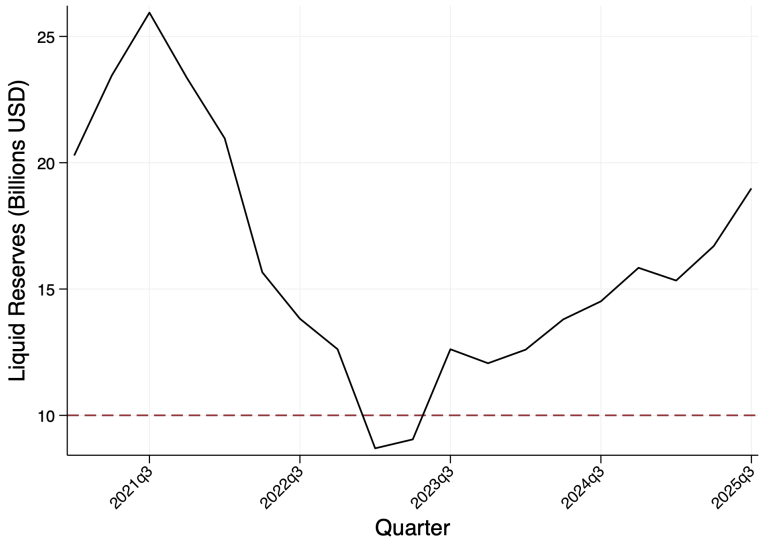
2.1 The Foreign Exchange Liquidity Crisis

In early 2023, Pakistan faced a severe balance of payments crisis driven by external debt servicing obligations and delayed financial inflows. The crisis was exacerbated by political instability following the April 2022 government transition, which delayed IMF program negotiations and fiscal reforms for months, causing external financing to stall precisely when reserves were most depleted. By May 2023, liquid foreign exchange reserves held by the State Bank of Pakistan (SBP) had collapsed to $4.4 billion, sufficient to cover less than one month of imports (State Bank of Pakistan, 2023).

As illustrated in Figure 1, this depletion prompted a sharp contraction in formal trade financing. To prevent a sovereign default, the SBP imposed strict administrative controls on foreign exchange outflows, effectively freezing the issuance of Letters of Credit (LCs) for all non-essential imports. This liquidity shock paralyzed the formal banking channel, leaving shipping containers stranded at ports due to the inability to settle dollar-denominated payments (Reuters, 2023).

Reserves began recovering in July 2023 following an IMF Stand-By Arrangement and bilateral support from Saudi Arabia, UAE, and China, reaching $12.4 billion by 2023Q3 and $15.8 billion by 2024Q2. As reserves recovered and LC processing gradually resumed through late 2024. This complete cycle—from crisis to recovery—provides time-series variation to test whether barter policy effects were crisis-contingent.

Figure 1: Pakistan's Foreign Exchange Reserves Crisis and Recovery



2.2 The Policy Response: Barter Trade Mechanism

In response to the foreign reserve crisis, the Ministry of Commerce issued Statutory Regulatory Order, titled the Business-to-Business (B2B) Barter Trade Mechanism (Ministry of Commerce, Government of Pakistan, 2023). This policy created a legal framework for private firms to conduct trade without foreign currency, specifically targeting three countries: Afghanistan, Iran, and Russia. These partners were selected due to their mutual exclusion from, or constraints within, Western banking systems (SWIFT sanctions or financial isolation), rendering them natural partners for barter trade.

The policy introduced a credit-based goods-for-goods clearing mechanism that bypassed commercial banks. Pakistani firms importing from eligible countries earned tradable barter credits recorded by Pakistan Customs, valued at the import amount. These credits could be used by the importing firm itself or transferred to other firms to settle export transactions. Pakistan Customs acted as clearing house, matching aggregate imports and exports. This design solved the double coincidence of wants problem by eliminating the need for direct bilateral firm-to-firm matching.

Firms were required to register barter contracts through the Pakistan Customs Web-Based One Customs (WeBOC) system, the same platform used for conventional trade. The mechanism enforced an Import-Export parity, where the value of goods imported must be offset by exports of equivalent value within 90 days. This facilitated the export of value-added goods and staples (textiles, pharmaceuticals, rice) in exchange for critical raw materials and food imports (coal, minerals, and fresh produce). The complete list of eligible import and export goods can be found in Appendix.

3 Empirical Strategy

3.1 Identification Approach

The barter trade policy provides a rare opportunity to estimate the causal effect of alternative payment mechanisms on trade flows during a financial crisis. Three features of the institutional setting generate credible identifying variation. First, the policy was introduced at a specific date (June 1, 2023) during an acute crisis phase when conventional payment channels were frozen, creating sharp temporal variation in treatment. Second, the policy applied to some products and not others, generating cross-sectional variation in treatment eligibility. Third, Pakistan's reserve levels fluctuated dramatically—from crisis ($3–9 billion) through recovery ($12–19 billion)—allowing me to test whether policy effects were crisis-contingent.

This combination of timing, product-level eligibility, and reserve fluctuations enables a difference-in-differences event study design that compares export flows for eligible versus ineligible products before and after policy introduction, conditional on product and time fixed effects. The identifying assumption is that eligible and ineligible products would have followed parallel trends in the absence of the policy—an assumption I assess using event stuyd design.

3.2 Econometric Specification

We estimate the following event study specification using Poisson Pseudo-Maximum Likelihood (PPML):

$$Y_{ht} = \sum_{\tau=-8,\ \tau\neq-1}^{5} \beta_\tau \left(\text{Barter}_h \times \mathbf{1}\{t - t^* = \tau\}\right) + \alpha_h + \gamma_t + \varepsilon_{ht} \tag{1}$$

In this specification, Y_{ht} denotes the outcome of interest for HS4 product h in quarter t. We consider three export outcomes: (i) value of exports, capturing total export revenue; (ii) quantity of exports, measuring physical trade volume; and (iii) unit price, calculated as value divided by quantity. The variable Barter_h is an indicator equal to one for HS4 products eligible for barter trade and zero for ineligible products. The term $t^* = 2023\text{Q}3$ denotes the quarter of policy introduction (June 1, 2023), and τ indexes event time in quarters relative to the policy, ranging from eight quarters before ($\tau = -8$, corresponding to 2021Q3) through five quarters after ($\tau = 5$, corresponding to 2024Q4). The event time indicator $\mathbf{1}\{t - t^* = \tau\}$ equals one if quarter t is exactly τ periods from the policy introduction, and zero otherwise.

We normalize all coefficients relative to $\tau = -1$ (2023Q2, the quarter immediately before policy implementation), so the omitted category represents the baseline against which all other periods are compared. Product fixed effects α_h absorb time-invariant differences across products. Quarter fixed effects γ_t absorb aggregate shocks common to all products, such as seasonal patterns, macroeconomic conditions, and overall Pakistan-Afghanistan trade dynamics.

The coefficients of interest are $\{\beta_\tau\}$ for $\tau \in \{-8, \ldots, -2, 0, \ldots, 5\}$. The pre-treatment coefficients $\{\beta_\tau\}_{\tau=-8}^{-2}$ provide both a visual and formal test of the parallel trends assumption. If eligible and ineligible products followed similar trajectories before the policy, these coefficients should be small in magnitude, exhibit no systematic trend, and be jointly statistically insignificant.

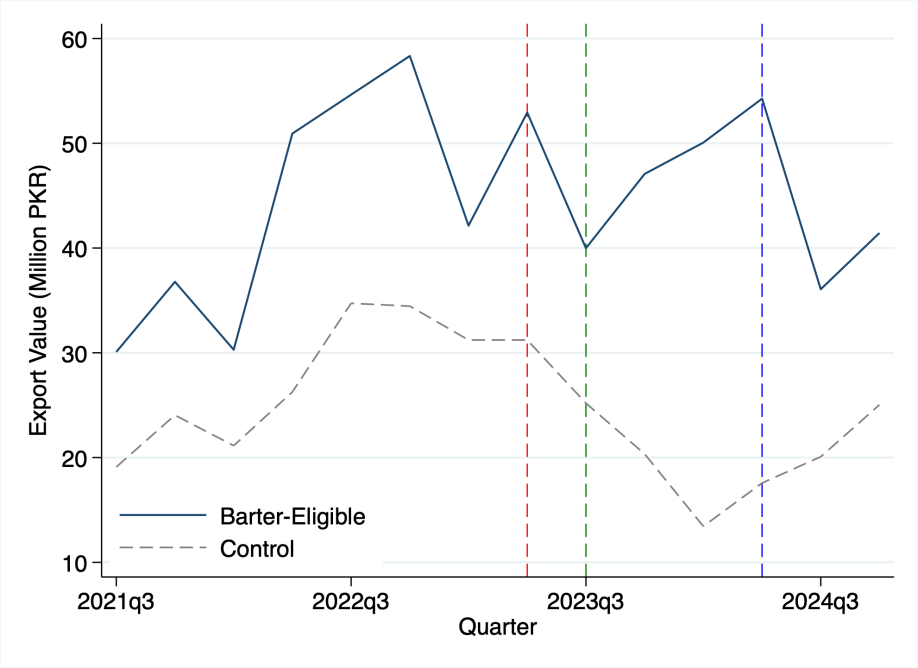
We employ PPML rather than log-linearized OLS because PPML naturally accom-

modates zero trade flows, without requiring adjustments such as adding one before logging or dropping zero-valued observations. Second, PPML delivers consistent estimates in the presence of heteroskedasticity, which is pervasive in trade data where variance increases with trade volume.

3.3 Identifying Assumptions

The validity of this research design rests on two core assumptions of parallel trends and no anticipation. The parallel trends assumption states that in the absence of the barter policy, export flows for eligible and ineligible products would have evolved similarly on average. This assumption is not directly testable but can be assessed by examining pre-treatment trends. Figure 2 provides visual evidence of parallel pre-treatment trends. The figure plots aggregate quarterly exports for eligible and ineligible products separately from 2021Q3 through 2024Q4. Both groups exhibit similar trajectories during the pre-crisis period (2021Q3–2022Q2), with exports rising modestly. Beginning in 2022Q3(red line), as Pakistan's reserves crisis intensified, both groups experienced sharp declines. After the barter policy introduction in 2023Q3 (marked by the vertical green line), the trends diverge: eligible product exports stabilize and begin recovering, while ineligible product exports continue declining through early 2024 before gradually recovering as conventional payment channels resumed (blue line).

Figure 2: Pre-Treatment Trends: Barter-Eligible vs Control Products



Another assumption of no anticipation says that firms did not adjust behavior in anticipation of the policy before its announcement. This assumption is plausible for three reasons. First, the policy was announced and implemented on the same date (June 1, 2023) with no advance notice, precluding anticipatory responses. Second, Pakistan's political environment in early 2023 was chaotic—reserves were collapsing, the IMF program was stalled, and default seemed imminent—making any specific policy response difficult to predict.

4 Data

Our empirical analysis uses transaction-level export data from the Federal Board of Revenue (FBR) of Pakistan, covering all bilateral trade between Pakistan and Afghanistan from 2021Q3 through 2024Q4. These administrative customs records capture the universe of formal export transactions processed through Pakistan Customs' Web-Based One Customs (WeBOC) system. Each record contains the HS4 product code, export value in US dollars, export quantity, and transaction date.

We combine these customs data with the official list of barter-eligible products from Statutory Regulatory Order (SRO) 642(I)/2023, issued by the Ministry of Commerce on June 1, 2023 (Ministry of Commerce, Government of Pakistan, 2023).

We construct a balanced panel at the HS4-quarter level by aggregating individual transactions within each product-quarter cell. Our sample spans 14 quarters, providing eight pre-treatment quarters (2021Q3–2023Q2) and six post-treatment quarters (2023Q3–2024Q4). The reason why we start from 2021Q3 is that before that there was a regime chnage in Afghanistan just so that it does not contaiminate our results we start from 2021Q3. The pre-treatment period allows assessment of parallel trends, while the post-treatment period captures both the acute crisis phase (2023Q3–2024Q2, when reserves remained below $10 billion) and the recovery phase (2024Q3–2024Q4, when reserves exceeded $12 billion).

The final balanced panel contains 7,980 product-quarter observations (570 products $\times$ 14 quarters), divided into 259 barter-eligible products (treatment group) and 311 ineligible products (control group). For each product-quarter, we have three outcome variables: (i) *export value*, the sum of all transaction values in US dollars; (ii) *export quantity*, the sum of all quantities in kilograms; and (iii) *unit price*, calculated as total value divided by total quantity.

Product eligibility for barter trade was determined by the Ministry of Commerce based on sector characteristics rather than firm-specific or crisis-specific factors. The

ineligible products concentrate in machinery (HS 84, 78 products), electrical equipment (HS 85, 52 products), transport equipment (HS 86–89, 41 products), and precision instruments (HS 90–92, 38 products).

5 Results

This section presents our main findings on the impact of Pakistan's barter trade policy on bilateral exports with Afghanistan. We examine three outcomes—export values, quantities, and unit prices—to assess both whether the policy mitigated crisis-induced trade disruptions and through what mechanism such mitigation occurred.

5.1 Export Values: Crisis Mitigation Effect

We begin by assessing whether the barter trade mechanism mitigated export revenue losses during Pakistan's foreign exchange crisis. Figure 3 presents event-study estimates of the treatment effects for barter-eligible products relative to ineligible products. The vertical dashed line at 2023Q2 denotes the baseline quarter, immediately preceding the policy's introduction in 2023Q3 (June 1, 2023). The coefficients $\hat{\beta}_\tau$ capture differential changes in export values relative to this baseline.

The pre-treatment coefficients are small, statistically indistinguishable from zero, and display no systematic trend. This pattern is consistent with eligible and ineligible products following parallel export trajectories in the two years prior to the policy, providing support for the identification strategy.

In the policy introduction quarter (2023Q3), the estimated coefficient remains close to zero and statistically insignificant, consistent with a short adjustment period as firms became aware of and began using the new mechanism. In contrast, a pronounced divergence emerges in 2023Q4. The effect intensifies in 2024Q1 and remains elevated through 2024Q2. The persistence of the effect during this period suggests that the barter mechanism provided sustained protection at the height of the foreign exchange shortage, when conventional payment channels were most severely constrained.

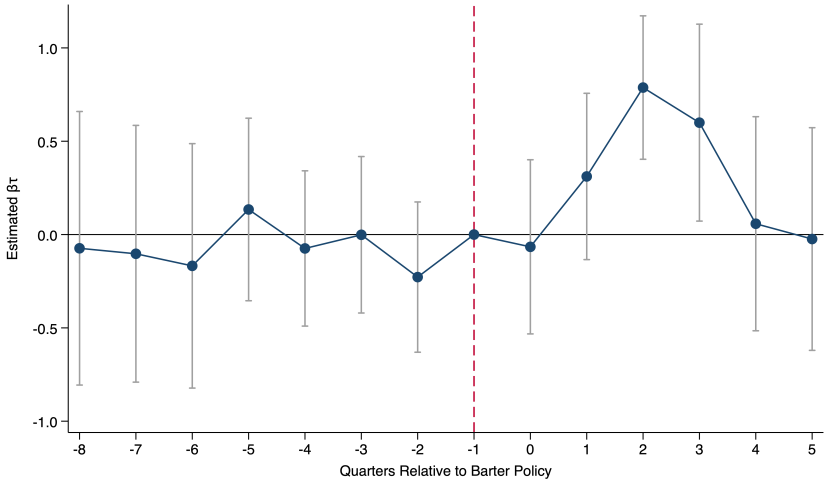
As macroeconomic conditions improved, however, the advantage associated with barter eligibility dissipated. Following the recovery of foreign exchange reserves above $12 billion and the resumption of standard letter-of-credit processing, the estimated effect declined sharply. By 2024Q3, the coefficient is statistically indistinguishable from zero, and by the end of the year the differential has fully disappeared. The sharp contrast between the crisis and post-crisis periods underscores that the earlier gains were

not permanent but closely tied to the binding nature of the liquidity constraint.

Taken together, these results indicate that the barter mechanism provided substantial crisis mitigation—supporting export revenues when conventional trade finance mechanisms were impaired. The resulting rise–persistence–collapse pattern is characteristic of a policy whose effectiveness is explicitly contingent on crisis conditions.

Export values alone, however, cannot distinguish whether this protection operated through increases in physical trade volumes or through price adjustments. To shed light on the underlying mechanism, we next examine how the policy affected quantities and prices.

Figure 3: Effect of Barter Trade Policy on Export Values



Notes. Figure presents event study estimates of the barter policy's impact on export values from equation 1. The figure plots coefficients $\hat{\beta}_\tau$ and 95% confidence intervals for quarters $\tau = -8$ through $\tau = 5$ relative to policy introduction in 2023Q3. The reference period is $\tau = -1$ (2023Q2). The dependent variable is export value for HS4 product h in quarter t, estimated using Poisson Pseudo-Maximum Likelihood (PPML). Standard errors are clustered at the HS4 product level. Sample: 7,980 HS4-quarter observations (570 products $\times$ 14 quarters). All regressions include product and quarter fixed effects.

5.2 Export Quantities: Real Trade Protection

Having established that the barter mechanism increased export values during the crisis, we now examine whether this effect reflects real trade protection—i.e., increases in physical quantities—rather than price adjustments. Figure 4 presents event-study estimates for export quantities, using the same specification as for values. The pre-treatment pattern again provides strong support for the parallel trend assumption. Similar to the value results, the policy introduction quarter (2023Q3) shows minimal imme-

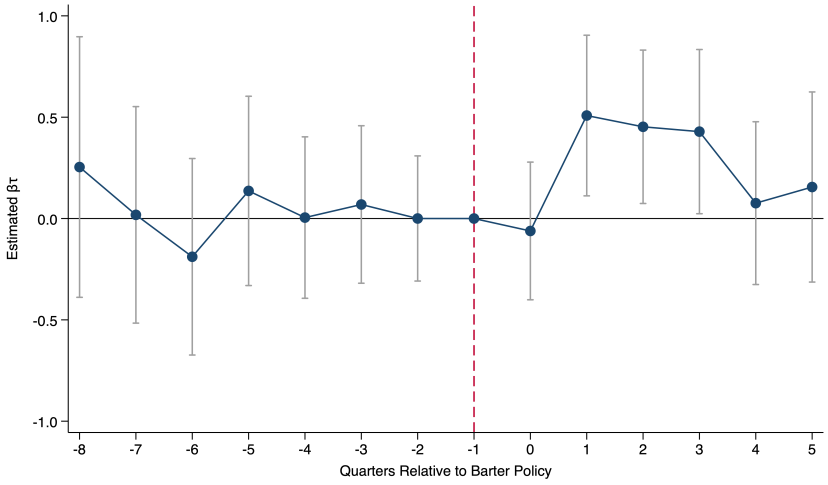
diate impact, with the coefficient remaining close to zero and statistically insignificant. This is consistent with the implementation lag observed in values, as firms required time to navigate the new administrative procedures and establish barter arrangements.

The quantity effect emerges strongly in 2023Q4, with the coefficient rising sharply. This timing closely mirrors the pattern observed for export values, indicating that the value increases were driven primarily by higher shipment volumes rather than price changes. The effect persists through 2024Q1 and 2024Q2, remaining elevated and statistically significant throughout the crisis period.

As with export values, the quantity advantage dissipates following the macroeconomic recovery. The coefficient declines in 2024Q3 and continues falling through year-end, eventually returning to levels statistically indistinguishable from zero.

The close correspondence between the quantity and value patterns provides strong evidence that the barter policy generated real trade protection. Exporters of eligible products were able to maintain physical shipments during the crisis, while exporters of ineligible products faced binding constraints that reduced their ability to trade. We next examine prices to confirm that the observed effects operated through quantities rather than pricing adjustments.

Figure 4: Effect of Barter Trade Policy on Export Quantities



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5.3 Unit Prices: No Evidence of Price Adjustments

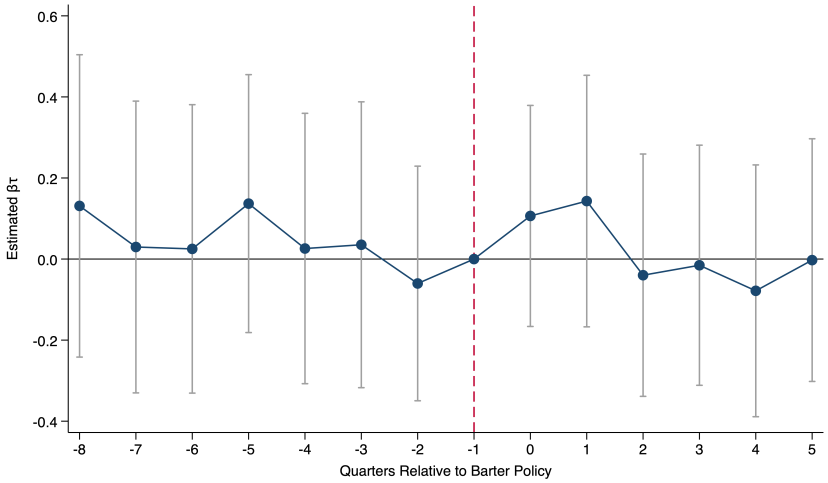
To confirm that the observed effects operated through physical quantities rather than pricing mechanisms, Figure 5 presents event-study estimates for unit prices.

Throughout the entire sample period—both before and after the policy—the coefficients remain tightly clustered around zero with no systematic pattern. All point estimates are statistically insignificant, and the confidence intervals consistently include zero. This stability indicates that barter-eligible and ineligible products experienced similar price dynamics regardless of the foreign exchange crisis or the policy intervention.

The absence of any price effect is striking. During the peak crisis quarters (2023Q4–2024Q2), when we observe large positive effects on both values and quantities, unit prices show no differential movement. This rules out alternative mechanisms such as quality upgrading, price discrimination, or changes in product composition within HS4 categories. Instead, it confirms that the barter mechanism generated real trade protection by enabling firms to maintain physical shipments at prevailing market prices.

The flat price profile, combined with the parallel movements in values and quantities, provides clean evidence that the policy worked through its intended channel: bypassing the frozen banking system to facilitate goods-for-goods exchange without altering the fundamental economics of the traded products.

Figure 5: Effect of Barter Trade Policy on Unit Prices



Notes. Figure presents event study estimates of the barter policy's impact on unit prices from equation 1. The figure plots coefficients $\hat{\beta}_\tau$ and 95% confidence intervals for quarters $\tau = -8$ through $\tau = 5$ relative to policy introduction in 2023Q3. The reference period is $\tau = -1$ (2023Q2). All regressions include product and quarter fixed effects.

6 Conclusion

When financial systems freeze, international trade can collapse—even when underlying demand persists. Pakistan's 2023 foreign exchange crisis provides a stark illustration: with reserves depleted and banks unable to process letters of credit, thousands of containers sat stranded at ports despite willing buyers and sellers on both sides of the border. This paper examines whether barter trade mechanisms—a policy tool with deep historical roots but limited modern evidence—can mitigate such disruptions. The answer matters. Foreign exchange and banking crises remain recurrent features of emerging markets, and understanding which policy interventions can cushion trade flows has immediate practical relevance for policymakers facing similar constraints.

We exploit the introduction of Pakistan's business-to-business barter trade policy in June 2023, which allowed firms to exchange goods directly with Afghanistan, bypassing the paralyzed banking system. Using transaction-level customs data and product-level variation in barter eligibility, we find that the policy increased export values and quantities for eligible products during the peak crisis period. Unit prices remained unchanged, confirming that the mechanism generated real trade protection rather than compositional shifts or price adjustments. Critically, these effects were crisis-contingent: they emerged precisely when foreign exchange constraints were binding and dissipated completely once reserves recovered and conventional payment channels resumed operation. The findings validate a core theoretical prediction from Marin and Schnitzer (2002)—that barter can function efficiently when credit constraints bind—and demonstrate that state-facilitated non-bank payment mechanisms can serve as effective crisis mitigation tools. While barter cannot substitute for well-functioning financial systems in normal times, our results suggest it deserves consideration in the emergency policy toolkit for economies facing acute liquidity shocks.

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