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Determinants of the Trade Balance in the Turkish Economy

Ali Ari and Raif Cergibozan

[1]Kirklareli University Department of Economics, Kayali Kampusu 39020 Kirklareli Turkey

Abstract

The Turkish economy has a long-run problem of trade deficits. Several efforts and different policies over the last 50 years could not find any permanent remedy to this problem which is an important source of external vulnerability for the Turkish economy. Thus, this study aims to shed light on the trade balance dynamics in Turkey via Johansen cointegration test, vector error correction model, and impulse-response analysis, for the period 1987–2015. Estimation results indicate that in the long-run an increase in real effective exchange rate improves trade balance, while an increase in Turkish (foreign) income improves (deteriorates) trade balance. In the short-run, real effective exchange rate has no impact on trade balance, while an increase in domestic and foreign income negatively affects the Turkish trade balance. The impulse-response analysis also shows that the J-curve hypothesis does not hold for the Turkish case.

Keywords: Trade Balance, Exchange Rate, J-curve, Turkey

Corresponding Author: Ali Ari and Raif Cergibozan; email: ali.ari@klu.edu.tr

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1. Introduction

The Turkish economy has a long-run problem of trade deficits. Several efforts and different policies, i.e. import substitution over the 1960s and 1970s, trade liberalization after the 1980s and stabilization and restructuring policies in the 2000s, could not find any permanent remedy to this problem which is an important source of external vulnerability.

As stated by [6] Turkey had a relatively successful experience with an inward-oriented strategy in the 1960s and early 1970s, with high rates of growth of industrial production. This performance, however, was not sustainable because of the costs of resource misallocation between Turkey's import-competing and export industries caused by currency controls and import protection [15], and of the inability of Turkish firms to master more capital and skill intensive industries.

The occurrence of severe balance-of-payments and debt crises in the late 1970s, caused by large trade deficits and in parallel increasing foreign debt stock as a result of political instability (coalition governments, early elections, and violent left-right conflict) and negative international economic conditions (the oil crisis of 1973–74), forced the Turkish authorities to reorient the development strategy by adopting a radical structural adjustment program in January 1980. This program, largely supported by the IMF and the World Bank, aimed to implement a market-based mode of regulation

in order to restore economic growth by improving economic and financial efficiency, increasing domestic savings and attracting foreign capitals. This program was mostly characterized by the trade liberalization process, which consisted of export promotion and gradual import liberalization, and by the financial liberalization process, which mainly consisted of ending interest rate controls and the liberalization of capital movements.

This large structural reform program obtained an initial success by reducing the triple-digit inflation rates to an average of 30%, increasing export earnings at an annual rate of 10% and ensuring an average economic growth rate of 5.5% in the 1982–89 period [19]. However, this early success was shadowed by the occurrence of two deep financial crises in April 1994 and February 2001, mainly caused by high budget and trade deficits, rising short-term foreign debt stock, banking sector weaknesses and unstable and fractional political environment.

Stabilization and restructuring efforts implemented in May 2001 in the framework of the Program of Transition to the Strong Economy, backed by the IMF, restored a relative economic stability by restructuring the banking sector and fulfilling many structural and institutional reforms. This reform process was quite fruitful as remarkable improvements were recorded in terms of inflation (from over 50% in 2002 to 8% in 2015), budget deficit (from 12% of GDP in 2001 to 4% in 2015) and economic growth (on average 5% of GDP from 2002 to 2015).

However, the external balance worsened in the same period. As stated by [9], the TL steadily appreciated against the major world currencies in real terms since 2002. This situation is related to high real domestic interest rates that are intentionally set at high levels to prevent inflation rising again. As a direct consequence of the overvalued TL, trade deficits sharply increased in the 2002–15 period (more than 7% of GDP). On the other hand, the overvalued TL encouraged the private sector to borrow in international financial markets. As a result, the private sector foreign debt stock exceeded record levels. These are main reasons behind the vulnerability of the relatively stabilized Turkish economy to external shocks as the 2008-09 crisis illustrated.

As summarized above, one can affirm that the Turkish economy seems to follow a circle for decades: a period of economic growth largely financed by foreign capital leading then to substantial increases in TL value, thus increasing trade deficits (1980–90, 1992–93, 1995–97, 2000, 2002–07, 2010–...) is followed by a period of financial crisis leading to large depreciations of the TL and economic recessions (1991, 1994, 1998–99, 2001, 2008–09). The impact of depreciations on the trade balance is short lived as the early improvements in the trade balance are reversed steadily after a while [9] when the economic recovery restarts. This is why this study aims to shed light on the trade balance dynamics in the Turkish economy.

There are several empirical studies on the determinants of the trade balance in developed and developing countries, but the interest of most of those works is to show the short- and long-run relationship between trade balance and exchange rate because of the J-curve effect. The J curve refers to the trend of a country's trade balance following a devaluation or depreciation of the domestic currency: depreciation would lead to an initial deterioration of the trade balance and improve it after a

while. The J-curve phenomenon is related to in part pre-existing trade contracts [2, 16], in other words to sticky prices. In the short-run the contracts have to be honored, therefore demand for the more expensive imports and demand for cheaper exports to foreign buyers remain price inelastic. After some time, new contracts made after the depreciation begin to dominate as the volume of exports rises because of lower prices to foreign buyers, and the volume of imports reduces as a result of higher prices to domestic consumers, consequently the trade balance will improve (According to [13], the time lag occurs because of recognition lag, decision lag, delivery lag, replacement lag and production lag. See [21] for a more detailed explication).

The results of these empirical papers, often for identical countries, are quite different. This may stem from different time periods and/or different methodologies (See [5] for a large literature review). Regarding the Turkish data, there are a few studies in this area. In [6], in the analysis of the Turkish data for the 1969–93 period, divide their sample period into two sub-samples (1969–79 and 1980–93). Their estimation results obtained from Engle-Granger procedure, Johansen cointegration test and error correction model, indicate that before 1980, there is no short- or long-run relationship among the variables of the model. But in the post-1980 period, in the long-run, an increase in real exchange rate improves the trade balance as expected, while an increase in domestic (foreign) income improves (deteriorates) the trade balance contrary to the theory. For the short-run analysis, their results show that neither domestic nor world income is significant, but real exchange rate affects positively the trade balance. This relationship does not nevertheless follow a J-curve pattern. On the other hand, [14] obtains conflicting results by utilizing Johansen cointegration test and error correction model over the 1984–96 period. She shows that in the long-run, a real depreciation and an increase in foreign income lead to an improvement in trade balance, while an increase in domestic income adversely affects trade balance. Her short-run estimation results find a delayed J-curve effect.

In [3], by using Johansen cointegration analysis, vector error correction (VEC) approach, and generalized impulse-response (IR) analysis over the 1987–00 period, finds that in the long-run, a real depreciation of TL improves trade balance but neither domestic income nor foreign income have effect on trade balance. In the short-run, her results show no relationship between trade balance and foreign income, while an increase in domestic income deteriorates trade balance and real depreciation of TL improves it. Moreover, her IR analysis does not support the J-curve hypothesis. In [9] over the period 1980–05, by using ARDL approach and VEC model, finds, contrary to the theory, no long-run relationship between real exchange rate and trade balance, but in the short-run there exists the J-curve phenomenon. He also affirms that in the long and short run, an increase in world income deteriorates trade balance, while an increase in domestic income improves it.

Overall, the empirical results are not conclusive on the determinants of the trade balance for Turkey. The evidence also suggests that the J-curve is not an empirical regularity. Nevertheless, the evidence supports the existence of a favorable stable long-run relationship between trade balance and exchange rate.

Our study aims to shed light on dynamics of the trade balance for the Turkish economy via Johansen cointegration test, VEC model, and IR analysis, for the period 1987–2015 by using quarterly data. Our study improves upon the existing literature as it uses a very recent data covering the entire post-liberalization era.

The remainder of this paper is organized as follows. Section 2 describes the model and discusses the empirical results. Section 3 concludes.

2. Body of Paper

2.1. Model and Data Description

The trade balance model employed in this study adopts the form of [20] and it takes the following long-run (cointegrating) form:

$$LTB_t = \alpha + \beta REER_t + \gamma YD_t + \lambda YF_t + \varepsilon_t \quad (1)$$

where the measure of the trade balance (TB) is the ratio of exports to imports (X/M), REER is the real effective exchange rate, YD is the real domestic income, and YF is the real foreign (world) income. L before the variables represents the natural logarithm transformation, and ? is the random error term. According to the J-curve hypothesis, an increase in real effective exchange rate initially deteriorates then improves the trade balance when export and import volumes adjust to price changes. On the other hand, an increase in real domestic (foreign) income is expected to worsen (improve) the trade balance as demand for imports (exports) will increase.

The trade balance is approximated by aggregated flows of Turkey's six major trading partners (see Table 1). They account, on average, for over 50% of its total trade volume (The aggregated approach was used, since policy makers are more interested in single, averaged outcomes than in case-by-case information [21]). The real effective exchange rate (Note that trade balance is influenced by the real exchange rate, not the nominal exchange rate. The reason is that the trade balance depends on demand for domestic goods relative to foreign goods, thus on relative prices [18]) is modeled using the consumer price index, often referred to as competitiveness measures. Besides, we use real domestic and foreign GDP data as proxy for real domestic and foreign income variables due to the difficulty to find reliable income data.

The model is estimated over the 1987Q1–2015Q2 period, by using quarterly data. The data for the variables are gathered from the Central Bank of Republic of Turkey (CBRT), the IMF's International Financial Statistics (IFS), and the Turkish Statistical Institute (TSI).

Several econometric methods were implemented to investigate the determinants of the trade balance. In regards to univariate cointegration approaches, there are several examples including [8] and the modified OLS procedures of [17]. In terms of multivariate cointegration [10–12], Johansen (1996)'s maximum likelihood procedures are widely employed. Here, we use the Johansen procedure and the VEC model for the long-run and the short-run relationship, respectively, between trade balance and other variables.

Variable	Definition	Source
LTB	Natural logarithm of balance on goods and service at 1987 prices. *TB* is constructed as the ratio of exports of goods and services to imports of goods and services at 1987 prices.	IFS
LYD	Natural logarithm of real domestic GDP index (1987=100)	IFS
LYF	Natural logarithm of real foreign GDP index (1987=100). This variable is constructed as a weighted average of real foreign incomes of Turkey's major trading partners, each country receiving a weight equal to its share in Turkey's total volume of trade. $$YF = \sum_i w_i Y_i^*$$	IFS
w_i	Share of country i in Turkey's volume of foreign trade	TSI
Y_i^*	Real GDP of country i at 1987 prices.	IFS
i	United States, Germany, France, Netherlands, United Kingdom, Italy.	
LREER	Natural Logarithm of Real Effective Exchange Rate Index (1987=100) $$REER = E\frac{P_f}{P_d}$$	CBRT
E	Nominal exchange rate (domestic currency/foreign currency) $$E = \sum_i w_i E_i$$	CBRT
E_i	Value of country *i*'s currency in terms of domestic currency	CBRT
P_f	Foreign Price Level $$P_f = \sum_i w_i P_i^*$$	
P_d	Domestic Price Level (Consumer Price Index)	IFS
P_i^*	Consumer price index of country *i*	IFS

Table 1: Variables: Definitions and Sources.

For the Johansen procedure, we initially determine the rank of the long-run matrix Π, which permits us to find the number of linearly independent columns of Π. This gives us the number of cointegrating relationships (vectors) that exist among variables. There are two test statistics for the number of cointegrating vectors: the trace test and the maximum eigenvalue statistics. In the trace test, the null hypothesis is that the number of cointegrating vectors is less than or equal to *r*, where *r* is 0, 1, or 2. In other words, the trace statistic tests the null of $r = k (k = 1, 2, ..., n-1)$ against the alternative of unrestricted *r*. The maximum eigenvalue statistic, on the other hand, tests that there are *r* cointegrating vectors against the alternative that $r + 1$ exists.

On the other hand, the VEC model takes the following form:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-k} + u_t \quad (2)$$

where z_t denotes the vector of endogenous variables and $z_t = [LTB\ LREER\ LYD\ LYF]$. u_t is residual matrix, $\Gamma_i = -(I - A_1 - ... - A_i)$ with $i = (1, ..., k-1)$, and $\Pi = -(I - A_1 - ... - A_k)$. The estimations of $\widehat{\Gamma_i}$ and $\widehat{\Pi}$ present

	Level	*First Difference*
Variable	*1987Q1-2015Q2*	*1987Q1-2015Q2*
LTB	-0.74	-6.38***
LREER	-1.04	-8.11***
LYF	-1.42	-9.13***
LYD	-0.82	-3.70**

TABLE 2: Results of ADF Tests for Unit Roots (1987Q1-2015Q2). *, **, and *** represent statistical significance at the 10%, 5%; and 1% level, respectively.

the short- and long-run adjustments of changes in z_t. Here, $\Pi = \alpha\beta'$ where α is the speed of adjustment parameter, and β' is the long-term matrix of coefficients. If the variables are cointegrated, the deviations in the short run from the long-run equilibrium will affect changes in the dependent variable forcing the movement of the variables towards the long-run equilibrium. Thus, the coefficient of the error-correction term is a short-run adjustment coefficient which represents the proportion by which the long-run disequilibrium in the dependent variable is being corrected toward the equilibrium level in each period [22].

Besides, we employ the IR function along with the corresponding standard errors to observe the J-curve phenomenon. IR analysis measures the time profile of the effect of a shock at a given point in time on the expected future values of the variables in a dynamic system. For this reason, IR analysis will show the effect of a shock of one standard deviation of REER over TB.

2.2. Estimation Results

Before estimating cointegration test and VEC model in 1 and 2 to examine the dynamics of the trade balance, we need first to check integrating properties of our variables. We use the Augmented Dickey–Fuller (ADF) unit root tests [7] to test the stationarity of variables. According to the results presented in Table 2, all variables are stationary at their first difference. In other words, they are integrated of order one or they are said to be I1.

Since all variables in the model are integrated of the same order, we then proceed to test for cointegration by utilizing the Johansen procedure. According to both test statistics (given in Table 3) suggested by [12], there exists a single cointegrating relationship for each sector among the variables of the model over the 1987Q1–2015Q2 period at the 5% level of significance. This means that there is a long-run relationship between the variables of the model.

On the other hand, for each model, we have chosen the number of lags based on Akaike (AIC), Schwarz (SIC) and Hannan-Quinn (HQIC) Information Criteria. In this sense, a lag length of four is found appropriate for our sample period.

The results of the estimated long-run trade balance, in Table 4, indicate that the real effective exchange rate, the real domestic and foreign incomes are statistically significant and explain the variations in the Turkish trade balance. According to the results,

	Test Statistics (1987Q1-2015Q2)			
	Trace		*Maximum Eigenvalue*	
	Statistic	*%0.5 C.V*	*Statistic*	*%0.5 C.V*
r=0	21.398**	18.397	18.576**	17.147
r ≤ 1	2.822	3.841	2.822	3.841

Table 3: Johansen's Test for Number of Cointegrating Vectors (1987Q1-2015Q2).

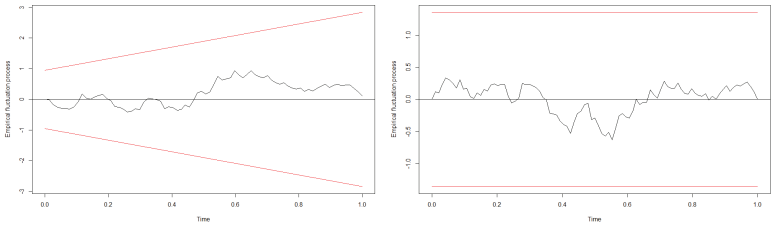
Long run coefficients					
LTB= 0.84LREER-1.64LYF+1.28LYD					
[5.27] [-3.01] [4.20]					
VECM Results 1987Q1-2015Q2 (Dependent Variable: ΔLTB)					
Lags	ECT	*ΔLTB*	*ΔLREER*	*ΔYF*	*ΔYD*
1	-0.41***	0.05	0.24	-1.31	-0.70***
	[-4.46]	[0.41]	[1.27]	[-1.07]	[-3.60]
2		-0.03	-0.22	-2.53**	-0.42***
		[-0.21]	[-1.18]	[-2.07]	[-4.93]
3		-0.10	0.04	0.51	-0.37***
		[-0.88]	[0.24]	[0.41]	[-3.44]
R^2 = 0.44, heteroscedasticity: χ^2= 258.7 (260) - (0.51), LM –Stat = 14.99 (0.53)					

Table 4: Cointegration Equations and VECM Results (1987Q1-2015Q2). *, **, and *** represent statistical significance at the 10%, 5%; and 1% level, respectively.

positive sign of the REER coefficient suggests that the Marshall-Lerner condition is satisfied, thus devaluation of the domestic currency improves the trade balance in the long-run. Moreover, an increase in YD improves the trade balance while an increase in foreign income YF deteriorates it, contrary to our expectations.

As the results of the cointegration models indicate a significant long-run relationship, we may then examine whether a short-run relationship exists among the variables of the model. The short-run dynamic behavior of the trade balance is examined by estimating the VEC model. According to the results of the VEC model (Table 4), the REER has no impact over the trade balance in the short run, while an increase in YD and YF negatively affects the Turkish trade balance. On the other hand, the error correction term is negative and significant as expected. This means that the deviations in the short run are corrected by 41% toward the long-run equilibrium level in each quarter. Moreover, the diagnostic tests indicate that the VEC model is adequately specified since the LM statistics show no autocorrelation in the residuals up to 10 lags, and the White heteroscedasticity statistic is insignificant. Furthermore, the CUSUM tests indicate that the short-run and the long-run coefficients of the model are stable since the plot of these statistics fall inside the critical bounds of 5% significance as shown in Figure 1 See Brown et al, (1975) and [4] for more details about these tests.

Besides, we employ the IR analysis to capture the J-curve phenomenon. Here, the IR analysis measures the time profile of the effect of a shock of one standard deviation



a-OLS-CUSUM *b- Rec-CUSUM*

Figure 1: CUSUM Tests (1987Q1-2015Q2).

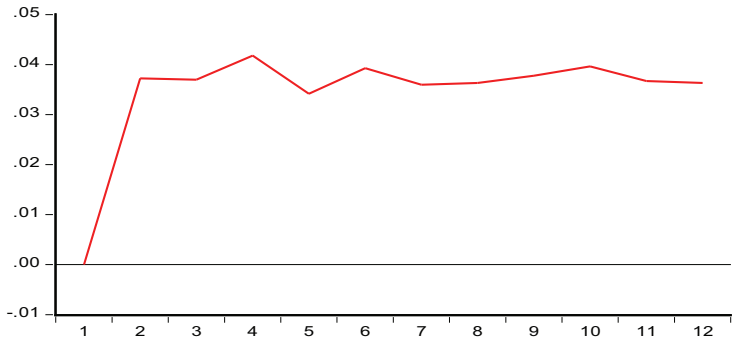


Figure 2: Response of LTB TO LREER (1987Q1-2015Q2).

of REER over TB. As seen in Figure 2, an increase in REER improves TB, but the J-curve hypothesis does not hold for the Turkish economy.

3. Conclusion

This study aimed to show the short- and long-run determinants of the Turkish trade balance over the period 1987-2015 via cointegration test, VEC model, and IR analysis. Our cointegration test results indicate that in the long-run devaluation of the domestic currency improves the trade balance; an increase in domestic income improves the trade balance; an increase in foreign income deteriorates.

Moreover, our VEC model results show that contrary to the theory, in the short-run REER has no impact on the trade balance, while YD and YF have a negative impact on the trade balance. Besides, the CUSUM tests indicate that the short-run and the long-run coefficients of the model are stable. On the other hand, the IR analysis shows that the J-curve hypothesis does not hold for the Turkish case.

Our study has important policy implications. It is important for the Turkish policy makers to understand whether real exchange changes can be used as a policy tool to manipulate trade flows. Since there is a generalized belief in Turkey that trade deficits are mainly caused by the overvalued TL, depreciating the TL would improve the trade balance. This is partly confirmed by our estimation results. However, one has to assess trade balance benefits with potential unfavorable effects of a permanent depreciation.

The first potential undesirable effect is the pass-through of the exchange rate on inflation. For a country that struggled to reduce the inflation rate for decades, this is an

important issue to take into account. The second possible adverse effect is due to high dependence of Turkish production and exports on imports, i.e. imported intermediate goods and raw materials. Hence, an increase in domestic producers' competitiveness stemming from real depreciation might be eroded by increases in import prices. The third adverse effect is related to the foreign debt stock held by enterprises and households in Turkey. Hence, a permanent depreciation will reduce firm profitability that may lead to generalized bankruptcies in the real sector with spillover effects to the banking sector

Alternatively, authorities may increase the country's competitiveness by supply-side policies, such as increasing labor productivity, decreasing taxes or increasing the quality of human capital. On the other hand, investing in high-technology sectors of which international demand is less dependent on price fluctuations related to changes in real exchange rate may bring another solution to the long-dated Turkish trade deficits.

This study may be extended to test whether the adopted exchange rate regime has an impact on the determinants of the trade balance, since authorities used both fixed and floating exchange rate regimes over the sample period.

References

[1] S. r. Johansen, *Likelihood-based inference in cointegrated vector autoregressive models*, Oxford University Press, New York, 1995.

[2] A. D. Krueger, *Exchange Rate Determination*, Cambridge University Press, Cambridge, UK, 1983.

[3] E. Akbostanci, Dynamics of the trade balance: The Turkish J-curve, *Emerging Markets Finance and Trade*, **40**, no. 5, 57–73, (2004).

[4] M. Bahmani-Oskooee and T. J. Brooks, Bilateral J-Curve between US and Her Trading Partners, *Weltwirtschaftliches Archiv*, **135**, no. 1, 156–165, (1999).

[5] M. Bahmani-Oskooee and A. Ratha, The J-curve: A literature review, *Applied Economics*, **36**, no. 13, 1377–1398, (2004).

[6] J. C. Brada, A. M. Kutan, and S. Zhou, The exchange rate and the balance of trade: The Turkish experience, *Journal of Development Studies*, **33**, no. 5, 675–692, (1997).

[7] D. A. Dickey and W. A. Fuller, Distribution of the estimators for autoregressive time series with a unit root, *Journal of the American Statistical Association*, **74**, no. 366, part 1, 427–431, (1979).

[8] R. F. Engle and C. W. J. Granger, Co-integration and error correction: representation, estimation, and testing, *Econometrica. Journal of the Econometric Society*, **55**, no. 2, 251–276, (1987).

[9] F. Halicioglu, The J-curve dynamics of Turkey: An application of ARDL model, *Applied Economics*, **40**, no. 18, 2423–2429, (2008).

[10] S. r. Johansen, Statistical analysis of cointegration vectors, *Journal of Economic Dynamics & Control*, **12**, no. 2-3, 231–254, (1988).

[11] S. r. Johansen, Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models, *Econometrica. Journal of the Econometric Society*, **59**, no. 6, 1551–1580, (1991).

[12] S. Johansen and K. Juselius, Maximum Likelihood Estimation and Inference on Cointegration — With Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, **52**, no. 2, 169–210, (1990).

[13] H. B. Junz and R. R. Rhomberg, Price Competitiveness in Export Trade among Industrial Countries, *American Economic Review*, **63**, no. 2, 412–418, (1973).

[14] P. Kale, Turkeys Trade Balance in the Short and the Long Run: An Error Correction Modelling and Cointegration, **15**, 27–56.

[15] A. O. Krueger, Some Economic Costs of Exchange Control: The Turkish Case, *Journal of Political Economy*, **74**, no. 5, 466–480, (1966).

[16] S. P. Magee, Currency Contracts, Pass-Through, and Devaluation, *Brookings Papers on Economic Activity*, **No. 1**, 303–325, (1973).

[17] P. C. B. Phillips and B. E. Hansen, Statistical inference in instrumental variables regression with $I(1)$ processes, *Review of Economic Studies*, **57**, no. 1, 99–125, (1990).

[18] M. Rahman, M. Mustafa, and D. V. Burckel, Dynamics of the yen-dollar real exchange rate and the US-Japan real trade balance, *Applied Economics*, **29**, no. 5, 661–664, (1997).

[19] D. Rodrik, Premature Liberalization, Incomplete Stabilization: The Özal Decade in Turkey, Tech. Rep., Incomplete Stabilization, The Özal Decade in Turkey. NBER Working Paper, 1990.

[20] A. K. Rose and J. L. Yellen, Is there a J-curve? *Journal of Monetary Economics*, **24**, no. 1, 53–68, (1989).

[21] T. Stucka, The Effects of Exchange Rate Change on the Trade Balance in Croatia, Tech. Rep., 2004.

[22] M. B. Yusoff, The effects of real exchange rate on trade balance and domestic output: A case of Malaysia, *International Trade Journal*, **24**, no. 2, 209–226, (2010).