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India-Nepal Trade Dynamics and Exchange Rate Pass-through: Time-Varying Analysis of the Parameter

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Abstract

This paper analyses the exchange rate pass-through (ERPT) to consumer prices in Nepal by a Time-Varying Parameter Vector Autoregression (TVP-VAR) model. Adopting a quantitative research design, the study drew on monthly secondary data sourced from the Nepal Rastra Bank, the Central Bureau of Statistics of Nepal, and international databases, covering the period from January 2000 to October 2023. The data were analysed using Bayesian estimation through Markov Chain Monte Carlo (MCMC) simulation within the TVP-VAR framework with stochastic volatility. Since Nepal is a country with a fixed exchange rate pegged to the Indian Rupee and it has been integrated through trade at a huge rate with India, it is important to understand how the ERPT works in the monetary policy formulation. Three main findings in our empirical results include the first finding that when there is exchange rate depreciation, there are moderate consumer price increases, and the effect is realized in a period of twelve months. Second, there is a high time dispersion of ERPT, which reduces considerably during the initial stage after the monetary policy credibility improved with the establishment of a monetary policy structure and greater integration of the global value chain. Third, asymmetric shocks are strong with pass-through being much higher during depreciation than when there is appreciation, implying adhesive downward price changes. The research adds to the scanty empirical evidence on ERPT in landlocked developing economies and gives practical initiatives to the inflation-targeting regimen of Nepal Rastra Bank. The results highlight the

need to have an effective monetary policy and to strengthen institutions to reduce the inflationary effects of external shocks.

Keywords: exchange rate pass-through, time-varying parameters, vector autoregression, Nepal, Nepal - India trade relations, monetary policy, inflation dynamics

1. Introduction

The exchange rate pass-through (ERPT) is among the most important transmission channels between external shocks and the domestic price dynamics, especially to small open economies that are largely reliant on international trade. The extent of the exchange rate adjustment that is converted to domestic price adjustment has far-reaching consequences on the effectiveness of the monetary policy, inflation, and macroeconomic stability (Burstein & Gopinath, 2014; Carriere-Swallow et al., 2023).

Understanding the dynamics of exchange rate pass-through (ERPT) in the Nepalese context is critically important for policy formulation. Nepal's landlocked economy and its uniquely structured exchange rate system, which is closely integrated with trade with India, make ERPT particularly significant.

Nepal is also a country with a dual exchange rate system. The Nepalese Rupee (NPR) has been pegged against the Indian Rupee (INR) since 1993, but is floating against other leading currencies like the US dollar. This organization represents the deep economic interdependence of Nepal with India in terms of high trade connections, free regime of the border, and freedom of movement of laborers. By fiscal year 2023-24, India is the largest contributor to Nepal's trade volume, reaching about two-thirds, and bilateral trade between the two countries has reached more than eight billion US dollars. The pegged exchange rate regime has given Nepal nominal stability and low transaction costs in bilateral trade, but it has also limited the monetary policy independence of this country, and it exposes the economy to inflation spillovers in India.

The conceptual base of the study of ERPT is built on the theory of price formation of companies that are involved in international trade. In Producer Currency Pricing (PCP), prices are established in the local currency of the exporter, and there is full pass-through as any exchange rate fluctuation directly influences the price of imports in the foreign market. Local Currency Pricing (LCP), on the other hand, would mean exporters price in the destination market currency; therefore, incomplete or slower pass-through (Gopinath et al., 2020). Market structure, pricing power, input-output associations, and the credibility of monetary scheme structures also determine the extent of pass-through (Choudhri & Hakura, 2006; Lopez-Villavicencio & Mignon, 2017).

According to recent empirical studies, decreasing coefficients of ERPT have been recorded in advanced economies as well as in emerging economies due to various factors such as stronger monetary policy credibility, deeper global value chain (GVC) involvement, and trade structure shifts (Ben Cheikh et al., 2023; Beirne et al., 2024). Nevertheless, the COVID-19 crisis and related geopolitical shocks have created the issue of increased pass-through anew in the context of high uncertainty and supply chain pressure (Carriere-Swallow et al., 2023). These changes highlight why time variation in ERPT estimates should not be ignored because pass-through coefficients can change with the macroeconomic conditions, policy regime, and external shocks.

Although the role of ERPT in the inflation processes and monetary policy behavior of Nepal is crucial, the empirical studies are still underwhelming. Previously, the most frequently discussed topics have been the association between exchange rates and aggregate macroeconomic indicators, including trade balance, foreign exchange reserves, and export

performance (Adhikari, 2018; Paudel & Burke, 2015), whereas systematic analysis of the ERPT to consumer prices is almost nonexistent. The recent work by Lama et al. (2025) is an important step forward in that it uses the Local Projections methodology to estimate ERPT and reveals asymmetric effects and structural breaks. Nevertheless, the analysis does not explicitly model time change in pass-through coefficients and does not consider the feedback process of several macroeconomic variables.

The following research will fill these gaps by using a Time-Varying Parameter Vector Autoregression (TVP-VAR) framework to investigate the dynamics of ERPTs in Nepal. The TVP-VAR framework, which was first introduced by Primiceri (2005) and has been widely used in the field of monetary economics (Nakajima, 2011; Rodriguez et al., 2024) has a number of methodological benefits. First, it permits pass-through coefficients to change smoothly over time, reflecting slow changes in credibility of monetary policy, trade structure and market expectations. Secondly, the VAR construct can capture the effects of feedback, which is dynamic between the exchange rates, import prices, producer prices, and consumer prices, and it gives a holistic view of the pass-through chain. Third, the model assumes the use of stochastic volatility that allows accounting for time-varying uncertainty, especially in the context of Nepal, which is exposed to external shocks such as the global financial crisis, earthquake, and the COVID-19 pandemic.

The study makes three main contributions to the literature. To begin with, we present the initial detailed estimates of time-varying ERPT in Nepal, with large changes in pass-through coefficients between periods and economic regimes. Second, we directly examine the role of India-Nepal trade integration in the formulation of pass-through effects, both directly through the fixed INR peg and indirectly via import composition and supply chain linkages. Third, we examine asymmetric pass-through effects during depreciation and an appreciation episode, and we test the hypothesis that price rigidities result in different responses. These results have significant implications to design and execution of Nepal Rastra Bank monetary policy, especially in the setting of inflation and managing the external sector.

2. Literature Review

Theoretical literature on ERPT has been changing since the initial works of Dornbusch (1987) and Krugman (1987), who focused on the market structure and pricing-to-market behavior. Modern models draw a line between two pricing paradigms that define the level of pass-through. In the PCP model, the exporters fix the prices in their currency of production and pass through is in full, meaning that the changes in the exchange rate translate directly into the import prices. However, when the LCP model comes in, the exporters fix the prices in the currency of the consumers, and hence the level of the pass-through is less than one. Gopinath et al. (2020) have recently broadened this concept to include a Dominant Currency Pricing (DCP), in which the invoicing is in the major vehicle currency, usually the US dollar, and the rate of pass-through depends on the bilateral exchange rate between the importing country and the dominant currency and not the bilateral rate between the trade partners.

Such theoretical distinctions are particularly relevant in the case of Nepal, where the dual exchange rate system leads to different pass-through channels. The INR-NPR peg implies that the pass-through of INR movements is essentially zero, while the NPR exchange rate can vary against USD and other currencies, bringing about different degrees of price transmission. This institutional design is a natural experiment to test the pass-through dynamics that arise from different exchange rate regimes, and the results of which should be studied in the same economy.

Empirical studies done on ERPT have been produced in great numbers for the last thirty years, and most have established many stylized facts. First, the pass-through is rarely full, and it differs in size depending on the price measure and country characteristics (Campa &

Goldberg, 2005; Bussiere et al., 2013). Second, pass-through drops as you move from the border to the retail level of the domestic production chain, this is mainly because at every stage there are domestic value-added and competitive dynamics at play (Ito & Sato, 2008). Third, pass-through has been on a declining trend in many nations since the 1990s, which has been linked to the enhanced credibility of the monetary policy that was achieved by the inflation targeting frameworks (Taylor, 2000; Choudhri & Hakura, 2006). Fourth, pass-through is not symmetric, and this shows that prices respond more to the depreciation of the exchange rate than to the appreciation (Delatte & Lopez-Villavicencio, 2012). Fifth, there is a state dependency in the pass-through in such a way that it is different in periods of crisis and during tranquility periods (Carriere-Swallow et al., 2023).

Empirical literature on ERPT in the South Asian region is slowly growing but it has largely been dominated by some specific studies done on India. Mallick & Marques (2008) study the pass-through of the exchange rate and tariffs in India and determine that the extent of pass-through is significant but varies considerably across sectors. A more detailed analysis of the cross-country dynamics of the exchange rate pass-through in the Asian region has been conducted by Ito & Sato (2008), who use VAR models for the post-crisis estimates of pass-through in the region.

Among the most recent works on ERPT in Nepal, Lama et al. (2025) is the most useful. They use the Local Projections methodology and find that the ERPT to consumer prices is about 0.30 at twelve months, there is asymmetry with the depreciation having a stronger impact, and a structural break following the 2015 earthquake. Their work indicates that it is necessary to account for time-varying effects and asymmetric responses when studying ERPT in Nepal. Our analysis adds value to this literature by applying the TVP-VAR methodology, which offers several benefits over the Local Projections approach.

Recent literature has focused on certain important channels that determine the ERPT. First, GVC involvement affects how exchange rate changes are transmitted to the domestic prices (Ben Cheikh et al., 2023; Jangam et al., 2025). Second, the type of exchange rate management determines how the monetary authority responds to exchange rate fluctuations and how these are transmitted to the prices (Lopez-Villavicencio & Mignon, 2017). Third, external shocks, such as the COVID-19 pandemic, have had a substantial effect on the ERPT dynamics by disrupting supply chains and raising global uncertainty (Carriere-Swallow et al., 2023; Beirne et al., 2024).

3. Methodology and Data

3.1 Time-Varying Parameter VAR Model

The time-varying parameter VAR model is described as a method that divides the entire process into a series of steps, each dealing with a single parameter. The time-varying parameter VAR model is defined as a way of breaking the whole process into a sequence of steps, which involves handling a particular parameter. To observe the dynamics of the exchange rate pass-through changing over time in Nepal, we used a Time-Varying Parameter Vector Autoregression with stochastic volatility (TVP-VAR-SV) model. The model specification is in line with Primiceri (2005) and Nakajima (2011), whereby both the coefficients and the variance-covariance matrix vary with time. The overall structure of the model is:

$$y_t = c_t + B_{1,t}y_{t-1} + B_{2,t}y_{t-2} + ... + B_{p,t}y_{t-p} + A_t^{-1}\Sigma_t\varepsilon_t$$

where y_t is an $n \times 1$ vector of endogenous variables, c_t is a time-varying intercept, $B_{i,t}$ are time-varying coefficient matrices, A_t is a lower triangular matrix capturing contemporaneous relationships, Σ_t is a diagonal matrix of stochastic volatilities, and $\varepsilon_t \sim N(0,I)$. The time-varying parameters follow random walk processes:

$$\beta_t = \beta_{t-1} + \nu_t, \text{ where } \nu_t \sim N(0, Q)$$

$$a_t = a_{t-1} + \zeta_t, \text{ where } \zeta_t \sim N(0, S)$$

$$\log \sigma_{i,t} = \log \sigma_{i,t-1} + \eta_{i,t}, \text{ where } \eta_{i,t} \sim N(0, W_i)$$

This specification permits the coefficients of the VAR (β), contemporaneous relations (a), and the volatilities (σ) to change slowly through time so as to reflect structural change in the economy without the establishment of discrete breaks.

Bayesian estimation was performed by using the Markov Chain Monte Carlo (MCMC) simulation, i.e., the Gibbs sampler algorithm, to estimate the model. We performed several MCMC iterations, and the first draws were discarded as burn-in, whereas the rest of the draws were preserved at intervals with the aim of decreasing autocorrelation in the chain.

3.2 Variable Selection and Data Sources

Four endogenous variables of our VAR system refer to various pass-through process stages: (1) Nominal Effective Exchange rate (NEER): Trade weighted, exchange rate index, calculated by using major trading partners of Nepal (India, China, US, EU, UAE, Saudi Arabia), with amounts of bilateral trade shares as weighted in the index. Growth of NEER presupposes NPR depreciation. (2) Import Price Index (IMP): This was calculated based on unit value indices on major categories of imports, such as petroleum products, machinery, chemicals, and consumer goods, based on the trade statistics of the Nepal Rastra Bank. (3) Producer Price Index (PPI): Manufacturing producer prices in the major industrial areas were obtained through the Central Bureau of Statistics of Nepal. (4) Consumer Price Index (CPI): Headline inflation rate both in urban and rural regions, which was sourced from Nepal Rastra Bank and CBS.

The VAR ordering is the standard pass-through chain, in which exchange rate shocks have an initial impact on the price of imports, which then pass on to producer prices and eventually to consumer prices. All the variables are in natural logarithms and are differentiated to ascertain stationarity. The years included in the sample are between January 2000 and October 2023, and the total amount of monthly observations is close to three hundred. We chose lag length using the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC), although our results are stronger than other lag specifications.

This study also introduced a number of exogenous control variables to capture external effects: (1) the CPI inflation rate of India, which reflects the monetary spillovers via the trade mechanism, (2) the Global oil price (Brent crude), which is a reflection of the energy cost shock, (3) the US Federal Funds rate, which represents the world monetary policy position and (4) the policy interest rate of Nepal (repo rate), which is a measure of domestic monetary policy position.

3.3 Identification Strategy

Structural shocks in the TVP-VAR were identified using a recursive (Cholesky) decomposition, and the ordering indicates the perceived timing of the responses to the variables. The exchange rates were the first to be ordered because they are the first to react to the shocks and policy announcements of the globe. The price of imports is a contemporaneous and lagging response to exchange rates. The producer prices are lagging behind all variables because the manufacturing adjustment is slow. The consumer prices come last, as they display slow flow through the production chain and distribution networks.

This identification mechanism is in line with price-setting literature that focuses on sticky prices and slow adjustments at the downstream levels of the production process. We checked robustness by sensitivity analysis against other orderings and discovered qualitatively similar results, but the size of short-run responses was different, as it should be.

4. Results and Discussion

4.1 Baseline ERPT Estimates

Table 1 indicates the estimation of baseline TVP-VAR results during the entire sample period (2000-2023). The mean exchange rate pass-through coefficient to the consumer prices shows that exchange rate depreciation results in moderate consumer price increments, the full impact of which takes place in a period of about one year. This estimate falls within the scope of estimates made in other South Asian economies and is in line with the dependency of imports (imports will form about one-third of GDP) in Nepal.

Table 1: *Average Exchange Rate Pass-Through Coefficients (2000-2023)*

Pass-Through Stage	Coefficient	Std. Error	68% CI	Horizon (months)
NEER → Import Prices	0.62	0.08	[0.54, 0.70]	3
Import → Producer Prices	0.48	0.06	[0.42, 0.54]	6
Producer → Consumer Prices	0.55	0.05	[0.50, 0.60]	9
NEER → Consumer Prices (Total)	0.34	0.04	[0.30, 0.38]	12

Note: *Coefficients denote cumulative pass-through at given horizons. CI refers to the Bayesian estimation of a credible interval. All the coefficients are found to be statistically significant at customary levels.*

The pass-through chain tells you significant things concerning the mechanism of transmission. Pass-through of exchange rates to import prices at the first stage is high and incomplete as would be expected by a combination of both PCP and LCP behavior of pricing between partners in Nepal trade. The comparatively large coefficient indicates that foreign exporters cannot completely use exchange rate changes via the profit margins, but particularly transfer a substantial share to Nepalese importers. The observation is contrary to what is recorded on the lower first-stage pass-through in large economies that have large pricing power.

Pass-through, import to producer price at the second stage indicates high consumption of imported inputs in the manufacturing industry of Nepal. Quite a large percentage of the inputs in manufacturing are imported, and this has direct cost correlations between the prices of imports and the cost of production within the country. The coefficient shows that there is some cost shock absorption in terms of productivity adjustments and compression of profits. Pass-through of producer to consumer prices at the third stage is quite complete, which implies that the power of the final goods retailers on the markets is not great, and the competitive pressure on the consumer markets is strong.

4.2 Time Variation in Exchange Rate Pass-Through

Table 2 illustrates how the ERPT coefficients have changed through the sample period, and it can be seen that the time difference is significant. Three different sub-periods have significantly different pass-through characteristics:

Table 2: *Time-Varying ERPT to Consumer Prices by Period*

Period	Average ERPT	Std. Dev	Key Characteristics
2000-2003	0.52	0.09	High inflation volatility; weak monetary policy framework
2003-2015	0.38	0.06	Post-monetary policy reform; stable inflation expectations
2015-2019	0.28	0.04	Low global inflation; enhanced GVC integration
2020-2023	0.41	0.11	COVID-19 pandemic; supply chain disruptions; high uncertainty

Note: *Measured at 12-month horizon- ERPT coefficients. Std. Dev is within the period standard deviation of time-varying coefficients*.

The most significant pass-through coefficients were found during the early period (2000-2003) and were associated with rather low credibility levels of the monetary policy and high inflation expectations. The formal monetary policy framework was introduced in Nepal not before 2003, and before that, the policy behavior was not conducted transparently and systematically, which was aimed at inflation targeting. Such a situation was facilitated by the low levels of monetary credibility and high levels of inflation persistence, which resulted in the rapid pass-through of exchange rate shocks to consumer prices.

There was a significant drop in ERPT in 2003 and beyond, and the coefficient decreased significantly in 2003-2015. That was accompanied by a number of organization-wide enhancements: the monetary policy became formally adopted in 2003, Nepal Rastra Bank operations became more transparent, and the inflation rate remained relatively steady over an extended period of time. Those advancements enhanced the validity of monetary policy, anchoring expectations of inflation and minimizing the extent to which shocks in the exchange rates were relayed to domestic prices. The result gives strong support to the hypothesis put forward by Choudhri & Hakura (2006) and Taylor (2000) that when there is a low and stable inflation rate, then the pass-through is lower.

The minimum pass-through coefficients occurred in 2015-2019 when the world experienced benign inflation, steady prices of oil, and more high-rise in global value chains. The backward GVC involvement (consumption of the foreign intermediate inputs) of Nepal grew significantly within this period in accordance with the trend reported by Jangam et al. (2025). Increased GVC integration decreases the elasticity of the exchange rates in exports because cost forms become more intricate and firms form long-term relationships that facilitate price changes.

Nevertheless, the rise in pass-through became significant in 2020-2023, which was fueled by pandemic-related upheaval and stress in the supply chain as well as uncertainty. This revival is consistent with the overall international data compiled by Carriere-Swallow et al. (2023) and Ben Cheikh et al. (2023), who discovered that pass-through increases significantly in times of high uncertainty. In the case of Nepal, supply shocks caused by the pandemic, political turmoil, and the active tightening of monetary policy by the US provided more favorable conditions for the increased pass-through. The observation indicates that ERPT rises during crisis regimes in even those countries that have generally credible monetary systems.

4.3 Asymmetric Pass-Through: Depreciation vs Appreciation

Table 3 provides the estimates of asymmetric pass-through, which isolates the consumer price response to both the depreciation and appreciation of the exchange rates. The

findings indicate high levels of asymmetry with pass-through coefficients of depreciation being more than those of appreciation.

Table 3: *Asymmetric Exchange Rate Pass-Through*

Exchange Rate Movement	ERPT to CPI (3m)	ERPT to CPI (6m)	ERPT to CPI (12m)	No. Episodes
Depreciation (>2%)	0.28	0.38	0.45	42
Appreciation (>2%)	0.09	0.14	0.19	38
Asymmetry Ratio	3.11	2.71	2.37	-

Note: *Asymmetry ratio = depreciation ERPT/appreciation ERPT. Episodes are characterized by cumulative exchange rate movements of more than 2% marker within 3-month windows*

This asymmetry is most significant in the short run (three months) of depreciation pass-through, which is over three times that of appreciation. This ratio increased a little further as the horizon was longer, but it was still economically notable with a depreciation effect that is more than twice that of the appreciation effect, even at the twelve-month horizon. Such results are not unique to the phenomenon known as rockets and feathers observed in other emerging markets (Delatte & Lopez-Villavicencio, 2012), where the prices increase fast when the currency is depreciated, and slow down or not at all when appreciating.

This asymmetry can be attributed to a number of mechanisms. First, there are downward nominal price rigidities that prevent the firms from being able to lower prices as a result of lower costs, because the adjustments to the menu costs would trigger a message of weakness among competitors. Second, companies might not be keen on reducing prices when the exchange rate is on an upward trend because they are uncertain on the sustainability of the exchange rate movement, but instead they may choose to increase profit margins in the short run. Third, market power implications enable the firms to take advantage of the growing costs to raise the markup, and the competitive forces do not permit a similar increase in the markups when the costs are going down.

The implications of the policy are big. When explained in the asymmetric pass-through, it means that when monetary authorities are in depreciation episodes, the trade-off becomes particularly difficult, given that inflationary pressure accumulates quickly, and it might be hard to undo it by means of future appreciation. This asymmetry exaggerates the significance of the exchange rate stability and advocates the preemptive policy intervention against the occurrence of major incidents of devaluation.

4.4 The Role of India-Nepal Trade Integration

Since India is the leading economy in the Nepal trade, we performed further analysis to isolate the contribution of the dynamics of INR to NPR as compared to movements in other bilateral exchange rates. Table 4 isolates the total ERPT into the contribution of the INR piece and non-INR pieces (mainly USD, EUR and CNY).

Table 4: *Decomposition of ERPT by Currency*

Exchange Rate Component	Share of Trade	ERPT Contribution	Effective Pass-Through
INR (India)	0.63	0.18	0.29
USD (United States)	0.12	0.08	0.67
EUR (Eurozone)	0.08	0.04	0.50

CNY (China)	0.09	0.03	0.33
Others	0.08	0.01	0.13
Total	**1.00**	**0.34**	-

Note: *ERPT contribution = share of trade x effective pass-through. Effective pass is a measure of the transmission of the bilateral exchange rate to domestic prices*

Interestingly, though India has an excessive share in terms of trade, its contribution in terms of ERPT is not high. The effective pass-through of the INR movements is, in fact, negative to the sample average, which is indicative of the fixed peg system since 1993. USD movements, on the other hand, enjoy a significantly greater effective pass-through even at a reduced trade share. This trend indicates a number of significant dynamics.

To begin with, it is also true that the fixed peg with INR has helped to cushion Nepal against fluctuations in the exchange rate in bilateral trade between Nepal and India, its main partner. The fact that the rate of the INR-NPR is stable implies that Indian inflation is more directly transmitted by means of the trade prices, but not by the exchange rate adjustments. Second, the increased pass-through of USD is based on the high values of imports of Nepal in petroleum products, machinery, and intermediate goods in dollar prices on the international markets. The commodities are sensitive to changes in the exchange rates. Third, China is increasingly playing a significant role in the trade of Nepal, which is being manifested in moderate pass-through of CNY movements, however, below USD levels.

The decomposition has significant implications for the monetary policy. Although the INR peg can offer a lot of stability, taking into consideration that India is the main trading partner, Nepal is still vulnerable to other pass-throughs of other currencies, especially the USD. This is a heightened exposure that has increased with the appreciation of the dollar in the recent tightening cycle by the US Federal Reserve, as part of the inflationary pressures despite the stable INR peg.

4.5 Impulse Response Analysis

In Table 5 for presentation, the impulse response functions to one standard-deviation shock to the nominal effective exchange rate follow the dynamic behavior of import price, producer price and consumer price responses.

Table 5: *Cumulative Impulse Responses to Exchange Rate Shock (% change)*

Variable	1 Month	3 Months	6 Months	12 Months	24 Months
NEER (shock)	1.00	1.00	1.00	1.00	1.00
Import Prices	0.38	0.56	0.62	0.63	0.64
Producer Prices	0.12	0.24	0.36	0.48	0.51
Consumer Prices	0.04	0.11	0.22	0.34	0.39

Note: *Responses are expressed in terms of cumulative change in percentage of each variable after a one standard deviation (approximately 1) shock to NEER. All the responses are statistically significant using 68% credible intervals*

The pass-through process is sequential, as is confirmed by the impulse responses. The response of import prices was the quickest, and more than half of the ultimate response was within three months. This prompt reaction indicates the relatively pliable character of import pricing and the immediate cost effect of an exchange rate development on imported products. Producer prices responded more slowly, and their maximum response took about a year. The reduced speed of transmission to producer prices was an indication of the longer contract

periods, the planning cycles of production, and the time taken by the input cost changes to flow through multi-stage production processes.

The slowest adjustment was on consumer prices, and the response took time to build up during the first year and on a slight upward increment past the twelfth month. The slow responsiveness of retailers is indicative of a number of factors, namely: the unwillingness of retailers to necessarily pass on to consumers the increase in costs was captured by menu costs and customer relationships, the gradual adjustment of wages and rents which comprise non-tradable items in the CPI basket, and the slowness of the distribution networks to relay the message to final consumers that the producer increased their costs.

The dynamic pattern also provides significant knowledge regarding the durability of the ERPT effects. The fact that the all price indices continued to increase albeit modestly, over the past twelve months indicates that it is not an event that the exchange rate shocks are reversed. The implication of this persistence on monetary policy is that exchange rate fluctuations give rise to persistent rather than episodic problems in controlling inflation.

4.6 Robustness Checks

To test the stability of our key findings, the study included a number of robustness exercises. First, this paper re-estimated the TVP-VAR with other prior specifications of the hyperparameters that define time-varying coefficient evolution. Findings were qualitatively similar in a variety of previous environments, but the approximated extent of time variation also grew with less diffuse priors.

Second, we investigated the sensitivity of results to specifications of two to four lags and discovered that the results were not sensitive to additional lags. Third, this paper approximated the model through sub-sample/s that did not include the COVID-19 period (2020-2023) to confirm that our result was not purely due to the pandemic shock. The decreasing pattern of ERPT between 2003 and 2019 and the asymmetric impacts were still well reflected in the pre-pandemic sample, which proves that the tendencies are not caused by the recent period of the crisis. Nevertheless, the revival of pass-through in 2020-2023 was peculiar to the pandemic era and is an actual change in structure.

Fourth, sensitivity analysis was carried out on this paper considering the measure of the exchange rate, with a comparison made between the findings on NEER and the bilateral USD-NPR rate. The difference in the magnitudes was a bit, but the qualitative trends of time variation and asymmetry were maintained in both specifications. Lastly, we tested robustness to other identification schemes such as alternative orderings of variables in the Cholesky decomposition and sign restrictions on impulse responses. The fundamental results are resistant to these other identification methods.

5. Conclusions and Policy Implications

The paper presents extensive evidence on the dynamics of exchange rate pass-through in Nepal on the basis of a Time-Varying Parameter VAR framework. Three main findings emerge. Firstly, the average is moderate but time varying, with a bigger variation with time as ERPT to consumer prices declines after gains in monetary policy credibility and increases in times of high uncertainty. Second, the pass-through process is highly asymmetrical, with the effects created by depreciation episodes being significantly more substantial as compared to appreciation. Third, the transmission mechanism is carried out in a chain manner, starting with exchange rates into import prices, then producer prices, and finally to consumer prices, with gradual adjustment.

This research has a number of policy implications for the banks of Nepal, which is the Rastra Bank and macroeconomic policymakers. To begin with, the decreasing pattern of ERPT up to 2019 confirms the idea that exchange rates can be effectively reduced by means of

institutional reforms and an increase in monetary policy credibility. Clear policy communication, plausible inflation targeting, and regular policy structures ought to continue to be a priority.

Second, the rebounding of pass-through in 2020-2023 shows that ERPT is state-dependent and rises during times of crisis. This means that the monetary authorities need to be very sensitive to changes in the exchange rates, especially at a time when uncertainty has been high and react to policy in advance. Third, pass-through asymmetry is pronounced, implying that the main policy goal should be to avoid the occurrences of large depreciation episodes since the inflationary effects of depreciation are significantly higher than the disinflationary effects of appreciation. This calls in favor of foreign exchange interventions or revision of the policy that will restrict the downward pressure on the currency downward in the time of stress. Fourth, although the INR peg can offer a lot of stability, taking into consideration that India is the main trading partner, Nepal is still exposed to adverse pass-through by the other currencies, especially the USD. Potential remedies to this vulnerability may be the diversification of the trade relationships and taking into consideration making changes to the exchange rate regime. Fifth, the comparatively long lags of the pass-through process (whole effects take up to twelve months or more to become apparent) indicate that the monetary policy reactions to the exchange rate shocks may be gradual as opposed to sudden. Nevertheless, the persistence of pass-throughs means that any short-term movement in exchange rates may be a source of long-term inflation difficulties that calls on permanent policy responses. Lastly, the average level of total pass-through suggests that Nepal has significant monetary policy freedom even with the fixed INR peg even though it is limited compared to the fully flexible exchange rates.

There are some directions that future research can take based on this analysis. To begin with, company-level or product-level data might give more insight into the microeconomic principles behind pass-through asymmetries and influence of prices power in defining transmission. Second, it would help to extend the analysis to include variables in financial sectors that may shed light on the impact of credit channels and balance sheet effects on strengthening or diminishing exchange rate shocks. Third, comparative analyses involving dynamics of the monetary cooperation between economies of South Asia might be used to pin down region specific aspects and the possible monetary value of further monetary collaboration. Lastly, the research on the application of the pass-through mechanism in case of greater digital payment adoption and financial inclusion is a promising study.

Summing up, the current paper has shown that exchange rate pass-through in Nepal cannot be assumed to be constant and symmetric but instead changes with the quality of the institutions, economic structure, and conditions in the world. The dynamics are imperative in understanding the manner in which the small open economy will conduct its monetary policy and curb inflation in a high level of external vulnerability. The downward movement of ERPT in most of our sample time period offers promising outcomes that sound macroeconomic management can minimise the exchange rate vulnerability, but the recent re-emergence of the same during the pandemic shows that there are still obstacles in front of us in the name of external shocks.

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