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# EXCHANGE RATE AND TRADE DYNAMICS IN INDONESIA: CONNECTING THE DOTS[1]

*This paper provides an overview of the exchange rate and trade dynamics in Indonesia. Using data on monthly export and import price and volume at the sectoral level, the paper estimates pass-through effects of exchange rate changes to trade price and volume. Results indicate adjustment frictions that depend on the source of the exchange rate fluctuation and the degree of integration in global value chains. Overall, combining price and volume effects, we find that a 10 percent depreciation in the exchange rate is associated with a rise in the goods net-exports of up to 1.6 percent of GDP.*

## A. Exchange Rate and Trade Balance: Recent Trends

**1. Movements in exchange rates play an important role in determining how a country's trade balance adjusts in response to both external and domestic shocks**. Exchange rates typically act as a shock absorber, in the sense that in response to an external shock, a depreciation should boost exports through the competitiveness channel and reduce imports as they become more expensive relative to domestic goods.[2] However, recent evidence from both emerging and advanced countries suggests that the transmission of exchange rate changes to trade price and quantities, through the expenditure-switching channel,[3] may be incomplete (see for example, Campa and Goldberg 2005). We examine this issue for Indonesia and attempt to, first, uncover a pattern from recent trends in both exchange rates and trade movements. Figure 1 below charts, since 2011, the movements in exchange rates in relation to both the terms of trade (proxy for real-sector fundamentals) and interest rate differentials (proxy for carry-trade attractiveness in international financial markets) as well as value of goods exports/imports. We see that, after a period of decline following the taper tantrum in 2013, goods imports have rebounded and steadily increased in the past few years despite a sharp depreciation of the rupiah since mid-2017. Following the tightening of global financing conditions in 2018, which put pressures on financial flows to Indonesia, the rupiah depreciated by about 6 percent in real effective terms. However, during the same period, imports surged both in value and volume terms by approximately 20 percent and 8 percent year-on-year respectively. On the other hand, exports moved more in line with recent changes in the exchange rate, growing in value by 7 percent in 2018.

[1] Prepared by Manasa Patnam (SPR).

[2] See Obstfeld (2001) and Engel (2002) for a survey.

[3] The expenditure-switching effect, the focus of this paper, refers to the shifting of domestic consumption away from foreign goods towards domestic goods because of trade price changes. In addition to this, there may also be an expenditure-changing or wealth effect which reflects the reduction in purchasing power associated with a weaker currency, leading to a compression of domestic demand and thereby of imports.

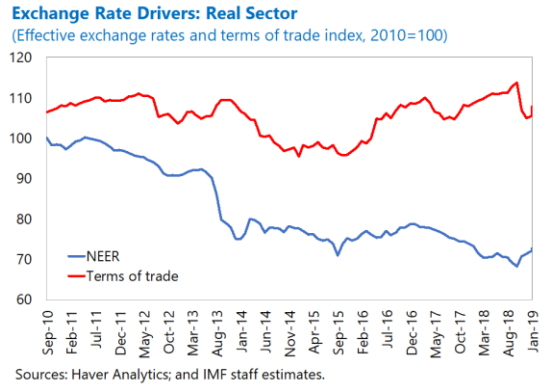
**2. Exchange rate movements appear to have increasingly diverged from trade-related pressures, indicating a possible disconnect from fundamentals**. An examination of the drivers of exchange rate reveals that movements in the nominal exchange rate have recently diverged from real-sector related fundamentals. For instance, as shown in Figure 1 and text table, the correlation between the terms of trade and NEER, has switched from positive (2010−2014) to negative (2015−2018) over the recent half of this decade. In contrast, we find that the opposite pattern holds for the relationship between the exchange rate and movements in the financial sector (proxied by the Indonesia-U.S. interest rate differential), where the correlation has turned from negative to positive.

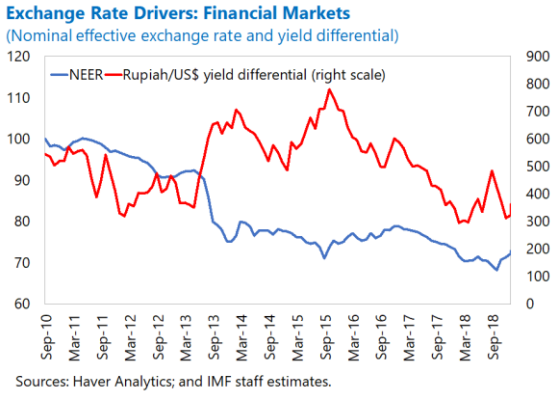
**Correlation of Exchange Rate with Terms of Trade and Interest Rate Differentials 1/**

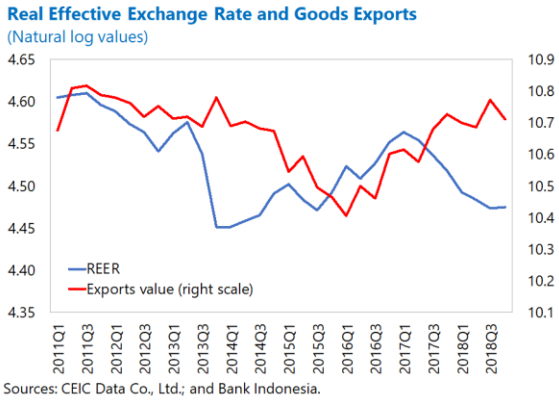
| | 2011-2014 | 2015-2018 |
|---|---|---|
| Correlation between ToT and NEER | 0.67 | -0.32 |
| Correlation between IRD and NEER | -0.65 | 0.49 |

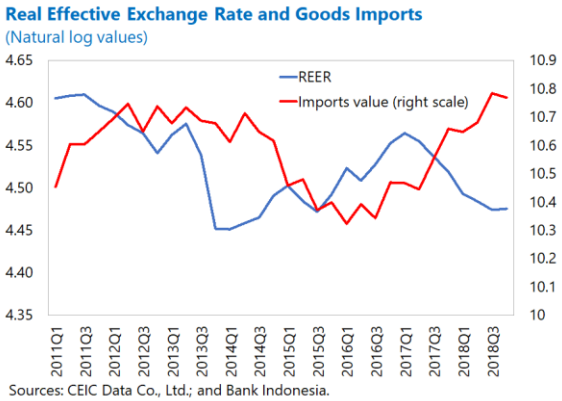
1/ ToT refers to terms of trade, NEER to nominal effective exchange rates, and IRD to the Indonesia-U.S. interest rate differential (in bps). All pairwise correlation coefficients are signficant at the 5% level.

**Figure 1. Indonesia: Exchange Rate and Trade Fluctuations: Recent Trends**

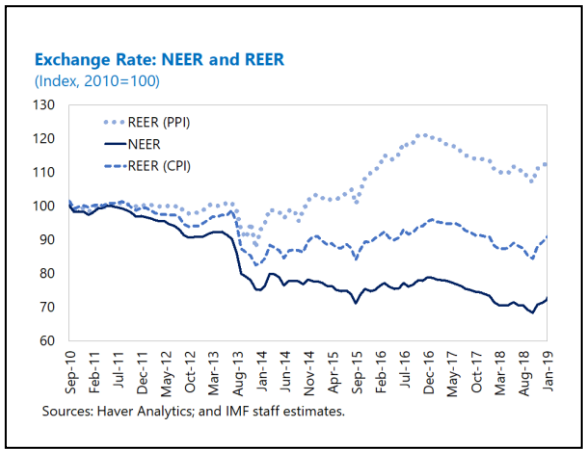


**3. The volatility of exchange rates appears higher than fundamentals**. The estimated standard deviation of both the PPI-based REER and NEER index (during 2010:Q1-2018:Q4) is strictly above the standard deviation of the terms of trade index by approximately 4 standard deviations. In addition, the PPI-based real exchange rate tracks very closely the nominal exchange rate at the monthly frequency and displays a similarly large persistence and volatility as the nominal exchange rate. These facts suggest that the exchange rate displays both high and "excess volatility" appearing therefore to be disconnected from fundamentals (see Chari and others, 2002 and Baxter and Stockman, 1989).




**4. High exchange rate volatility, in excess of the volatility of fundamentals, is intrinsically linked to a limited pass-through of exchange rates to trade prices**. Empirical evidence has shown that the excess volatility of real and nominal exchange rates is associated with limited pass-through effects of exchange rate changes to trade and consumer prices (Devereux and Engel, 2002).[4] This would imply that, both, depending on the nature of the shock and transmission mechanism, the change in the nominal exchange rate may not lead to a full substitution between domestic and foreign goods because of slow-changing relative prices of home and foreign goods.

**5. The literature has examined several reasons related to both the source of shock and transmission mechanism to understand why pass-through effects of exchange rate changes to trade prices may be limited**. These explanations can be broadly divided into those concerning the *nature of the exchange rate shock,* which creates different types of fluctuations, and those related to the *transmission mechanism,* which mutes the effect of volatile exchange rate fluctuations on local prices and quantities. In terms of the shock process, it has been posited that shocks emanating from international asset demand generate large and volatile exchange rate fluctuations that have small effects on the rest of the economy, because of financial frictions compared to productivity/demand or monetary shocks (Devereux and Engel, 2002; Forbes and others, 2018). The reasons why financial market shocks may be less impactful hinge on distortions within the micro-foundations of the international markets such as the presence of noise traders with limits to arbitrage, financial frictions, and time-varying risk premium (see Itskhoi and Mukhin, 2017).

[4] This means that the relationship between the equilibrium exchange rate and real-economy shocks are amplified by the presence of frictions related to firms, speculative activity in financial markets and market structure of international trade. For early insights on this see Krugman (1989) who argues that firms face significant sunk cost frictions and do not react to exchange rate changes that lie within a range, preferring a 'wait and see' approach, which prevents them from adjusting their prices and volumes instantaneously. Further over time, an increased volatility of exchange rates, partly from excessive speculation in international financial markets, could widen this range and further weaken firms' responsiveness.

**6. In terms of the transmission mechanism the literature has emphasized the role of price-setting, the structure of international trade markets and demand preferences**. For instance, there may be a significant home-bias in consumption that may weaken the expenditure switching effects of exchange rate changes from limited adjustment of trade quantities. Alternatively, local currency pricing or pricing to market with markup adjustment may limit the responses of trade prices to exchange rate movements. Finally, the global integration of trade markets, where import and export production process are no longer isolated and instead linked though complex supply-chain arrangements, may create offsetting impacts on prices that may net out the price effects in the aggregate.

**7. To understand whether the exchange rate movements and trade flows are disconnected in recent times, we estimate the sectoral pass-through effect of exchange rate changes on trade prices and quantities**. Using data on monthly trade prices and volumes at the sectoral level, the paper first examines if, and to what extent, the pass-through effects are limited. Next it examines a few specific channels, especially relevant for Indonesia, that may drive these effects. Depending on the sector's orientation and structure, limited pass-through can arise from deeper involvement in global value chains and foreign currency invoicing. In addition, these effects can be asymmetric such that the magnitude of pass-throughs may vary in response to exchange rate appreciations and depreciations.

## B. Data and Empirical Methodology

**8. We use sectoral data on import and export volume and prices at a monthly frequency to estimate six- and twelve-month pass-through effects**. Trade value and volume data are obtained from Statistics Indonesia (BPS) at the SITC (revision four) sectoral classification. Real effective exchange rate data is from BIS. Monthly commodity price index[5] is from the IMF and data on global value chains is obtained from the OECD Trade in Value database.

**9. Our estimation of aggregate trade-related pass-through effects, accounts from the possible heterogeneity of these effects across sectors**. Estimates obtained from pooling all sectoral data can typically suffer from an "aggregation bias," if the price volatility is driven by sectors that experience relatively higher or lower elasticity. For instance, we would expect the results to be upward biased in high price volatility sectors are relatively inelastic. This insight was developed by Imbs and Mejan (2015) who show how aggregate elasticities obtained from combining disaggregate effects differ substantially from those obtained based on examining purely aggregate relationships.

[5] The index is used to identify (approximately) terms of trade shocks to commodity related exports/imports and represents four broad commodity asset classes: (1) energy, (2) agriculture, (3) fertilizers, and (4) metals and is a weighted average of 68 global commodity prices. The weight is calculated based on the global import share over a 3-year period (2014−2016) and is normalized to 100 at year 2016 prices.

**10. Using sectoral monthly data on trade flows, we augment the exchange rate pass-through equation with commodity price shocks and account for the asymmetric response to shocks**. We attempt to eliminate the effect of nominal price rigidities on pass-through estimates by focusing on the six- and twelve-month changes of trade prices and quantities,[6] where subscript *ct* denotes the cumulative change of all variables (trade prices, quantities, exchange rate and commodity price) between time *t* and the previous six or twelve months for sector $i$. The specification also mitigates bias from other (unobserved) economic factors that may be correlated with both import/export prices and ER/commodity shocks by conditioning on quarterly time effects ($\rho_q$). These time dummies can capture at the quarterly level, for instance, policy actions in response to exchange rate fluctuations or movements in other real-economic variables that are not explicitly included in the specification. In sum, the exchange rate ($e$) and commodity price ($c$) pass-through for the dependent variable, import prices ($mp$) expressed in local currency, can be specified as.[7]

$$\Delta mp_{i,ct} = \underbrace{\beta_i^+ \Delta e_{ct}^+ + \beta_i^- \Delta e_{ct}^-}_{Exchange\ Rate\ PT} + \gamma_i^+ \underbrace{\Delta c_{ct}^+ + \gamma_i^- \Delta c_{ct}^-}_{Commodity\ PT} + \rho_q + \epsilon_{i,ct}$$

The overall pass through can then be obtained by aggregating sector-wise pass-through coefficients based on their shares ($\beta^+ = \sum_i s_i \beta_i^+$ and $\beta^- = \sum_i s_i \beta_i^-$). A similar specification is employed for export prices expressed in foreign currency. In the next step we use the observed cumulative price changes to predict quantity response, while similarly conditioning on quarter specific time effects.

## C. Results

**11. Results indicate that there is considerable asymmetry and sectoral heterogeneity in the pass-throughs of exchange rate on import and export prices**. The overall pattern that emerges from the estimated disaggregated effects below is that (i) trade prices are on average more responsive, i.e., have higher estimated pass-throughs, to exchange rate shocks relative to commodity price shocks; (ii) the exchange rate pass-through coefficient of import prices is higher than that of export prices; (iii) both export and import price pass-throughs vary by the nature of the shock with appreciations (depreciations) linked to stronger import (export) price changes; and (iv) sectoral price pass-throughs are dispersed, with the largest importing and exporting sectors having weak price responses to exchange rate fluctuations over a six-month horizon.

**12. Import prices adjust well to exchange rate fluctuations with the effects being stronger for appreciation episodes**. Table 1 reports the estimated import-price pass-through coefficients by

[6] Gopinath and others (2010) exploit good level data and identify pass throughs using cumulative changes in the log of the bilateral nominal exchange rate over the duration for which the previous price was in effect. However, since our data is at the sectoral level (combining several good) we are unable to identify discrete price changes and therefore focus on cumulative changes, assuming that rigidities last between six to twelve months. The median duration for trade price rigidity is estimated to be around 9−12 months (see Gopinath and Rigobon, 2008) but commodity goods can have lower durations.

[7] In this specification, $e$ denotes the log of real effective exchange rate and $c$ denotes the log of commodity price index. Import and export prices are derived based on their respective values and volumes. Import prices. $mp$, are expressed in Indonesian rupiah and deflated by the consumer price index. Export prices are expressed in U.S. dollars and deflated by the foreign consumer price index. Import and export volumes are also expressed in logs.

sector and differentiated by the type of shock (exchange rate vs commodity price) as well as by horizon. First, focusing on the six-month horizon we find that overall, across sectors, a 10 percent increase in exchange rate (appreciation) is associated with an import price decrease of 5.7 percent. On the other hand, a 10 percent increase in commodity prices is associated with an import price increase of 4.6 percent. The aggregate effects however mask important directional and sector-specific effects. For instance, a 10 percent appreciation of the exchange rate is associated with a decline in import prices by 8 percent, whereas a similar magnitude of depreciation results in only a 3 percent increase in import prices. In terms of sectoral effects, we find that the sector with the largest import share, accounting on average for 32 percent of total imports, (machinery and transport equipment) has a very low sensitivity to exchange rate (coefficient of -0.04) movements compared to other top importing sectors which have significantly higher pass-throughs (coefficient on average of -0.6). Turning to the twelve-month horizon, we see a general improvement in the import price sensitivities, with a 10 percent increase in exchange rate (appreciation) associated with an import price decrease of 7 percent, which indicates that the pass-through of exchange rates to import prices have a delayed effect. Most notably, the largest importing sector, which had almost negligible pass-throughs over the six-month horizon, increases its sensitivity to 6 percent (following a 10 percent exchange rate change) at the twelve-month horizon. This could be explained by time-lags in pricing and delivery and settlement delays. As before, we find a similar pattern of heterogeneity with twelve-month pass-throughs being stronger for appreciation and commodity price declines.

**Table 1. Indonesia: Import Price: Pass-Through of Exchange Rate and Commodity Price 1/**

| | Share in Imports | Exchange Rate Pass-Through | | Commodity Price Pass-Through | |
|---|---|---|---|---|---|
| | | 6-month | 12-month | 6-month | 12-month |
| Food and live animals | 8.4% | -0.36 | -0.66 | -0.15 | 0.32 |
| Beverages and tobacco | 0.5% | -5.90 | -3.93 | -1.23 | -0.96 |
| Crude materials | 5.1% | -1.47 | -0.81 | -0.28 | 0.09 |
| Mineral fuels, lubricants | 19.4% | -1.07 | -1.00 | 0.89 | 0.87 |
| Animal and vegetable oils and fats | 0.1% | 2.79 | 2.57 | 0.24 | 0.29 |
| Chemical | 13.8% | -1.04 | -0.65 | 0.20 | 0.17 |
| Manufactured goods | 16.0% | -0.23 | -0.37 | 1.27 | 0.69 |
| Machinery and transport equipment | 31.7% | -0.04 | -0.57 | 0.21 | 0.67 |
| Miscellaneous manufactured articles | 4.5% | 0.02 | -1.37 | 0.04 | 0.22 |
| Other | 0.4% | -9.24 | -0.73 | 4.50 | 11.63 |
| Total | 100% | -0.57 *** | -0.70 *** | 0.46 *** | 0.60 *** |
| Asymmetric effects: | | | | | |
| + (Appreciation/commodty price increase) | | -0.80 * | -1.01 *** | 0.33 | 0.58 *** |
| - (Depreciation/commodty price decrease) | | -0.31 ** | -0.43 ** | 0.53 *** | 0.70 ** |

1/ The estimation sample period is between 2011–2018. Gray shaded cells for individual sectoral indicate effects that are not significant at the 10% level. Significance for aggregate effects are as follows: *** indicates significance at the 1% level; ** at the 5% level and * at the 10% level. 6-month refers to a cumulative horizon of six months; 12-month to a cumulative horizon of one year. Asymmetric effects are aggregated from the (unreported) sector-wise differentiated effects. Sectoral import and export shares are an average over the sample period.

**13. The price sensitivity of export prices to exchange rate shocks is generally lower than of imports and concentrated over shorter horizons and during episodes of depreciation**. Table 2 reports the estimated export-price pass-throughs by sector and differentiated by the type of shock (exchange rate vs commodity price) as well as by horizon. Overall, across sectors, a 10 percent increase in exchange rate (commodity-prices) is associated with increasing export prices (in foreign currency) by 4 percent (2 percent) at the six-month horizon compared to 1.5 percent (3 percent) over the twelve-month horizon. One explanation for the result that exports prices have lower estimated pass-through coefficients than import prices could be that firms set export prices in a dominant currency (mostly the dollar) and are therefore unable to change frequently their prices in response to exchange rate changes. There is however considerable asymmetry and heterogeneity in the distribution of these effects across sectors and by type of shocks.[8] Depreciations and commodity-price declines are associated with higher pass-throughs compared to appreciations and commodity price increases. We find a large dispersion of these effects across sectors, with the largest exporting sector having insignificant pass-throughs for exchange rate changes but significant pass-through effects for commodity price changes (on average 4 percent increase to a 10 percent increase in commodity prices).

**14. With regards to estimation, it should be noted that pooled estimates of the overall aggregate effect are significantly downward biased**. Results from a specification that pools all sectors reveals an aggregate import and export pass-through coefficient of -1.65 and 0.06, respectively. As discussed above there is substantial heterogeneity in both the sectoral share in total export/import value and the related sector-specific volume effects to price changes. The downward bias suggests the presence of sectors whose prices experience large price changes, but which are relatively more elastic.

**15. The volume of both imports and exports are fully responsive to price changes**. For a given level of price change, overall, we find that, for both exports and imports, the six-month adjustment to quantities is strong with aggregate elasticities close to one (Table 3). Import quantities adjust one-on-one to change in import prices, over all horizons. For exports, the effect is strong over the six-month horizon but weaker over time. There is still some sectoral variation in the distribution of these effects with commodity-intensive sectors (e.g., mineral fuels) more inelastic to price changes.

**16. The price and quantity results imply that exchange rate changes can have significant effects on the current account, by affecting movements in net-exports of goods**. We can combine the estimates for aggregate price and volume pass-throughs with the overall import and

[8] In some cases, pass-through coefficients over the 12-month horizon are estimated to be lower than at 6-months, suggesting that the effect declines over longer time horizons. This could happen for several reasons, including round-about production structure effects whereby, in the case of depreciation for e.g., exporters gradually pass-on cost increases from imported inputs into prices (neutralizing the initial decrease in foreign price). It could also be explained by the presence of other factors that take place over time, such as policy responses to the initial exchange rate shock, that may affect pricing decisions but are not adequately captured in the specification.

## Table 2. Indonesia: Export Price: Pass-Through of Exchange Rate and Commodity Price 1/

| | Share in Exports | Exchange Rate Pass-Through | | Commodity Price Pass-Through | |
|---|---|---|---|---|---|
| | | 6-month | 12-month | 6-month | 12-month |
| Food and live animals | 7.0% | 0.56 | 0.11 | -0.18 | 0.07 |
| Beverages and tobacco | 0.7% | -1.67 | -1.52 | -0.10 | -0.30 |
| Crude materials | 9.2% | 3.44 | 2.17 | 0.10 | -0.85 |
| Mineral fuels, lubricants | 25.9% | -0.43 | -0.45 | 0.43 | 0.46 |
| Animal and vegetable oils and fats | 11.9% | 0.59 | 0.04 | 0.43 | 0.60 |
| Chemical | 6.7% | -0.38 | -0.51 | -0.35 | 0.23 |
| Manufactured goods | 13.2% | -0.36 | -0.57 | 0.32 | 0.35 |
| Machinery and transport equipment | 12.7% | 1.52 | 1.34 | 0.34 | 1.07 |
| Miscellaneous manufactured articles | 11.7% | 0.38 | -0.02 | 0.26 | 0.32 |
| Other | 1.0% | -3.05 | -0.05 | -3.43 | -1.65 |
| Total | 100% | 0.44 ** | 0.14 | 0.22 ** | 0.33 *** |
| Asymmetric Effects | | | | | |
| + (Appreciation/commodty price increase) | | 0.28 | 0.09 | -0.39 | 0.29 |
| - (Depreciation/commodty price decrease) | | 0.61 ** | 0.25 | 0.52 *** | 0.46 ** |

1/ The estimation sample period is between 2011–2018. Gray shaded cells for individual sectoral indicate effects that are not significant at the 10% level. Significance for aggregate effects are as follows: *** indicates significance at the 1% level; ** at the 5% level and * at the 10% level. 6-month refers to a cumulative horizon of six months; 12-month to a cumulative horizon of one year. Asymmetric effects are aggregated from the (unreported) sector-wise differentiated effects. Sectoral import and export shares are an average over the sample period.

## Table 3. Indonesia: Import and Export Volume Response to Prices 1/

| | Imports | | Exports | |
|---|---|---|---|---|
| | 6-month | 12-month | 6-month | 12-month |
| Food and live animals | -1.20 | -1.16 | -0.68 | -0.80 |
| Beverages and tobacco | -0.07 | -0.19 | -0.72 | -0.90 |
| Crude materials | -0.80 | -1.06 | -1.10 | -0.99 |
| Mineral fuels, lubricants | -0.30 | -0.04 | -0.33 | -0.10 |
| Animal and vegetable oils and fats | -1.53 | -1.71 | -1.37 | -0.60 |
| Chemical | -1.11 | -1.36 | -1.37 | -0.74 |
| Manufactured goods | -1.63 | -1.35 | -0.34 | -0.24 |
| Machinery and transport equipment | -1.10 | -1.04 | -1.07 | -0.97 |
| Miscellaneous manufactured articles | -0.82 | -0.57 | -0.32 | -0.14 |
| Other | -0.93 | -0.96 | -0.87 | -0.97 |
| Total | -1.01 *** | -0.93 *** | -0.72 *** | -0.48 *** |

1/ The estimation sample period is between 2011–2018. Gray shaded cells for individual sectoral indicate effects that are not significant at the 10% level. Significance for aggregate effects are as follows: *** indicates significance at the 1% level; ** at the 5% level and * at the 10% level. 6-month refers to a cumulative horizon of six months; 12-month to a cumulative horizon of one year.

export share of goods to obtain a back-of-the-envelope effect of exchange rate movements on net exports.[9] The results suggest that a 10 percent depreciation in the exchange rate is associated with a rise in the goods net exports of, on average, 1.3 percent and 1.6 percent of GDP over a 6-month and 12-month horizon respectively. Our results are similar to those obtained by Bussiere and others (2013) who estimate export and price elasticities for 40 countries during the period 2000–2011 using aggregate quarterly data. Specifically, for Indonesia, the authors find the import and export price pass-through coefficients to range between 0.5 to 0.7 (for up-to two quarters). As an additional benchmark, Chapter 3 in IMF (2015) estimates the average effect of a 10 percent depreciation on net-exports to be 1.5 percent of GDP across a set of 23 advanced and 37 emerging/developing economies.

**17. *Nature of the shock:* Pass-through effects of trade prices are weaker when exchange rate fluctuations are derived from international financial market perturbations**. The text table shows the six-month aggregate import and export price pass-throughs estimated from a decomposition of the exchange rate fluctuations by those predicted by financial market shocks (proxied by changes in the U.S. bond yields and VIX) and other residual fluctuations.[10] We find that for both imports and exports, pass-through of residual fluctuations with respect to import/export prices are higher than that induced by financial market volatility (especially for imports) suggesting that the nature of the shock plays an important role in the evaluation of whether the implied exchange rate volatility is transmitted fully into the trade movements. The literature offers several conceptual reasons for this result (see Devereux and Engel 2002; Itskhoi and Mukhin, 2017). For instance, the presence of speculators or noise traders in asset markets may result in the exchange rate reacting to shocks to the expectations of such traders (either forecast error shocks or from limits to arbitrage) which are unrelated to trade fundamentals.

**Pass-Throughs by Type of Exchange Rate Shock**

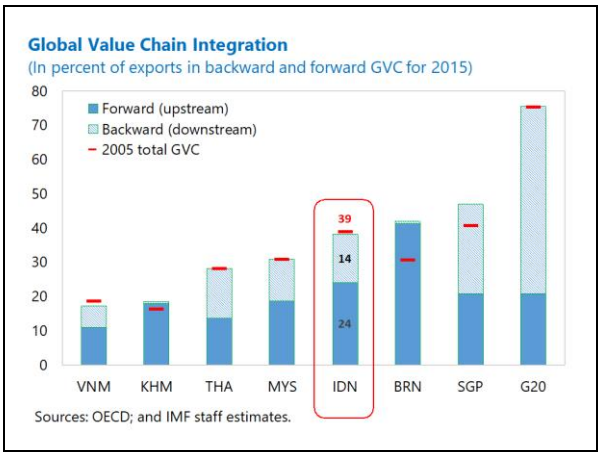
| | Imports | Exports |
|---|---|---|
| Financial market fluctuations | -0.15 | 0.36 |
| Residual fluctuations | -0.64 ** | 0.44 * |

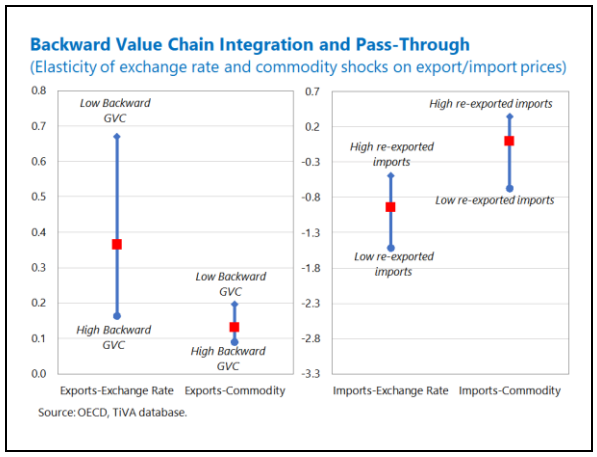
**18. *Transmission Mechanisms:* The sectoral dispersion in pass-through can be partly explained by its integration in GVC**. Indonesia is reasonably well-integrated in the global value chain with both backward and forward linkages. Compared to its peers in the Asian region,

[9] This effect is obtained as, $\beta^X.V\beta^X.(X/Y) - \beta^M.V\beta^M.(M/Y)$, where $\beta^X$ ($\beta^M$) and $V\beta^X$ ($V\beta^M$) denote the exchange rate pass-through coefficient of export (import) prices and the price pass-through of export (import) prices to export (import) volumes respectively (see IMF, 2015 for more details). $X/Y$ and $M/Y$ are the 2018 goods export and import shares for Indonesia. The results are similar when using average export and import shares between 2012–2018.

[10] The estimation is done in two steps: first, exchange rate changes are regressed on two explanatory variable relating to international asset price movements (interest differential between Indonesia and United States and the volatility index, VIX); second we decompose total exchange rate changes into those predicted by financial market shocks (as obtained from predictions in the first stage) and residual fluctuations and then include both terms in the main pass-through equation.

Indonesia has one of the largest shares in terms of forward GVC linkages, measured by the domestic value added embodied in foreign exports (as share of gross exports). On the other hand, it also has a high degree of backward linkages; as of 2016, 14 percent of Indonesian exports have foreign value-added content. Further, many of the intermediate imports are often used for re-exports. The share of intermediate goods import used for re-exports is 20 percent, on average in Indonesia. Exploiting the sectoral variation in backward participation and intensity of re-exports, we find several interesting effects.[11] First, export pass-throughs are very sensitive to the share of foreign value-added content embodied in the sector's exports. Sectors with less dependence on imports for producing exports, i.e., with lower backward linkages are more likely to have high exchange rate pass-through effects on export prices. The same holds for commodity price effects but the difference is much smaller. Second, import price pass-throughs also vary by the extent of the share of imports used for re-exports. Those sectors with high shares of re-exported imports experience lower price pass-through effects of exchange rate shocks relative to sectors with a smaller share of imports for re-exportation needs. One reason for such an effect could be that this reflects weak substitutability between domestic and foreign goods, in the sense that these imports are essential for exports and limit the extent of expenditure switching.




**19. Taken together, the results suggest that while trade prices adjust less than fully to exchange rate and commodity price shocks, volumes adjust strongly and almost instantaneously to price changes**. Combined, these results indicate that exchange rate fluctuations can have a significant impact on the current account, by affecting net-exports through trade price and quantity adjustment. However, we do find incomplete adjustment of trade prices concentrated in the top import/export sectors over shorter time-horizons. We find that the pass-through effects vary substantially across sectors and, additionally, that appreciations have stronger pass-through effects than depreciation, confirming the asymmetries in the effects. We also find suggestive

[11] This specification augments the pass-through equations with global value-chain measures of backward participation (share of imports used for exports) and re-export intensity (share of imports that are re-exported) for exports and imports respectively. See OECD (2018) and Koopman and others (2014) for details. These measures are then interacted with the exchange-rate and commodity price change variables.

evidence that the extent of pass-through is weaker when exchange rate changes derive from financial market perturbations and when sectors are more tightly connected in the global value-chain for re-import and re-export purposes.

**20. In conclusion, this paper's analysis weaves together several elements that determine the transmission of exchange rates fluctuation to trade**. It documents frictions in the adjustment of trade prices to exchange rate shocks that depend on the source of the exchange rate fluctuation as well as transmission mechanism related to the trade integration in global value chains. These results obtained in the paper are overall consistent with the existing literature on exchange rate pass-through effects, where it is found that (i) aggregate pass-through effects of exchange rate changes on trade prices are incomplete (Campa and Goldberg 2005; Gopinath and Itskhoki, 2010); (ii) exports that are highly dependent on imports have low sensitivity to exchange rate shocks (Amiti and others, 2019.), and; (iii) financial sector driven exchange rate shocks are weakly transmitted to the real economy (Forbes and others, 2019).

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