Does economic policy uncertainty dampen imports? Commodity-level evidence from India

Sharma, Chandan; Paramati, Sudharshan Reddy

Published in:
Economic Modelling

DOI:
10.1016/j.econmod.2020.09.019

Publication date:
2021

Does economic policy uncertainty dampen imports? Commodity-level evidence from India

Chandan Sharma[*] and **Sudharshan Reddy Paramati**[**]

Abstract

This study investigates the effects of economic policy and financial market uncertainties on Indian imports. For this purpose, we consider a panel of 97 commodities imported to India during the period: September 2011 to January 2019. We utilize two panel estimation techniques, the Pooled Mean Group (PMG) and Cross-sectionally Augmented Distributed Lag (CS-DL), for the analyses. In the short-run, we find that economic uncertainty leads to more imports to India. Conversely, in the long-run, it has a dampening effect. Our estimates also reveal that both domestic and global economic uncertainties have a considerable impact on Indian imports. However, we do not find any noticeable impact of financial market uncertainty on the imports. For robustness purposes, we also make use of aggregated import data for a longer time-horizon. These results fairly validate the findings of the commodity-level analysis. Finally, our sectoral-analysis suggests that the imports of primary products are more sensitive to the policy uncertainty than those of the manufacturing products. Given that, our study offers detailed policy suggestions in the context of an emerging economy.

JEL Classification: F13; F14; O21; O24

Keywords: Economic policy uncertainty; imports; heterogeneous dynamic panels; India

Acknowledgement:

We sincerely thank Prof Angus C. Chu, Co-Editor of this journal and two anonymous reviewers for their constructive and very useful feedback on previous versions of this paper.

[*] Indian Institute of Management Lucknow, India; csharma@iiml.ac.in;

[**] School of Business, University of Dundee, Dundee, UK; s.paramati@dundee.ac.uk; Corresponding author.

1. Introduction

Frequent and sudden economic policy changes are considered to be one of the main hurdles for business operations in developing economies. Despite having some crucial economic and business implications of policy uncertainty, it is quite challenging to measure it precisely. Lately, Baker et al. (2016) have developed an index of economic policy uncertainty (EPU), which is suitable and convenient to quantify its impact on the indicators of the economy. This research is part of a developing literature on the real effects of policy uncertainty on economic indicators. In this study, we specifically focus on the effects of policy uncertainty on commodity – level imports to an emerging country, i.e., India.

The background work of measuring the impact of economic policy uncertainty on the economy was initiated almost four decades ago by Marcus (1981), which attempts to analyze the effects on policy uncertainty on technological innovation. Bernanke (1983) tries to show the impact on investment through a theoretical model. Aizenman and Marion (1991) and Rodrik (1991) further extended the discussion and evidence. A series of recent empirical research attempted to examine the effects of economic policy uncertainty on investment, tourism, oil price and financial markets (e.g., Kang, et al., 2014; Antonakakis et al., 2014; Aloui et al., 2016; Gozgor and Ongan, 2017; Jens, 2017; Sharma, 2020).

To the best of our knowledge, there is very limited empirical literature that has examined the nexus between economic uncertainty and trade. For instance, the model of Novy and Taylor (2014) shows the effects of a direct channel of policy uncertainty on imports. In an open economy setting, firms have option to procure either domestic or foreign intermediate inputs. If a situation of relatively high level of economic uncertainty prevails, then firms are likely to reduce their dependence on foreign inputs and use more domestic ones since inventory costs are higher for imported inputs, leading to imports contraction. However, the argument may not be valid in all cases. In some situations, the uncertainty may dampen inputs market and domestic investment, which could lead to more reliance on imports. Thus, uncertainty situations can boost imports. While focusing on trade policy uncertainty, Handley and Limão (2015) show that the uncertainty severely affects firms exporting behavior. A range of studies has also shown that policy uncertainty seriously affects investment, income and makes exchange rate and inflation volatile, which may affect firms' and consumers' demand for the imported items.

Against this backdrop, in this paper, we examine the effects of economic policy uncertainty on Indian imports. We use a panel of 97 commodities that were imported during the period from September 2011 to January 2019 in the analyses. To test the robustness of the results, we also examine the effects using aggregated import data at a quarterly frequency. The use of aggregated data allows us to cover a longer time-horizon. We contribute to the existing literature in a variety of ways. First, we choose to examine the effect on imports. Notably, the imported inputs have become the primary source of growth for exports in developing economies like India in recent years. The results of Hummels et al. (2001) demonstrate that the vertical integration of imported inputs constitutes almost 21 per cent of exports of the emerging world. Results of Anós-Casero and Astarloa (2010) show that the value addition of imported products was around 14.5 percent in overall exports of Argentina in the year 1997. In a similar line, Turco and Maggioni (2013) for Italian industries, and Aristei et al. (2013) for European economies, establish a vital reliance on imported inputs for their exports. Among other researchers, Sharma (2014) has shown the highest level of dependency for export and total factor productivity (TFP) growth on imported inputs in the context of India.

Second, for analysis, we mainly opt to use commodity level data than the aggregated import data because this approach provides more precise information through heterogeneity in imported data regarding the linkage of import flows with policy uncertainty. Third, we employ

Autoregressive Distributed Lag (ARDL) cointegration based method in the panel context. This helps in findings the long-run as well as short-run effects. This is important because it can be argued that the uncertainty may not have long-run consequences as it may settle down in the long run. However, some other authors do not support this viewpoint and believe that uncertainty has both short and long-run consequences (e.g., see Fang et al., 2018, Sharma, 2020).

Furthermore, the issue of error cross-section dependence is overlooked in these models. The assumption related to errors that they are independently distributed may lead to wrong and inconsistent inference estimates if the data is suffering from error cross-section dependence. Therefore, we also employ the CS-DL (asymptotic distribution of the cross-sectionally augmented distributed lag) approach of the mean group. This approach relies on pooling cross-section with dependency and large time-series data under the coefficient of heterogeneity. Fourth, several previous studies have used annual data in their analyses, while the EPU index is developed to display the short-time horizon uncertainty more suitably. A long-horizon analysis using lesser frequency data, such as annual, might not capture the effect as the short-run deviations are often settled down in the low-frequency data. Therefore, we use monthly commodity-level data for examining the effects, which is likely to provide some better insights. Given these arguments, our paper is expected to make a significant contribution to the literature and offers valuable policy insights for emerging economies like that of India. Finally, imports can be potentially affected by both domestic and global shocks. Unlike previous studies, we use a range of uncertainty indicators both at the domestic and global level to test their effects on Indian imports. Recently some studies, e.g., Ludvigson et al. (2019), have shown that market uncertainty can have severe implications for output and trade. With this viewpoint, we also examine the market uncertainty impact on imports.

The rest of this paper is organized as follows: the next section offers a brief review of the existing literature. In section 3, we discuss import and policy issues and offer some stylized facts in the context of India. Section 4 reports the nature of data and measurements. Section 5 outlays the econometric specification and its relevant discussion. In Section 6, we present results and their related discussion. The final section concludes with plausible policy implications.

2. Literature review

As discussed in the introduction section, recently there have been several empirical studies which explored the effects of economic uncertainty on real economic activities (see, e.g., Kang et al., 2014, 2017; Pástor and Veronesi, 2012, 2013; Tam, 2018; Sharma, 2020; Xu, 2020). However, not many researchers have tested their effects on international trade. There are some studies, which focused on how the shocks in economic policy uncertainty affect exchange rate fluctuations (Krol, 2014) and some others have demonstrated how exchange rate uncertainty affects international trade (Asteriou et al., 2016; Sharma and Pal, 2018). Since international trade depends on movements of exchange rate, and uncertainty shocks on exchange rates can be channelized and transmitted into the trade volume. In this section, we present discussions on the effect of economic policy uncertainty on imports or trade.

We begin reviewing the related studies that have primarily focussed on international trade. For instance, Novy and Taylor (2014) have extended the idea of economic uncertainty in the context of an open economy. Authors built a theoretical modelling approach, in which they argue that the firms import intermediary goods from domestic and or foreign suppliers. The intuition behind this argument is that the recent literature on international trade demonstrates that the intermediate capital intensive products become a major integral part of international trade. The model of Novy and Taylor shows the effects of the direct channel of uncertainty on imports. It is shown in the study that firms can opt to use/ either domestic or foreign intermediate inputs. It is also demonstrated empirically, by the authors, that in the presence of higher economic uncertainty in the country, the firms are expected to reduce their dependence on imported items. This is done by utilizing more domestically produced inputs because, in such situations, inventory holding costs are likely to be more for imported materials. This behaviour may ultimately lead to a reduction in imports.

While focusing on uncertainty, Handley and Limão (2015) showed that uncertainty severely affects firms exporting behavior. The findings of Tam (2018) indicate that the economic uncertainty in the U.S. has a significant impact on global trade. It is because the U.S. has a considerable direct and indirect trade linkage with major economies around the world. There are also some empirical attempts, which aimed to explore the effect of policy uncertainty on international trade, prices and income (real), via firm's entry investments in a general equilibrium setting. For instance, Handley and Limão, (2017) show that a decrease in policy uncertainty drops U.S. inflation and augment its consumers' income substantially. In related literature, several researchers (such as Adler and Stevens, 1974; Lin, 1995) documented that investment is strongly and positively associated with exports and imports. More specifically, these scholars, among others, argued that a reduction in investment leads to a decline in exports and imports. Therefore, uncertainty negatively affects exports via investment channels. In a recent study, Albulescu et al. (2019) showed that economic uncertainty transmits risk through oil price and currency market, which in turn affects the financial market and investment.

Overall, the above literature indicates that economic policy uncertainty has a significant impact on economic activities in general and international trade in particular. However, we noted that the previous studies mostly focused on cross-country context and used low-frequency data series, i.e., annual and quarterly and also aggregate data. Therefore, in this study, we aim to fill these vital research gaps in the literature. Specifically, we use commodity-level monthly data of imports into India and employ robust panel econometric techniques. Moreover, for a robustness test, we also examine the effect on aggregated data using quarterly frequency. Hence, the findings of this study will offer important policy and practical implications for a major emerging economy like that of India.

3. Imports and policy uncertainty in India

The import policy of India was suffering from quantitative restraints as well as a high level of import tariff structure before 1991. The import tariff structure was characterized by an extreme-level of tariff and quota on final goods. However, intermediate and primary imports were relatively less taxed. This type of inward-looking and import substitution policy was a major impediment for the growth of the industrial sector in the country. A range of drastic economic reforms and liberalization were introduced in 1991 with prominence on the external sector. The new trade policy inverted the previous policy directions. The tariff protection was severely reduced, relaxed, and simplified the restrictive import licensing regime. The requirement of licensing for importing was a major hurdle, which was almost brought to an end for importing of most machinery, equipment, and manufacturing intermediate products. The government had also initiated the process of industrial reforms that included loosen control over locational restrictions of plants and mandatory industrial licensing. The price control in several sectors was making the Indian market less attractive to private and foreign firms.

Furthermore, as part of the reforms' process, restrictions were eased on administrative prices as well. The policy reforms also aimed to liberalize raw materials and the capital goods market, which finally open the way for industrial growth. The industrial growth eventually paved the way for import dependency and export-led growth. Yet, imports of consumer goods, to some extent, remained to be regulated.

Importantly, however, the Indian trade policy is not robust over time. For instance, import weighted means tariffs increased from 24.6 per cent in 1996-97 to 30 per cent in 1999-2000. The main purpose of altering tariff rates was to reduce the trade deficit. Furthermore, agricultural product importing is severally blocked by keeping the tariff unreasonably high, which has significantly reduced the possibility of imports of the related items. **Table 1** presents the growth of the value of imports in recent years. Imports of ores & minerals chemicals & related products, textiles (excluding readymade garments) and other manufactured goods only show double-digit growth in the illustration period. Importantly, the import performance of engineering and electronic goods have been abysmal, which is a worrying factor for the policymakers as in these areas the Indian industries have been heavily relied on imports. One of the crucial reasons for the inconsistent performance of Indian imports is policy uncertainty and unclear objectives of the policies.

[Insert Table 1 here]

On the other side, economic policy uncertainty stemming from fiscal policy, trade policy, monetary and credit policy, tax policy and foreign capital regulation policy is generally high. It is considered that policy uncertainty is the prime impediment in investment, trade, and growth. Some studies have found that a 10% increase in EPU leads to a 3% drop in investment in the country (Bhagat et al., 2013). **Figure 1** illustrates the policy uncertainty and movement of imports in India. The plot clearly shows that overall uncertainty has come down from a peak of 290 score to in a range of 100 to 150 after 2013. It perhaps indicates the stable government, which was formed in 2014, is the prime reason for such a movement. However, within the range, it is fluctuating to some extent and that may have some serious implications for the economic indicators. For instance, the Eurozone debt crisis in 2012 and serious corruption charges against the union government of India had brought the uncertainty back to its peak level. More recently, economic reform attempts and demonetization of high-value currency also made the uncertainty at a relatively higher level. Looking at the co-movement of imports and EPU, they are correlated (R^2=0.3), yet not very strongly. The next sections will unveil the relationship between the two by regressions analyses using a set of robust panel econometric techniques.

[Insert Figure 1 here]

4. Data

This research utilizes unit-level monthly frequency data of 97 merchandized items imported to India. Almost all merchandized sectors' imported commodities data are used in our analysis. This includes agriculture, ores, minerals, petroleum, crude, chemicals, textiles, engineering goods, leather and several other types of raw, processed and manufacturing goods. We retrieve monthly data series on quantity and unit price of these items (mp) from 'Economic Outlook' database that is made available by the Centre for Monitoring Indian Economy (CMIE), India. The database provides monthly, quarterly and annual frequency data, we opt to use monthly data because it suits our purpose. The period of data is from September 2011 through January 2019. The selection of the sample period is based on data availability. The list of selected commodities is presented in **Appendix-I**.

In the standard related literature, income of the destination country is considered as one of the key variables that theoretically determine the import demand. Our empirical analysis utilizes monthly frequency data, whereas GDP data is not available at this frequency. Nevertheless, the Index of Industrial Production (IIP), which is highly correlated with GDP series in India, is available to use at a monthly level. Therefore, the income or output of India is proxied by the IIP series. The data on IIP is taken from the International Financial Statistics (IFS) of the International Monetary Fund (IMF) database.

One crucial question often raised in the empirical literature is whether to use nominal or real exchange rate, while investigating its impact on trade. We choose to use real effective exchange rate (REER) for an important reason. For instance, REER series takes into account of effects of the nominal exchange rate, in addition to the relative prices of destination country against the major trading partner countries (see Arize et al., 2017, and Sharma and Pal, 2018).

For measuring economic policy uncertainty (EPU), we utilize news-based EPU indices developed by Baker et al. (2016). Specifically, we use three EPU indices: EPU index of India (EPU_India): The Indian index includes information from seven leading newspapers of the country. The news articles in each newspaper are selected based on the keywords related to uncertainty, economy and policy, such as fiscal policy, monetary policy, regulation and others. This information is used for constructing the EPU index for India[1]. We specifically use the EPU index of India from September 2011 to January 2019. The selection of this time-horizon is mainly based on the availability of import data series. To understand the effect of global uncertainty on Indian imports, we also use EPU indices of the U.S. and Global. Both the U.S. and Global indices were constructed on a similar line. It uses information from 10 large newspapers of the U.S., while Global EPU is a GDP-weighted average of 21 major economies of the world.

Some studies, e.g., Rey (2015) has shown exchange rate market uncertainty, which is measured through the Volatility Index (VIX), has a significant effect on capital flows. Motivated by Rey’s finding, we attempt to know the impact of exchange rate market uncertainty on the Indian imports. Therefore, we also make use of VIX of the U.S. developed by the Chicago Board Options Exchange (CBOE). The VIX is a real-time market index that measures market risk and investors' sentiments. Further, the U.S. market is the largest financial

[1] Details of methodology of construction of EPU index can see at https://www.policyuncertainty.com/india_monthly.html

market in the world, so the VIX helps to capture that aspect in the analysis as well. The descriptive statistics on the selected variables are displayed in **Appendix-II**.

5. The model and econometric issues

5.1. The model

Conventional theoretical models of import demand equations (e.g., Emran and Shilpi, 1996) consider variables such as price of imported commodities, destination country's income or output, which is usually proxied with GDP, price level at source country and the destination country and rate of foreign exchange between source and destination country. Since India's contribution to the world's total imports is not very large; so it may be realistic to assume that imports to India are somewhat elastic. Thus, to form an import demand function for Indian imported commodities, we can implement an imperfect substitute model. The postulation of infinite import supply elasticity can be turned into a single equation version of import demand model. With these perspectives, we may be required to include the relative price of competing products in the import model. Hence, the basic model of import demand is as follow:

$$lmq_{it} = \beta_{0i} + \beta_{1i} lEPU_{it} + \beta_{2i} lreer_t + \beta_{3i} lmp_{it} + \beta_{4i} liip_{it} + u_{it} \quad (1)$$

where mq, iip, and mp are quantity of imported commodity (i) to India in month (t), income or output of India, and unit price of commodity (i), respectively. Likewise, $reer$ is the real effective exchange rate. Our focus coefficient is β_1 as this will help us to understand the impact of EPU on imports. As discussed previously, we use three EPUs in alternative models: EPU of India (EPU_India), EPU of U.S. (EPU_US) and global EPU (EPU_Global). Alternatively, we also include VIX in the model to examine its' impact on Indian imports. Given the existing theories, a higher (lower) domestic and global economic policy uncertainties may reduce (raise) imports into India, thus, β_1 is expected to be negative. Further, we expect a positive sign of β_2

as a real appreciation of the exchange rate of domestic currency against foreign currencies will make imports less expensive.[2] The price coefficient is, as usual, expected to be negative. Finally, we expect a positive sign of β_4 as increase in income or output of the destination country leads to higher imports.

5.2. Econometric methods and specification

For estimation purpose, we use Autoregressive distributed lag (ARDL) $(p, q_1, \dots, q_k)$ model of Pesaran et al. (1999) in the panel context. Equation 1 in a dynamic panel form can be specified as:

$$lmq_{it} = \sum_{j=1}^{p} \lambda_{ij} lmq_{i,t-j} + \sum_{j=0}^{q} \delta'_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

where $i = 1, 2, \dots, N$ signifies number of cross-sections of imported commodities, $t = 1,2, \dots, t$ presents months. Lags of parameter of the dependent variable is λ_{ij} are scalars; X_{it} is $k \times 1$ vector of the determinants variables for the i^{th} commodity, δ_{ij} denotes $k \times 1$ parameters vectors; μ_i covers the panel fixed effect. The time horizon (t) should be large enough to fit each group of commodities (i) independently.

The reparametrized *Eq.* (2) in the error correction form is as follows,

$$\Delta lmq_{it} = \Phi_i lmq_{i,t-1} + \beta'_i X_{i,t} + \sum_{j=1}^{p-1} \lambda^*_{ij} \ \Delta lmq_{i,t-1} + \sum_{j=0}^{q-1} \delta^{*\prime}_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

where $\Phi_i = -\left(1 - \sum_{j=1}^{p} \lambda_{ij}\right)$, $\beta_i = \sum_{j=0}^{q} \delta_{ij}$,

$\lambda^*_{ij} = -\sum_{m=j+1}^{p} \lambda_{im}$, $j = 1,2, \dots, p-1$, and

[2] REER index is computed in such a way that an increase in its value signifies appreciation of the Indian rupee. If we assume that the Indian rupee was fairly valued in the base year when its value is 100. If the REER is more than 100 indicates that the rupee is overvalued, thus, likely to promote Indian imports.

$$\delta_{ij}^{*} = -\sum_{m=j+1}^{q} \delta_{im} \text{ , } j = 1,2, \dots , q-1$$

Since, in our case, number of cross-sections and time-horizons are large, a range of estimation methods can be implemented for analysis of dynamic heterogeneous panel such as *Eqs.* (3) . We begin by applying pooled mean group (PMG) estimator suggested by Pesaran et al. (1999). This is somewhat a mixed approach that keeps a balance between dynamic fixed-effect (DFE) and mean group (MG) estimators. The PMG estimator considers long-run coefficients are homogeneous. This assumption allows error variances and short-run parameters to oscillate across panel groups.

CS-DL Approach: the PMG approach makes use of lags of the dependent variable and available heterogeneity of short-run dynamics; however, the issue of error cross-section dependence is overlooked in this method. The assumption related to errors that they are independently distributed leads to wrong and inconsistent inference estimates if the data is suffering from an error cross-section dependence.

We use the estimation technique that is developed specifically for nonstationary panel time series. The literature (see, Moscone and Tosetti, 2010; Eberhardt and Teal, 2011) shows that variables used in the panel data models dominated by time-series effects are often characterized by nonstationarity, cross-section dependence as well as parameter heterogeneity. These issues should be taken care of while estimating for consistency of parameters.

Recently, Chudik et al. (2015) proposed the CS-DL (cross-sectionally augmented distributed lag) approach of the mean group. This approach relies on pooling cross-section with dependency and large time-series data under the coefficient of heterogeneity. The technique appropriately augments the individual regressions by using average of the cross-sections for dealing with the effects of the common factors across the panel individuals. The key benefit of the use of CS-DL technique is that its' performance for a small sample is excellent. For a small sample, the CS-DL performance is seen to be far superior to other techniques in most of the cases. Additionally, the application of the CS-DL approach for long-run coefficients' estimates also substantially improve the estimates of short-run coefficients, especially when time observations (T) of the series is reasonably large. It is noteworthy that in the CS-DL approach, the short-run coefficients are not required to be estimated separately (Chudik et al., 2016).

6. Empirical results

6.1. Analysis of commodity-level panel data

Before we run the regression analysis, it is important to identify the order of integration of the variables. For this purpose, we employ a panel unit root (Levin, Lin and Chu, 2002) test, which works under the assumption of 'common unit root processes'. The null hypothesis of unit root is tested against the alternative hypothesis of no unit root. The results from the panel unit root test, see **Table 2**, establish that the selected variables follow a random walk behaviour. These evidences, therefore, confirm that the considered variables are non-stationary in their levels and stationary in their first-order differences. Given these findings, we move on to the next step to investigate the long-run equilibrium relationship among the variables of the study. Over time, a number of panel cointegration testing procedures have been developed. For instance, techniques developed by Kao (1999), Pedroni (1999, 2004), Maddala and Wu (1999) and Westerlund (2007) are widely utilized in the empirical literature. For our investigation purpose, we use the approaches developed by Kao (1999), Pedroni (1999, 2004), and Westerlund (2007).

[Insert Table 2 here]

The results of cointegration tests are presented in **Table 3**. Kao's (1999) test is very similar to Pedroni's approach; however, it takes into consideration of intercepts of cross-sections as well as homogenous coefficients on the first step regression. The test requires slope coefficients to be homogenous and intercept should be heterogeneous across cross-sections. It also sets all trend coefficients to zero. The null hypothesis for Kao's panel cointegration test is 'no cointegration'. It is important to note that both Pedroni and Kao extend Engel and Granger's (1987) time series cointegration test to the panel context. Likewise, Pedroni's panel cointegration approach uses a number of different statistics and it is developed on the same lines of Engel and Granger (1987) residual cointegration test. Specifically, the underlying argument is that if the residuals of spurious regression, the considered variables are non-stationary in the model, are stationary, then it implies that the variables have a significant cointegration association in the long-run. Given that, the Pedroni's test assumes the null of no cointegration in the heterogeneous panels, meaning that the estimated residuals are non-stationary or integrated with I (1). If Pedroni's test rejects the null hypothesis, then it implies that the estimated residuals are stationary, which establishes a significant long-run cointegration relationship among the variables in the model. Our estimated results of Kao's and Pedroni's cointegration tests confirm the rejection of the null hypothesis across four models. These evidences, therefore, establishes a significant long-run equilibrium relationship among the variables.

We further undertake our cointegration estimation by applying Westerlund (2007) test. This technique has some attractive properties for small-sample. Additionally, it also has high power relative to residual-based panel cointegration tests (Kao and Pedroni). This test is suitable for our purpose because the joint null hypothesis of this test is that all cross-section series in the panel are cointegrated among themselves. This approach utilizes the Lagrange Multiplier (LM) statistics proposed by McCoskey and Kao (1998). The test facilities to incorporate cross-correlation within as well as between units.

Moreover, the test uses a bootstrap method that helps in minimizing the distortions causing by the application of the asymptotic normal distribution in testing. Thus, because of better performance, we opt to adopt this test for the analysis, which should serve as a robustness check for the previous estimates. The Westerlund panel cointegration test results are also reported in Table 3. The estimated results confirm the cointegrating relationship among variables under consideration. Thus, the evidence from all three tests are consistent and establish significant cointegration nexus among the variables.

[Insert Table 3 here]

After establishing significant long-run cointegration relationships among the variables of the import model, we take a further step to investigate the long-run and short-run impacts of economic uncertainty on imports demand. More specifically, we undertake two-panel estimation techniques: PMG and CS-DL.

The estimated results based on panel PMG method are displayed in **Table 4**. The upper panel of the table reveals long-run results, while the lower panel presents the short-run estimates. As discussed, we estimate four models using three EPUs and a volatility index (VIX). Columns 1 to 3 (models 1 to 3) of Table 4 present the results of the model in which different EPUs are included, while column 4 (model 4) reports VIX model. We begin by presenting long-run estimates. The results on our prime focus variables, i.e., uncertainty indices, indicate that economic uncertainty has a negative impact on imports across the models. However, the U.S. EPU and global EPU are only turned out to be statistically significant. The main take away knowledge from these long-run estimates is that the U.S. and global EPUs significantly influence Indian imports. The previous literature (e.g., Tam, 2018) documented that the U.S. economic policy uncertainty has a significant impact on the exports and imports of the Asian and emerging economies. Therefore, our estimates are consistent with the previous findings. Focusing on the results of other indicators, the estimates show that the unit price of commodities (*mp*) has a negative effect on the import demand and the elasticity is found to be around 0.45.

Similarly, the income effect is found to have a sizable positive impact on imports. Specifically, the estimated income elasticity is found to be around two, indicating that a unit increase in income/output in India leads to a two-unit rise in imports. The coefficient of REER is found to be negative across the models; however, statistically significant only when Indian EPU is used in the model. This result perhaps an indication of the 'J curve' phenomenon (see Rose and Yellen, 1989), yet our evidence is not quite robust and precise. Overall, the estimated sign and size of elasticity are within the lines of theoretical expectation.

Now we focus on short-run results. The error correction term is estimated to be negative and statistically significant across the models implying the short-run deviations are corrected speedily and variables are converging in the long-run. In the short run, all three EPUs are found to be positive and statistically significant; however, market uncertainty indicator (VIX) fails to cross the statistical barrier. This is suggesting that economic policy uncertainty leads to import surge in India. It can also be argued that both domestic and global economic uncertainties lead to more imports into India. Also, the price effect is found to be statistically significant and negative, that makes sense. Real exchange rate and income effects are not showing any statistical impact in the short-run and that is not very surprising.[3] Finally, both the long-run and short-run estimates suggest that VIX does not have any significant implications on Indian imports.[4]

[3] We apply the Hausman test to know whether PMG or MG (Mean Group) is more efficient in our case. The calculated Hausman statistic is not statistically significant (p-value is 0.14). Based on that evidence, we can conclude that the PMG estimator is a relatively efficient estimator under the null hypothesis; thus, the PMG estimator is preferred in this paper.

[4] Choi and Shim (2019) document that the policy uncertainty has a significant impact on output in India, whereas its' effect is mostly insignificant in other major emerging economies.

[Insert Table 4 here]

To address the issue of error cross-section dependence as well as to include the panel dynamics in the form of lagged regressand; we now employ the CS-DL model. These results are presented in **Table 5**. All three EPUs are found to have a positive effect on Indian imports. The estimated coefficients of Indian and global EPUs are around 0.02, suggesting that the uncertainty has almost a 2% positive impact on the Indian imports. While the U.S. EPU has a relatively more significant effect (5%) on the Indian imports, indicating India's close tie-up with the U.S. in terms of trade. It seems, these models are mainly capturing the short-run effects of policy uncertainty. This could be because our time-horizon is not too large. Thus, it is evident that the short-run effects dominate the results.

Likewise, the coefficients of price and income are also turned to be statistically significant and showing expected signs. Specifically, the price has a negative while income has a positive effect across the models. However, the impact of the real exchange rate could not be validated by the CS-DL estimator. We could not establish any favourable results of VIX again in this estimation.

[Insert Table 5 here]

To understand the uncertainty effects on different types of commodities, we repeat our analyses for broad categories of commodities. Specifically, we divide our sample commodities into two categories: primary and manufacturing. The long-run and short-run results, based on PMG estimator, on these sectors are displayed in **Table 6**. The long-run estimates show that the price and income continue to have negative and positive impacts on imports, respectively. These coefficients are statistically significant in all the models. It is noticeable that primary products have comparatively higher price elasticity, while the difference in income elasticity is not entirely evident between both types of commodities. Further, the evidence on real exchange rates shows inconsistent and statistically insignificant impact on imports. The results on Indian EPU show a positive and negative impact on primary and manufacturing imports but could not cross the statistical barrier. Nevertheless, the U.S. as well as global EPUs have a negative and statistically significant in both the sectors. It is also noticeable that the primary products are comparatively more sensitive to the international uncertainty. This is a crucial finding of our study. Similar to previous results, the role of VIX is negligible for both the sectors.

We now focus on the short-run results of both the sectors. The error-correction terms are negative and statistically significant across the models, implying significant corrections of short-run deviation to converge the long-run equilibrium. In the short-run, the Indian EPU is positive and statistically significant only in the case of manufacturing. At the same time, the U.S. EPU and global EPU are positive and significant only for primary products. Thus, it seems that primary imports are greatly influenced by international policy uncertainty in the short-run, while manufacturing is mainly driven by Indian policy stands. These results are broadly validating our earlier findings.

[Insert Table 6 here]

6.2. Robustness check: analysis of aggregated data

Our analysis in the previous section offers several advantages. However, it has one major limitation i.e., the selected time period is not very long. This limitation may lead to inadequate differentiation between long-and short-run effects. It is noteworthy to mention that the commodity-level data is available for a limited period in the database, which restricted our sample period. To overcome this limitation and to test the robustness of our commodity-level results, we use aggregated data at a quarterly frequency.

Specifically, we use quarterly data from 2004:01 to 2018:04. To estimate equation 1 in a time-series context, we use aggregated import value (*mv*), the import price index of India is used as a proxy of the price of imports (*mpd*). GDP series of India is used as income indicator. As we did in the preceding section, EPUs of India, the U.S. and the global are used in alternative models to investigate the effects of policy uncertainty on imports.[5] Import data comes from 'Economic Outlook' of CMIE, while Indian GDP is sourced from the Handbook of Statistics on the Indian Economy provided by Reserve Bank of India (RBI). The REER is the same series that is used in the previous section. Thus, we estimate the following model:

$$lmv_t = \beta_{0i} + \beta_1 lEPU_t + \beta_{2i} lreer_t + \beta_{3i} lmpd_t + \beta_{4i} lGDP_t + u_t \qquad (5)$$

These variables are as defined earlier and βs are parameters to be estimated.

For estimation of equation 5, we continue to follow ARDL approach but in a time-series context. The estimated results are presented in **Table 7**. The upper panel of the table shows the long-run, while lower panel presents short-run results. Our results on the long-run relationship confirm that both Indian and the U.S. policy matter for the Indian imports, but the global EPU effect could not be established with aggregated data. The income effect is on the expected line and turned out to be positive across the models. The price effect is found to be positive. However, it should not be surprising as dependent variable is value of imports at current price, while price variable is import price index. In short-run, lags are selected as per Akaike information criterion (AIC). Overall, the EPU results are somewhat different from previous results. Precisely, EPUs results for India and U.S. are estimated to be statistically significant but only with lags. This is indicating that the policy uncertainty effects work with the time lags. In other words, uncertainty at the current period impact is shown to have dampening effect in the next quarters of imports. This can be understood easily that, due to forward contracts, effects are realized in the subsequent quarters. These findings provide some additional

[5] Since we fail to show any effects of VIX in the previous section, we do not report VIX results here as it is again found to be unrelated to Indian imports.

information regarding the impact of policy uncertainty on an emerging country's imports.

[Insert Table 7 here]

6.3.Discussion on the results

Our estimates indicate that the economic uncertainty affects Indian imports both in the long- as well as short-run. However, the nature of impact varies along with the time horizons. Specifically, the evidence indicates a dampening effect of the uncertainty in the long-run, while a positive effect of risk and uncertain environment on Indian imports in the short-run. It is also important to note that both domestic and international policy effects are similar on Indian imports. The long-run effects are not entirely unexpected as prevailing uncertainty and risk affect consumer demand, production and investment, so imports too. Yet, the imports can be befitted with uncertainty, at least in the short-run. This could be due to two reasons: first, uncertainty in economic policy makes domestic production suffers and more reliance on imported items in India. Second, policy uncertainty may create speculative opportunities for Indian firms. Given that the domestic economic uncertainty[6] leads to more dependency on imports. This finding is quite relevant and offers important policy recommendations for a major emerging economy like India. Overall, our results are in agreement with Sharma and Pal (2018, 2019)[7], which found similar results for India. While Novy and Taylor (2014) studied the U.S. firms and showed that increasing uncertainty reduces imports, which somewhat validating our long-run results. With these outcomes, we can offer two important inferences: First, the domestic economic uncertainty and unclear policy directions may lead to volatile productivity, which may finally lead to increasing dependency on imports. Thus, in such a situation, the importing firms can take a greater advantage and may aim to maximize their profit-making. To avoid such a situation, stability in policy formulation and implementation is warranted. Second,

[6] These estimates are consistent even when we considered the US EPU in the models.
[7] Both of these studies use exchange rate volatility as a measure of uncertainty in their analysis.

the country will have a severe imbalance in the balance of payment if it is over-dependence on imports. This is also because its export performance may be deteriorating due to the unstable economic situation. This will then put more pressure on the country's balance of payment and may further worsen its currency value in the global market.

Given that, we suggest the economic and trade policymakers of India to be more cautious with the domestic economic uncertainty as it may worsen the economic situation by over-dependence on imports. Further, it is essential to highlight here that India's balance of trade has been in deficit for years due to its inability to export more than what it imports. Bearing this in mind, the policymakers need to have counter policies to address the economic uncertainty on a timely basis; otherwise, the country's balance of trade may further aggravate. Specifically, we advise that the policymakers should initiate effective policies that may help to boost the economic activities in the country, such as reducing capital cost, offering a business-friendly environment and consistent supply as well as demand related policies.

7. Conclusion

This research paper was aimed to investigate the role of economic uncertainty on commodity-level imports to India during the period of September 2011 to January 2019. To achieve our objective, we undertook two estimation techniques, such as the PMG and CS-DL. By making use of these econometric techniques in panel data context, our study established that the economic uncertainty and commodity-level imports, along with control factors, share a significant long-run equilibrium relationship during the study period. Further, our evidence indicates that economic uncertainty has a significant positive impact on commodity-level imports in the short-run but found inconsistent impact in the long-term. Our results showed that both domestic, as well as international economic policy uncertainties, affect the movement of the Indian imports. We also attempted to know the degree of impact from financial market uncertainty on imports, but the results come out to be insignificant. The sectoral analysis showed that primary commodities are comparatively sensitive to uncertainty than manufactured products. This is perhaps resulted due to excessive protective and control policy for primary products, such as food and non-food commodities.

For a robustness check, we also utilized aggregated import data for an extended period. The results of this part somewhat validated the findings of disaggregated data. The aggregated data analysis provided an additional result that is short-run effects of uncertainty works with lags, perhaps due to contracts for trade in the current period. Thus, showing the J curve phenomenon. The price effect on imports is negative and statistically significant both in the short-run and long-run. In contrast, income has a substantial positive impact on imports only in the long-run. The impact of real effective exchange rates is somewhat inconsistent across the models and techniques.

Given the above pieces of evidence, our study provides and discusses relevant policy implications based on the evidence that are obtained for the long-and short-terms. We argue that economic uncertainty may lead to more dependency on imports in a developing country set-up. Where, on the one hand, demand is continuously growing. On the other hand, the uncertainty in policy is continued to prevail and impeding investment flows and domestic production. We can link these results in the context of the findings of Handley and Limão (2015), which reports that the country may fall into a situation of dipping exports due to growing economic uncertainty. This may eventually lead to an economic recession and may threaten to affect various vital economic factors such as employment/unemployment, poverty, exports, growth, price level, etc. We further argue that the situation of domestic economic uncertainty may be an advantage for the importing firms and may try to maximize their profits. It may, therefore, imply that the importing firms will enjoy the profits; while the exporting firms face the disadvantage situation.

Consequently, the country faces not only socio-economic issues internally but also faces an external crisis (current account of the balance of payment) due to rising imports and falling exports. Given all of those possible outcomes, we suggest that the policymakers need to implement effective counter policies to address the economic uncertainty on a timely basis; otherwise, a country like India will have both internal and external issues to deal with. Specifically, the policy authorities need to identify the source of economic uncertainty and offer immediate and effective counter policies to address the issue at the root level. This may help to address the economic uncertainty issue quickly and reduce its overall adverse impact on the economy.

Finally, our study is the first of its kind to investigate the impact of economic uncertainty on commodity-level imports to India. Therefore, it adds not only important value to the policy discussion but also offers practical knowledge on this growing economic issue. Future studies may consider investigating this issue at a regional or cross-country level and may expand the sample period if data become available.

References

Adler, M., & Stevens, G. V. (1974). The trade effects of direct investment. *The Journal of Finance*, *29*(2), 655-676.

Aizenman, Joshua, Marion, Nancy, 1991. Policy Uncertainty, Persistence and Growth. In: NBER Working Papers, vol. 3848. National Bureau of Economic Research, Inc.

Albulescu, C. T., Demirer, R., Raheem, I. D., & Tiwari, A. K. (2019). Does the US economic policy uncertainty connect financial markets? Evidence from oil and commodity currencies. Energy Economics, 83, 375-388.

Aloui, R., Gupta, R., & Miller, S. M. (2016). Uncertainty and crude oil returns. Energy Economics, 55, 92-100.

Anós-Casero P and Astarloa B D (2010) ‘Estimating the Import Content of Argentine Exports’, Policy Research Working Paper 5225, The World Bank: Latin America and the Caribbean Region Economic Policy Sector.

Antonakakis, N., Chatziantoniou, I., & Filis, G. (2014). Dynamic spillovers of oil price shocks and economic policy uncertainty. Energy Economics, 44, 433-447.

Aristei, D., Castellani, D., & Franco, C. (2013). Firms' exporting and importing activities: is there a two-way relationship?. *Review of World Economics*, *149*(1), 55-84.

Arize, A. C., Malindretos, J., & Igwe, E. U. (2017). Do exchange rate changes improve the trade balance: An asymmetric nonlinear cointegration approach. *International Review of Economics & Finance*, *49*, 313-326.

Asteriou, D., Masatci, K., & Pılbeam, K. (2016). Exchange rate volatility and international trade: International evidence from the MINT countries. Economic Modelling, 58, 133-140.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The quarterly journal of economics*, 131(4), 1593-1636.

Bernanke, B. (1983). "Irreversibility, Uncertainty, and Cyclical Investment." The Quarterly Journal of Economics 98: 85–106.

Bhagat, S., Ghosh, P., & Rangan, S. P. (2013). Economic policy uncertainty and economic growth in India. WP: 407, Indian Institute of Management Bangalore: Bangalore

Choi, S., & Shim, M. (2019). Financial vs. Policy uncertainty in emerging market economies. *Open Economies Review*, *30*(2), 297-318.

Chudik, A., Grossman, V., & Pesaran, M. H. (2016). A multi-country approach to forecasting output growth using PMIs. *Journal of Econometrics*, *192*(2), 349-365.

Chudik, A., K., Pesaran, M. H. (2015). Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors. *Journal of Econometrics*, 188, 393-420.

Eberhardt, M., & Teal, F. (2011). Econometrics for grumblers: a new look at the literature on cross-country growth empirics. *Journal of Economic Surveys*, *25*(1), 109-155.

Emran, M. S., & Shilpi, F. (1996). Foreign exchange rationing and the aggregate import demand function. *Economics Letters*, *51*(3), 315-322.

Engel, R. F., and C. W. Granger. (1987). Co-integration and Error Correction Representation, Estimation and Testing Econometrica, Vol. 55.(2) 251-76.

Fang, L., Chen, B., Yu, H., & Xiong, C. (2018). The effect of economic policy uncertainty on the long-run correlation between crude oil and the US stock markets. *Finance Research Letters*, *24*, 56-63.

Gozgor, G., & Ongan, S. (2017). Economic policy uncertainty and tourism demand: Empirical evidence from the USA. International Journal of Tourism Research, 19(1), 99-106.

Handley, K., & Limao, N. (2015). Trade and investment under policy uncertainty: theory and firm evidence. *American Economic Journal: Economic Policy*, *7*(4), 189-222.

Handley, K., & Limão, N. (2017). Policy uncertainty, trade, and welfare: Theory and evidence for china and the united states. American Economic Review, 107(9), 2731-83.

Hummels, D., Ishii, J., & Yi, K. M. (2001). The nature and growth of vertical specialization in world trade. *Journal of International Economics*, *54*(1), 75-96.

Jens, C. E. (2017). Political uncertainty and investment: Causal evidence from US gubernatorial elections. Journal of Financial Economics, 124(3), 563-579.

Kang, W., Lee, K., & Ratti, R. A. (2014). Economic policy uncertainty and firm-level investment. Journal of Macroeconomics, 39, 42-53.

Kang, W., de Gracia, F. P., & Ratti, R. A. (2017). Oil price shocks, policy uncertainty, and stock returns of oil and gas corporations. *Journal of International Money and Finance*, *70*, 344-359.

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of econometrics*, *90*(1), 1-44.

Krol, R. (2014). Economic policy uncertainty and exchange rate volatility. *International Finance*, *17*(2), 241-256.

Levin, A., Lin, C. F., & Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 108, 1–24.

Lin, A. L. (1995). Trade effects of foreign direct investment: evidence for Taiwan with four ASEAN countries. *Review of World Economics, 131*(4), 737-747.

Ludvigson, S. C., Ma, S., & Ng, S. (2019). Uncertainty and business cycles: exogenous impulse or endogenous response? American Economic Journal - Macroeconomics, Forthcoming

Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and statistics*, *61*(S1), 631-652.

Marcus, A. A. (1981). Policy uncertainty and technological innovation. *Academy of Management Review*, *6*(3), 443-448.

McCoskey, S., & Kao, C. (1998). A residual-based test of the null of cointegration in panel data. *Econometric reviews*, *17*(1), 57-84.

Moscone, F., & Tosetti, E. (2010). Health expenditure and income in the United States. *Health economics*, *19*(12), 1385-1403.

Novy, D., & Taylor, A. M. (2014). Trade and uncertainty. *Review of Economics and Statistics,* 1-50.

Pástor, Ľ., & Veronesi, P. (2013). Political uncertainty and risk premia. Journal of Financial Economics, 110(3), 520-545.

Pástor, L., & Veronesi, P. (2012). Uncertainty about government policy and stock prices. *The journal of Finance*, *67*(4), 1219-1264.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics, 61*(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, *20*(3), 597-625.

Pesaran, M.H., Y. Shin, and R. P. Smith (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, *94*(446), 621–634.

Rey, H. (2015). Dilemma not trilemma: the global financial cycle and monetary policy independence (No. w21162). National Bureau of Economic Research: Cambridge, MA.

Rodrik, Dani, 1991, Policy uncertainty and private investment in developing countries, *Journal of Development Economics* 36, 229–242.

Rose, A. K., & Yellen, J. L. (1989). Is there a J-curve?. Journal of Monetary economics, 24(1), 53-68.

Sharma, C. (2014). Imported intermediate inputs, R&D, and productivity at firm level: Evidence from Indian manufacturing industries. *The International Trade Journal*, *28*(3), 246-263.

Sharma, C. (2020). Testing the asymmetric effects of the economic policy uncertainty on the tourism demand in India. *Tourism Economics*, https://doi.org/10.1177/1354816619894080

Sharma, C., & Pal, D. (2018). Exchange rate volatility and India's cross-border trade: A pooled mean group and nonlinear cointegration approach. *Economic Modelling*, *74*, 230-246.

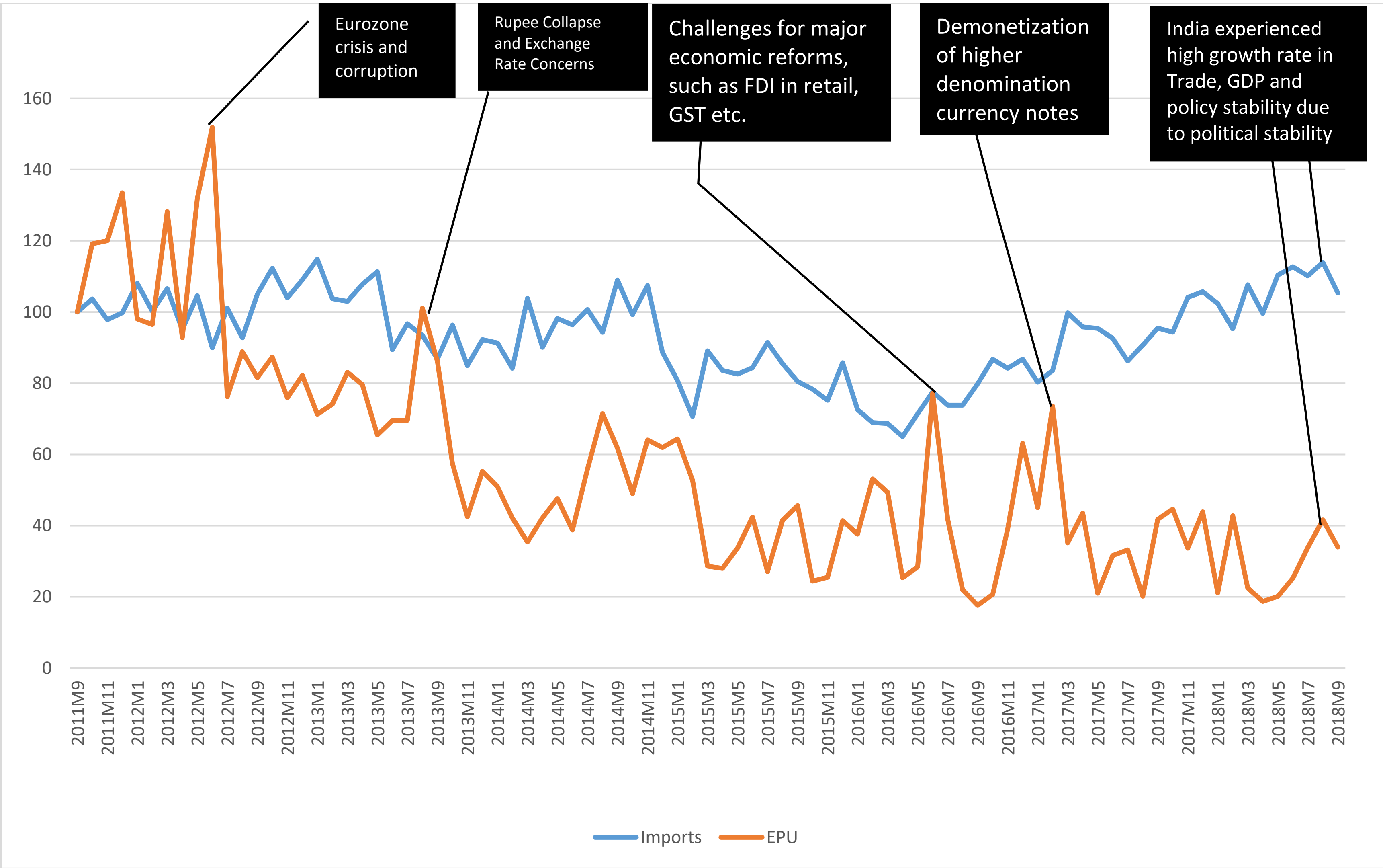
Sharma, C., & Pal, D. (2019). Does Exchange Rate Volatility Dampen Imports? Commodity-Level Evidence From India. International Economic Journal, 33(4), 696-718.

Tam, P. S. (2018). Global trade flows and economic policy uncertainty. *Applied Economics*, *50*(34-35), 3718-3734.

Turco, A. L., & Maggioni, D. (2013). On the role of imports in enhancing manufacturing exports. *The World Economy*, *36*(1), 93-120.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and statistics*, *69*(6), 709-748.
Xu, Z. (2020). Economic policy uncertainty, cost of capital, and corporate innovation. Journal of Banking & Finance, 111, 105698.

Figure 1: The time-varying trend of EPU and Imports in India



Source: Plotting the EPU series retrieve from https://www.policyuncertainty.com/india_monthly.html

Table 1: India's Imports of Major Commodities from World (Y-o-Y % change (in USD))

Year	Total Imports	Petroleum : crude and products	Agricultural and allied products	Ores & minerals	Leather & leather manufactures	Chemicals & related products	Engineering goods	Electronic goods	Textiles (excluding readymade garments)	Readymade garments	Other manufactured goods
2010-11	28.46	21.91	3.36	17.42	22.18	20.15	18.53	26.67	23.03	83.32	61.75
2011-12	32.41	46.43	34.56	57.92	8.76	31.96	25.71	22.9	19.95	60.47	16.66
2012-13	0.22	5.7	16.04	3.29	-5.87	-3.96	-4.27	-3.79	2.05	3.24	-9.77
2013-14	-8.44	0.7	-16.61	-25.53	77.36	-1.76	-16.09	14	-6.16	33.71	-15.17
2014-15	-0.27	-16.43	33.55	9.79	21.25	7.9	6.53	12.9	12.54	20.02	9.34
2015-16	-15.01	-40.1	6.88	-23.39	-5.63	-4.27	-2.61	7.51	-2.76	10.98	-7.64
2016-17	0.99	5.28	13.6	4.9	-3.75	-8.44	-0.21	4.83	-10.72	2.36	-3.34
2017-18	21.19	25	-2.97	46.73	6.44	19.65	15.74	22.4	20.35	29.77	33.34
2018-19	10.46	29.87	-16.07	5.89	3.53	18.36	15.82	8.01	9.86	43.83	-7.81
Average	7.78	8.71	8.04	10.78	8.33	13.81	8.84	6.57	12.83	7.57	31.97

Source: Economic outlook, CMIE

Table 2: Results on the panel unit root tests

	LMQ	LMP	LIIP	LREER	LEPU_India	LEPU_US	LEPU_Global	LVIX
Method	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
At level								
Levin, Lin & Chu t	4.212	2.048	0.735	5.567	2.354	0.007	1.698[#]	1.102
At first difference								
Levin, Lin & Chu t	-48.474***	-44.577***	-68.727***	-91.527***	-95.457***	-95.000***	-82.602***	-73.759***

Note: The constant term is included; # no constant and trend included.*** indicates the rejection of the null hypothesis of unit root at the 1% significance level.

Table 3: Long-run cointegration estimates

	Model 1	Model 2	Model 3	Model 4
Tests	Statistic	Statistic	Statistic	Statistic
Kao test				
Modified Dickey-Fuller t	-14.932**	-16.363**	-16.593**	-16.696**
Dickey-Fuller t	-16.592**	-17.554**	-17.708**	-17.770**
Augmented Dickey-Fuller t	-7.379**	-8.134**	-8.247**	-8.306**
Unadjusted modified Dickey-Fuller t	-85.308**	-85.308**	-85.382**	-85.309**
Unadjusted Dickey-Fuller t	-36.535**	-36.535**	-36.557**	-36.533**
Pedroni test				
Modified Phillips-Perron t	-48.109**	-47.761**	-49.376**	-48.710**
Phillips-Perron t	-41.516**	-41.295**	-42.555**	-41.947**
Augmented Dickey-Fuller t	-40.781**	-40.673**	-41.134**	-41.175**
Westerlund test				
Variance ratio	-9.304***	-9.244***	-9.353**	-9.288***

Notes: Ho – No cointegration; Ha - All panels are cointegrated (some panels are cointegrated for Westerlund test); Panel means – included in all the tests; Time trend – not included in all the tests; AR parameter – panel specific for Pedroni and Westerlund tests; while AR parameter is same for Kao test; ** implies the rejection of the null hypothesis of no cointegration at the 5% significance level.

Table 4: Long-and short-run effects of EPUs on imported commodities based PMG estimator

	Model 1	Model 2	Model 3	Model 4
Panel A: Long-run				
lmp	-0.452**	-0.447**	-0.461**	-0.449**
	(0.028)	(0.028)	(0.028)	(0.028)
liip	1.799**	1.868**	2.121**	1.880**
	(0.133)	(0.133)	(0.149)	(0.127)
lreer	-0.392**	-0.0799	-0.099	-0.232
	(0.426)	(0.181)	(0.181)	(0.191)
LEPU_India	-0.014			
	(0.018)			
LEPU_US		-0.135**		
		(0.053)		
LEPU_Global			-0.284**	
			(0.062)	
LVIX				-0.069
				(0.064)
Panel B: Short-run				
ecm	-0.444**	-0.441**	-0.445**	-0.443**
	(0.023)	(0.023)	(0.023)	(0.023)
Δlmp	-0.623**	-0.623**	-0.627**	-0.631**
	(0.090)	(0.089)	(0.089)	(0.090)
Δliip	0.353	0.375	0.071	0.199
	(0.449)	(0.429)	(0.453)	(0.473)
Δlreer	0.888	0.229	0.444	0.301
	(1.263)	(0.525)	(0.528)	(0.548)
Δ LEPU_India	0.049**			
	(0.024)			
ΔLEPU_US		0.187**		
		(0.091)		
ΔLEPU_Global			0.358**	
			(0.121)	
ΔLVIX				0.076
				(0.072)
_cons	2.567**	2.310**	2.000**	2.524**
	(0.197)	(0.192)	(0.189)	(0.198)
Obs. (panel)	6432 (97)	6432 (97)	6432 (97)	6432 (97)

Standard errors in parentheses
* p<0.10, ** p<0.05
Note: Dependent variable is Δlmq (first difference of quantity of imports) in all models.

Table 5: EPUs effects on imported commodities using CS-DL test

Variable	Model 1	Model 2	Model 3	Model 4
lmp	-0.8274**	-0.8221**	-0.821**	-0.8415**
	(0.1099)	(0.1134)	(0.115)	(0.1205)
liip	1.0006**	1.0155**	1.091**	0.9441**
	(0.4275)	(0.3786)	(0.391)	(0.4122)
lreer	0.9325	0.707	0.629	0.6941
	(0.6257)	(0.567)	(0.578)	(0.5918)
LEPU_India	0.0205*			
	(0.0114)			
LEPU_US		0.053**		
		(0.011)		
LEPU_Global			0.023*	
			(0.014)	
LVIX				-0.0304
				(0.1363)
Obs.(panel)	6408	6432	6432	6432
	(97)	(97)	(97)	(97)
Adj. R^2	0.55	0.57	0.59	0.57
CD test	26.94	27.61	27.39	27.76
	(0.00)	(0.00)	(0.00)	(0.00)

Standard errors in parentheses
* p<0.10, ** p<0.05
Note: Dependent variable is Δlmq (first difference of quantity of imports) in all models.

Table 6: Long-and short-run effects of EPU on imported commodities (sectoral results)

	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
				Panel A: Long-run				
lmp	-0.896**	-1.022**	-1.010**	-0.965**	-0.527**	-0.492**	-0.518**	-0.519**
	(0.047)	(0.039)	(0.040)	(0.044)	(0.039)	(0.039)	(0.038)	(0.039)
liip	2.008**	1.738**	2.140**	1.922**	1.541**	1.630**	1.907**	1.567**
	(0.304)	(0.314)	(0.335)	(.298)	(0.166)	(0.170)	(0.195)	(0.163)
lreer	0.112	0.481	0.441**	0.079	-0.068	-0.009	-0.033	-0.001
	(0.414)	(0.429)	(0.424)	(0.442)	(0.232)	(0.223)	(0.226)	(0.243)
LEPU_India	0.002				-0.012			
	(0.041)				(0.023)			
LEPU_US		-0.287**				-0.093*		
		(0.124)				(0.068)		
LEPU_Global			-0.402**				-0.282**	
			(0.142)				(0.080)	
LVIX				-0.133				0.061
				(0.149)				(0.081)
				Panel B: Short-run				
ecm	-0.475**	-0.472**	-0.478**	-0.474**	-0.445**	-0.443	-0.445**	-0.444**
	(0.036)	(0.036)	(0.037)	(0.035)	(0.030)	(0.030)	(0.030)	(0.030)
Δlmp	-0.662**	-0.613**	-0.632**	-0.638**	-0.501**	-0.519	-0.513**	-0.517**
	(0.153)	(0.153)	(0.150)	(0.153)	(0.109)	(0.108)	(0.110)	(0.110)
Δliip	1.119	1.260	0.753	.895	-0.354	-0.409	-0.598	-0.423
	(0.872)	(0.821)	(0.895)	(0.923)	(0.384)	(0.368)	(0.384)	(0.424)
Δlreer	0.149	-0.121	0.235	0.021	0.378	0.252	0.383	0.294
	(1.061)	(1.022)	(0.985)	(1.023)	(0.542)	(0.526)	(0.551)	(0.577)
Δ LEPU_India	0.069				0.029*			
	(0.048)				(0.016)			
ΔLEPU_US		0.356**				0.072		
		(0.164)				(0.108)		
LEPU_Global			0.612**				0.154	
			(0.228)				(0.134)	
ΔLVIX				0.173				-0.004
				(0.140)				(0.076)
_cons	1.781**	2.071	1.366**	2.239**	3.447**	3.130	2.838	3.184**
	(0.185)	(0.184)	(0.178)	(0.183)	(0.289)	(0.282)	(0.270)	(0.281)
	Primary	Primary	Primary	Primary	Manufacturing	Manufacturing	Manufacturing	Manufacturing
Obs. (panel)	2985 (43)	2985 (43)	2985 (43)	2985 (43)	3221 (51)	3221 (51)	3221 (51)	3221 (51)

Standard errors in parentheses
* p<0.10, ** p<0.05
Note: Dependent variable is Δlmq (first difference of quantity of imports) in all models.

Table 7: Long-and short-run effects of EPU on imported commodities (time series) ARDL estimate

	Model 1	Model 2	Model 3
	Panel A: Long-run		
lmpd	0.358**	0.4397**	0.578**
	(0.092)	(0.0553)	(0.082)
lgdp	0.747**	0.7096**	0.587**
	(0.082)	(0.0602)	(0.104)
lreer	-0.115	-0.3455	0.395
	(0.365)	(0.3112)	(0.451)
LEPU_India	-0.191**		
	(0.067)		
LEPU_US		-0.3120**	
		(0.0809)	
LEPU_Global			-0.065
			(0.101)
Contant	-1.458	-0.8435	-3.722**
	(1.531)	(1.2537)	(1.814)
	Panel B: Short-run		
ecm	-0.6732**	-0.8181**	-0.511**
	(0.1161)	(0.1318)	(0.111)
$\Delta lmqv_{t-1}$	0.2960**	0.3177**	0.255**
	(0.1382)	(0.1230)	(0.131)
$\Delta lmpd_{t}$	0.5631**	0.6171**	0.669**
	(0.1473)	(0.1350)	(0.145)
$\Delta lmpd_{t-1}$	-0.2817**	-0.2696**	-0.483**
	(0.1449)	(0.1381)	(0.153)
$\Delta lgdp_{t}$	0.0363	0.1064	-0.138
	(0.1744)	(0.1801)	(0.167)
$\Delta lgdp_{t-1}$	-0.3025	-0.3924**	
	(0.1834)	(0.1920)	
$\Delta lreer_{t}$	0.1271	0.0567	0.454**
	(0.1980)	(0.1912)	(0.199)
$\Delta lreer_{t-1}$	-0.4698**	-0.2633	-0.507**
	(0.1945)	(0.2002)	(0.197)
$\Delta lreer_{t-2}$	0.3395*	0.3909**	0.393
	(0.1988)	(0.1918)	(0.204)
Δ LEPU_India $_{t}$	0.0327		
	(0.0292)		
Δ LEPU_India $_{t-1}$	-0.0633**		
	(0.0305)		
ΔLEPU_US$_{t}$		0.0093	
		(0.0369)	
ΔLEPU_US$_{t-1}$		-0.1628**	
		(0.0573)	
ΔLEPU_US $_{t-2}$		-0.0876**	
		(0.0428)	
ΔLEPU_Global$_{t}$			0.019
			(0.044)
Adjusted R-squared	0.5823	0.703	0.506
F- statistic (Bounds Test)	4.865**	5.554**	3.126**

Standard errors in parentheses
* p<0.10, ** p<0.05
Note: Dependent variable is $\Delta lmqv$ (first difference of aggregate value of imports) in all models.

Appendix-I: List of imported commodities covered in the analysis

1	Agro chemicals	34	Other xkmeat	67	Fertilisers
2	Crude petroleum	35	Shellac	68	Crude fertiliser
3	Petroleum products	36	Spices	69	Fertiliser manufactured
4	Cashew nut shell liquid	37	Sugar and mollases	70	Motor vehicle/cars
5	Cashew	38	Sugar	71	Two and three wheelers
6	Castor oil	39	Mollases	72	Iron & steel
7	Cereal preparations	40	Tea	73	Aluminium, products of aluminium
8	Coffee	41	Tobacco	74	Nickel, products made of nickel
9	Cocoa products	42	Tobacco unmanufactured	75	Lead and products made of lead
10	Cotton raw including waste	43	Vegetable oils	76	Tin and products made of tin
11	Silk, raw	44	Wheat	77	Zinc and products made of zinc
12	Wool, raw	45	Alcoholic beverages	78	Electrodes
13	Jute, raw	46	Iron ore	79	Project goods
14	Fresh fruits	47	Processed minerals	80	Cotton yarn
15	Fresh vegetables	48	Sulphur & unroasted iron pyrites	81	Jute yarn
16	Fruits / vegetable seeds	49	Other crude minerals	82	Floor covering of jute
17	Guergam meal	50	Mica	83	Carpet(excl. silk) handmade
18	Marine products	51	Coal, coke & briquettes	84	Silk waste
19	Milled products	52	Finished leather	85	Manmade staple fibre
20	Natural rubber	53	Leather garments	86	Gold & silver
21	Oil meals	54	Leather footwear component	87	Gold
22	Other cereals	55	Saddlery and harness	88	Silver
23	Dairy products	56	Petroleum crude & products (POL)	89	Cement, clinker and asbestos cement
24	Processed fruits and juices	57	Organic chemicals	90	Pulp & waste paper
25	Processed meat	58	Inorganic chemicals	91	Newsprint
26	Processed vegetables	59	Other miscellaenious chemicals	92	Packaging materials
27	Pulses	60	Bulk drugs, drug intermediates	93	Plastic sheet, film, plates etc.
28	Rice, other than basmati	61	Drug formulations, biologicals	94	Plastic raw materials
29	Sesame seeds	62	Ayush and herbal products	95	Graphite, explosives and accessories
30	Niger seeds	63	Dye intermediates	96	Granite, natural stone and products
31	Other oil seeds	64	Dyes	97	Human hair, products thereof
32	Groundnut	65	Paints, varnishes and allied products		
33	Sheep/goat meat	66	Essential oils		

Appendix-II: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
		Commodity-level analysis			
lmq	6,600	12.129	4.066	0.000	20.778
lmp	6,600	4.418	3.085	-1.772	12.830
liip	8,633	4.756	0.080	4.594	4.907
lreer	8,633	2.044	0.022	1.997	2.087
LEPU_India	8,633	4.505	0.521	3.493	5.648
LEPU_U.S.	8,633	2.119	0.131	1.805	2.454
LEPU_Global	8,633	2.161	0.116	1.930	2.416
LVIX	8,633	1.192	0.115	0.978	1.633
		Aggregate data analysis			
lmq	51	4.916	0.172	4.534	5.106
lmp	51	5.133	0.154	4.879	5.356
lgdp	51	6.309	0.205	5.923	6.618
lreer	51	4.678	0.056	4.588	4.797
LEPU_India	51	2.069	0.166	1.745	2.408
LEPU_US	51	2.102	0.154	1.708	2.377
LEPU_Global	51	1.972	0.226	1.443	2.453