A CROSS-NATIONAL PANEL STUDY OF DEVALUATIONS ON DISAGGREGATED EXPORT SECTORS: A CASE FOR SECTOR SPECIFIC POLICIES

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Abstract

The focus of this paper is a global examination of how different export sectors react to real devaluations in the short term. The disaggregated nature of the data allows a closer analysis of the underlying cross-export differences in exchange rate movements. Current period real devaluation has contractionary effects on real exports in 80 per cent of specific export sectors and affects a variety of industries without distinction as to whether products incorporate more added value or less added value. Therefore, sector specific policy solutions are more advisable than implementing a uniform devaluation on a country's export portfolio. We gathered export data from 67 countries around the world across 65 export sectors at the two-digit SITC level, for the years 1976-2006.

JEL classification: O11, O40, O54

Keywords: Devaluations; Disaggregated Export Sectors; Short-term

1. Introduction

There has been a flurry of research on the relationship between exchange rate devaluations and a country's trade balance, including the impact of competitive devaluations. In this paper we take a different approach, we examine the relationship between devaluations and disaggregated export sectors, in the short run. The focus of our analysis is not a country's trade balance per se but rather a more global examination of how different export sectors react to devaluations. The disaggregated nature of the data allows a closer examination of the underlying cross-export differences in exchange rate movements which usually are undetected in those studies that employ highly aggregated data. These differences may help explain export-specific trade behaviour which likely will have implications for the trade balance. Given that a country's export portfolio changes over time it seems more appropriate for policy makers to understand the impact of exchange rate policy at a disaggregated level. This research has welfare implications for domestic savers and those who borrow through foreign denominated debt as it reveals that targeted policies have a more direct and potentially positive impact than blanket devaluations.

The current paper moves beyond the aggregate question of the impact of exchange rate policies on the trade balance and directly focuses on exports. Devaluation, in theory, lowers the relative price of exports and increases the relative price of imports resulting in increased external demand for exports and decreased internal demand for imports. This, however, is not often what happens. From the export side, devaluation by

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one country may be ineffectual if it leads to a series of devaluations by other competing developing countries, the country is a price taker, and/or export contracts are denominated in a foreign currency. From a demand perspective, if a country depends heavily on imported intermediate inputs for its exportables any price advantage may be offset by the new higher price of inputs. If the goal is to increase foreign exchange earnings, then, targeted policies are likely to be more effective and have fewer negative secondary effects, such a loss of income for domestic savers and increased debt burden for those holding foreign denominated debt. In this paper, we specifically examine the impact of devaluation by export sector. The analysis is disaggregated by country, year, and export sector. The objective is not to see how a relative price change between two countries affects a country's trade balance but rather to determine if we can make generalisable statements about the impact of devaluation on specific export sectors in the short run. It is of interest to consider the short-term perspective since the equilibrium in markets may rarely be observed. Thus, responsible monetary authorities should regard the short run implications to avoid making wrong decisions. The results of this study, then, would allow a policy maker to more clearly realize the impact of devaluation on his/her country's economic health based on an analysis of his/her country's export portfolio. Finally, it will allow fine-tuning of interventionist policies to minimize unintended consequences.

2. Literature Review

The impact of exchange rate policy has been examined from a variety of perspectives: volatility on exports, devaluation on output, impact on the trade balance (the J-curve), and devaluation on exports directly. There are aggregated, disaggregated, country-specific, regional, and bi-lateral studies. Finally, there is recognition that exchange rate policies can have a negative impact on domestic welfare, domestic savers, and those holding foreign denominated debt. Here we provide a brief overview of the current literature.[1] It is important to note that this study's contribution is to determine if there are differential effects of exchange rate policy on specific export sectors in the short run, using cross-national panel data. We leave similar questions related to the import sectors for future research.

Studies on volatility focus on the impact of uncertainty in pricing on exports. In general they conclude that exports are sensitive to uncertainty in exchange rates. Byrne et al (2006) using bi-lateral data from the US and the United Kingdom, Germany, France, and Italy separate exports and imports into differentiated groups to determine the effect of exchange rate volatility on trade. They make a case for sectoral differences in that uncertainty and volatility in exchange rates have a negative effect on differentiated goods; while, the effect on homogenous goods is not significant. However, the impact of volatility on industry level data between the US and Japan yields ambiguous results. (Bahmani-Oskooee and Hegerty, 2008) A study of Central and Eastern European countries concluded that manufacturing exports sectors may be negatively affected by

[1] For sources prior to 2007 please see Amin Gutiérrez de Piñeres and Cantavella-Jordá 2007

volatility. (Egert and Morales Zumaquero, 2008) Kandilov (2008) after controlling for export subsidies in agriculture concludes that the impact of exchange volatility is reduced by half and is greater for developing countries. Finally, Serenis et al (2008) in a cross country analysis using post 1992 data do not find any significant effects on exports.

Other studies ask directly whether or not devaluations have a contractionary or expansionary effect on output. Bahmani-Oskooee and Kutan (2008) study of Eastern European countries supports Miteza (2006) conclusions that real devaluations are contractionary in the long run. Razmi (2007) employing a sample of 24 developing countries and 19 industrialised countries infers that devaluation is more likely to be contractionary the higher market share of exports to developing countries and the larger the presence of trans-national corporations. This coincides with "evidence in support of the hypotheses of a fallacy of composition (FOC) and contractionary devaluations (COD) for 17 developing countries that are heavily specialized in manufactured exports." (Blecker and Razmi, 2008, p.106) Additionally, they determine that competitive devaluations lead to negative effects for all countries involved. Bahmani-Oskooee and Kandil (2009), examining MENA (Middle East and North Africa) countries, conclude that unanticipated devaluations have a positive effect on output in the short run but tend to be contractionary in the long run as the cost of imported inputs negates any gains. Kim and Ying (2007), on the other hand, prove that in pre-crisis situations devaluation is expansionary for East Asian countries. "With financial liberalization and improvement in information technology, devaluation may be more likely to be contractionary than before as it worsens the balance sheet of financial and nonfinancial business firms with heavy foreign-currency liabilities and results in serious interruption of external financing through a loss of credibility with international financial investors." (Kim and Ying, 2007, p.281) While devaluation has an expansionary effect on exports, increases in the money supply, government spending, and foreign income also have a positive and significant effect. (Narayan and Narayan, 2007) In general, the evidence points out a perverse impact of currency depreciation on private consumption in a number of developing countries. (Kandil, 2008) The lack of consensus led economists to expand the models to look at bilateral trade at a disaggregated level.

A number of studies expand on the country studies by examining bi-lateral trade to better capture the effect of exchange rate polices and relative price changes. Gil-Alana, Luqui and Cunado (2008) using bilateral data between the US and the UK find devaluation has a positive effect on the competitiveness of the country through gains in the import-competing and export sectors. Bahmani-Oskooee and Wang (2008) examining commodity trade between the US and China show that of 88 industries 34 react favourably to a depreciation and 22 industries exhibit traits consistent with the J-curve; yet, Narayan (2006) demonstrates that a real devaluation has a positive impact on trade balance but no evidence of a J-curve. Bahmani-Oskooee and Ratha (2007) extend the analysis using US-UK trade data to determine if an S-curve exists. "S curve depicts the dynamic relationship between the trade balance and the terms of trade. The trade balance is positively correlated with past movements in the terms of trade (reminiscent of the J curve), but negatively correlated with the current and future movements." (Bahmani-Oskooee and Ratha, 2007, p142) Their results support an S-curve in the majority of industries examined. Yet, the answer as to whether a devaluation has a positive impact on a country's trade balance in the short run and, further, into the long run still remains

murky. In this paper, we separate out the effect of devaluation on exports and imports. Our research focuses on the export sector using cross national disaggregated sector level data.

The J-curve has been examined from a multiplicity of angles; yet, there is still no consensus on its actual existence or impact. There have been country specific studies. Studies examine bi-lateral trade flows at an aggregate level and others at a disaggregated level. There are regional studies and comparative studies. One common aspect is that all are examining the J-curve to determine if through devaluation the overall impact of export growth leads to a long run improvement in the trade balance. Other studies ask whether devaluations are contractionary or expansionary and, if so, in the short run or the long run. In developing countries the consensus is that while exports may or may not increase, in general imports do not decrease sufficiently; thus, not having the desired impact on the trade balance.[2]

Country specific and regional studies have, yet, to lead to any generalizable results. Halicioglu (2008) finds that the data only support the existence of a J-curve in the short run for Turkey. Duncan (2008), however, finds that in Jamaica there is no evidence of the J-curve in the short or long run. Duncan's analysis reveals that for small countries with preferential trade agreements it is very difficult to lower prices through exchange rate policies. Additionally, since most exports also utilised imports as intermediate inputs a devaluation inevitably raises the cost of production. For Malaysia, Yusoff (2007) supports the existence of a delayed J-curve. Moreover, Yusoff shows that an increase in domestic income has a positive impact on Malaysia's trade balance. These results are consistent with what Bentum-Ennin (2008) finds in Ghana. In a study of seven Latin American countries Hsing (2008) obtains mixed results for both the short run and long run. Bahmani-Oskooee and Kutan (2008) examine the impact of devaluations in Eastern European countries. They find that in general if there are short run gains they do not extend into the long run.

Finally, there is a subset of literature that examines sensitivity of exports to the exchange rate. Consistent with theory, devaluation increases export competitiveness but the nuances tell a different story. Kandil (2008) states "while depreciation increases export competitiveness, the reduction in output supply may counter the positive effect on output growth." (p207) Bahmani-Oskooee and Ardalani (2006) use U.S. trade flows at a disaggregated level to determine the impact of devaluation on export and import earnings. They do not find evidence to support the idea that durables are more price elastic than nondurables.

Using firm level data in Taiwan, Fung and Liu (2009) conclude that a real depreciation does lead to an increase in exports through firm scale expansion and increases in productivity. A study of bi-lateral trade between Australia and U.S. reveals that while income increases exports devaluation is not as effective. (Bahmani-Oskooee and Wang, 2009) This study differs from the current literature in that our paper examines

[2] For an extensive review of the literature see Narayan 2006, Bentum-Ennin 2008, Bahmani-Oskooee and Ratha 2007, Kim and Ying 2007, and Amin Gutierrez de Pineres and Cantavella-Jordá 2010.

disaggregated real exports as the dependent variable across countries and time to determine if generalisations exist that can better guide policy makers.

3. Model, Methodology, and Results

3.1 Data

We gathered export data from 67 countries around the world across 65 export sectors at the two-digit SITC level.[3] Exports are in US dollars and are by country to the world. These together with the consumer price indices and exports unit value indices belong to the United Nations Common Database for the years 1976-2006. Data on nominal exchange rates and world gross domestic product are collected from the International Monetary Fund Statistics.

3.2 Methodology

The model is designed to examine the question of how a real devaluation affects real export growth in a direct way, unlike the traditional elasticities approach. We base our work on that of Forbes (2002). Her approach, however, is at firm data level for ten commodity industries for the period 1996-2000. She tries to analyze the impact of devaluations on output and profit growth rates. We attempt to improve the specification of the model by, for example, including inflation in the construction of real devaluation variable so that it is not used independently and therefore twice. Additionally, foreign income is also introduced in our model given that it is regarded as a determinant of a country's exports. Finally, this study takes into account global exports of all industry groups at the two-digit SITC code (65 groups) for a time span of thirty years, 1976-2006.[4]

Following Edwards' criteria (1989), a significant devaluation is considered to be more than a real 15% depreciation in a country's currency. However, any advantageous effects of devaluation might be offset by its inflationary effect. This is the reason that we regard devaluation in real terms. Thus, real devaluation was determined by the difference between the percentage change in the value of a country's currency and the percentage change of relative prices which is a ratio of domestic consumer price index over the US consumer price index, being both numerator and denominator proxies for inflation in relative terms.

The model to be estimated is the following:

[3] The countries included in the analysis are he following: Algeria, Argentina, Australia, Austria, Barbados, Belize, Bolivia, Brazil, Canada, Chile, China, Colombia, Costa Rica, Cyprus, Denmark, Ecuador, El Salvador, Finland, France, Germany, Greece, Greenland, Guatemala, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea Republic, Macau, Malaysia, Malta, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Norway , Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, Thailand, Trinidad Tobago, Tunisia, Turkey, United Kingdom, Uruguay, USA, Venezuela.

[4] SITC denotes Standard International Trade Classification.

$$\Delta X_{i,t} = \Phi_0 + \Phi_1 Devalue_{i,t-1} + \Phi_2 Devalue_{i,t} + \Phi_3 Devalue_{i,t+1} + \Phi_4 \Delta FY_t + \varepsilon_{i,t} \quad (1)$$

where $\Delta X_{i,t}$ is the change in real exports of commodity *i* in year *t*; nominal exports have been deflated by the corresponding export unit value to make it real. $Devalue_{i,t-1}$ is a dummy variable equal to 1 if the country which exports commodity *i* will have a devaluation in the next period (following the 15% rule); $Devalue_{i,t}$ is a dummy variable equal to 1 if the country which exports commodity *i* will have a devaluation in period *t*; $Devalue_{i,t+1}$ is a dummy variable equal to 1 if the country which exports commodity *i* had a devaluation in the previous period; ΔFY_t is the change in real world income in year *t*; and $\varepsilon_{i,t}$ is an independent and identically distributed error term with zero mean and constant variance. The Devalue term reproduces the effect of a real devaluation in year *t* while isolating effects in the periods before and after the devaluation. World gross domestic product in 2000 constant US dollars is the proxy variable for foreign income. The change of this variable explains the effect on export growth. Both $\Delta X_{i,t}$ and ΔFY_t have been constructed the same way, that is, taking natural logarithms on levels and then first differences. The results are per cent changes.

3.3 Results

The empirical analysis included 65 commodities. They were chosen according to the variety of products exported by the group of 67 countries representing the global economy in this sample. Table 1 reports estimates of equation 1. The pooled cross-section technique involves the computation of either fixed or/and random effects for the corresponding countries.[5] We used the model selection criteria based on the Hausman (1978) test to decide what effect would fit better the model. This is a formal test of equality of the coefficients estimated by the fixed and random effect estimator. If the coefficients differ significantly, either the model is misspecified or the assumption that the random effect is correlated with the regressor is incorrect. The test indicated that the fixed country effects model was the best fit. The majority of the regressions follow the fixed effects model.[6] This assumes that real exports, which is the explanatory variable, affect countries (cross-section units) equally. Differences among units caused by their own features are captured by the intercept.

Table 1. Regression estimates: effects of real devaluation on export growth

Dependent Variable	Devaluation dummies			Foreign Income	Num. Obser.
	D_{t-1}	D_t	D_{t+1}	DLFY	
Live animals (00)	0.010	-0.106***	-0.040	1.975***	1560
	(0.026)	(0.033)	(0.027)	(0.871)	
Meat and preparations (01)	-0.019	-0.032**	-0.021*	2.447***	1604
	(0.015)	(0.016)	(0.015)	(0.499)	

[5] The number of time observations is smaller than the units or countries, 30 versus 67; therefore we refer to the current analysis as pooled cross-section.

[6] Hausman test results are available from the authors upon request.

Dairy products and eggs (02)	-0.022 (0.018)	-0.064*** (0.019)	-0.028 (0.019)	1.091** (0.550)	1567
Fish and preparations (03)	0.041** (0.012)	-0.054*** (0.012)	-0.043*** (0.012)	2.790 (0.399)	1635
Cereals and preparations (04)	0.008 (0.021)	-0.091*** (0.022)	-0.015 (0.021)	1.981*** (0.656)	1616
Fruit and vegetables (05)	0.031*** (0.010)	-0.048*** (0.011)	-0.033*** (0.010)	1.756*** (0.368)	1633
Sugar, honey, and preparations (06)	0.006 (0.014)	-0.068*** (0.015)	-0.018 (0.015)	2.656*** (0.903)	1615
Coffee, tea, cocoa, spices (07)	-0.031** (0.015)	-0.086*** (0.015)	-0.017 (0.015)	2.754*** (0.586)	1629
Animal feeding stuff (08)	0.003 (0.018)	-0.083 (0.019)	-0.001 (0.018)	1.404** (0.589)	1625
Miscellaneous meat preparations (09)	0.018 (0.014)	-0.101*** (0.014)	-0.032** (0.014)	0.210*** (0.458)	1616
Beverages (11)	0.006 (0.014)	-0.087*** (0.014)	-0.044*** (0.014)	1.874** (0.460)	1632
Tobacco and manufactures (12)	-0.037 (0.018)	-0.084*** (0.019)	-0.022 (0.019)	0.355 (0.632)	1587
Hides, skins, fur skins, raw (21)	0.079*** (0.024)	-0.027 (0.025)	-0.057*** (0.025)	7.517*** (0.723)	1520
Oil-seeds, nuts, kernels (22)	0.037 (0.036)	0.016 (0.038)	-0.008 (0.037)	3.195*** (1.193)	1514
Rubber, crude and synthetic (23)	-0.006 (0.027)	-0.065** (0.028)	-0.028 (0.027)	4.966*** (0.755)	1376
Wood, lumber and cork (24)	-0.012 (0.018)	-0.081*** (0.019)	0.001 (0.019)	5.073*** (0.582)	1610
Pulp and waste paper (25)	0.035 (0.07)	-0.045 (0.08)	-0.090 (0.08)	7.964*** (2.627)	1482
Textile fibres (26)	-0.015 (0.019)	-0.043** (0.020)	-0.001 (0.020)	5.251*** (0.608)	1574
Crude fertilizers and minerals (27)	-0.004 (0.012)	-0.086*** (0.013)	-0.011 (0.013)	3.586*** (0.428)	1611
Metalliferous ores, scrap (28)	-0.046*** (0.017)	-0.053*** (0.018)	-0.034** (0.017)	8.888*** (0.587)	1627
Crude animal and vegetable materials (29)	0.020 (0.011)	-0.057*** (0.011)	-0.046*** (0.011)	2.851*** (0.370)	1643
Coal, coke, briquettes (32)	0.010 (0.126)	0.062 (0.130)	-0.279** (0.127)	2.453 (4.270)	1161
Petroleum and products (33)	-0.083*** (0.022)	-0.049** (0.024)	0.044** (0.023)	6.031*** (0.754)	1612
Gas natural and manufactured. (34)	-0.055 (0.047)	-0.046 (0.050)	0.022 (0.049)	2.681* (1.429)	1246

Fixed vegetable fats and oils (42)	0.0089 (0.029)	0.018 (0.030)	-0.033 (0.030)	3.331*** (2.454)	1537
Processed animal, vegetable fats and oils, etc (43)	-0.047 (0.087)	0.097 (0.092)	-0.176** (0.089)	-2.862* (3.036)	1442
Organic chemicals (51)	-0.009 (0.014)	-0.044*** (0.015)	0.025 (0.015)	4.862*** (0.476)	1599
Inorganic chemicals (52)	0.021 (0.014)	-0.065*** (0.015)	0.007 (0.015)	4.829*** (0.469)	1604
Dyes, tanning, colour products (53)	0.006 (0.013)	-0.080*** (0.014)	-0.019 (0.014)	3.570*** (0.439)	1618
Medicinal, pharmaceutical products (54)	-0.003 (0.012)	-0.092 *** (0.012)	-0.046 (0.012)	0.305 (0.377)	1626
Perfume, cleansing preparations (55)	0.016 (0.013)	-0.099*** (0.013)	0.042*** (0.013)	1.719*** (0.399)	1621
Fertilizers manufactured (56)	0.100 (0.083)	-0.170* (0.088)	0.025 (0.086)	3.470 (2.936)	1445
Explosives pyrotechnic products (57)	0.068 (0.087)	-0.046 (0.091)	-0.066 (0.090)	-3.147 (2.966)	1297
Plastic materials (58)	0.032** (0.014)	-0.081** (0.015)	-0.019 (0.015)	5.308*** (0.452)	1608
Chemical materials (59)	-0.098*** (0.012)	-0.002 (0.013)	0.008 (0.013)	1.575*** (0.404)	1559
Leather manufactures (61)	0.042 (0.046)	0.002 (0.049)	-0.008 (0.048)	4.356*** (1.639)	1626
Rubber manufactures (62)	0.021 (0.014)	-0.086*** (0.015)	-0.022 (0.015)	3.488*** (0.455)	1609
Cork and wood manufactures (63)	0.017 (0.015)	-0.099*** (0.015)	-0.020* (0.015)	4.098*** (0.479)	1643
Paper, paperboard and articles of paper pulp (64)	0.009 (0.013)	-0.074*** (0.014)	-0.035*** (0.014)	3.309** (0.407)	1626
Textile yarn, fabrics (65)	0.021** (0.010)	-0.076*** (0.011)	0.002 (0.011)	2.802*** (0.340)	1649
Non-metallic mineral manufactures (66)	0.029** (0.012)	-0.091*** (0.012)	-0.013 (0.012)	3.690*** (0.396)	1647
Iron and steel (67)	0.019 (0.015)	-0.054*** (0.016)	-0.040*** (0.016)	5.863*** (0.497)	1614
Non-ferrous metals (68)	0.009 (0.014)	-0.064*** (0.015)	-0.020 (0.015)	7.468*** (0.496)	1626
Manufactures of metals (69)	-0.002 (0.012)	-0.110*** (0.012)	-0.032*** (0.012)	2.251*** (0.377)	1631
Power-generating machinery	-0.018*	-0.072***	0.003	2.626***	1585

and equipment (71)	(0.017)	(0.018)	(0.018)	(0.526)	
Machinery for particular industries (72)	-0.006* (0.015)	-0.099*** (0.016)	-0.027* (0.016)	3.574*** (0.482)	1609
Metalworking machinery (73)	0.023 (0.019)	-0.137*** (0.020)	-0.041** (0.020)	4.961*** (0.626)	1555
General industrial machinery, equipment and parts (74)	0.008 (0.012)	-0.115*** (0.013)	-0.028** (0.013)	2.541*** (0.412)	1611
Office machines (75)	0.054*** (0.019)	-0.064*** (0.019)	0.014 (0.019)	4.609*** (0.556)	1548
Telecommunications (76)	0.004 (0.0018)	-0.095*** (0.019)	-0.035* (0.019)	4.498*** (0.553)	1572
Electrical machinery, apparatus and appliances (77)	0.027** (0.012)	-0.097*** (0.013)	-0.025** (0.013)	3.289*** (0.398)	1617
Road vehicles (78)	0.044*** (0.016)	-0.121*** (0.017)	-0.030* (0.017)	3.038*** (0.489)	1592
Other transport equipment (79)	-0.025 (0.031)	-0.037 (0.032)	-0.027 (0.032)	0.437 (0.945)	1568
Furniture, bedding, mattresses (82)	0.060*** (0.014)	-0.104*** (0.015)	-0.030** (0.015)	3.294*** (0.450)	1617
Travel goods, handbags (83)	0.028 (0.018)	-0.065*** (0.019)	-0.041** (0.018)	4.809*** (0.577)	1614
Clothing (84)	0.053 (0.012)	-0.078 (0.012)	-0.019 (0.012)	2.893 (0.372)	1639
Footwear (85)	0.044*** (0.015)	-0.081*** (0.016)	-0.051*** (0.015)	2.416*** (0.498)	1576
Professional, scientific and controlling instruments (87)	0.005 (0.012)	-0.108*** (0.013)	-0.012 (0.012)	2.351*** (0.382)	1575
Photographic apparatus, optical goods, watches (88)	-0.019 (0.015)	-0.060*** (0.016)	0.011 (0.015)	3.654*** (0.467)	1576
Miscellaneous manufactured articles (89)	0.021** (0.010)	-0.068*** (0.011)	-0.041*** (0.011)	2.941*** (0.347)	1647
Special transactions (93)	-0.010 (0.033)	-0.008 (0.035)	0.006 (0.034)	5.205*** (1.071)	1098
Zoo animals, pets (94)	0.033 (0.032)	-0.115*** (0.033)	-0.016 (0.033)	3.876*** (0.964)	1416
War, firearms, ammunition (95)	-0.234 (0.134)	0.464*** (0.142)	-0.221 (0.139)	-3.511 (4.587)	1106
Coin other than gold (96)	0.227 (0.237)	0.046 (0.251)	0.182 (0.250)	3.718 (8.183)	727
Gold, non-monetary (97)	-0.051 (0.139)	0.138 (0.146)	-0.076 (0.143)	-6.338 (4.697)	1109

Estimates of standard errors, in brackets, are computed using Cross-section weights PCSE (Panel Corrected Standard Errors) method which corrects for any panel heteroskedasticity. *** Significance at 1% level. **Significance at 5% level. *Significance at 10% level.

Table 1 reports estimates for individual export commodity equations corresponding to each of the 65 commodities. A disaggregated analysis allows us to differentiate real devaluation impacts on each of two-digit SITC export categories. The most remarkable observation is that the short-run response is perverse in most cases for D_t. A real devaluation within the first year of implementation affects negatively real export growth in 51 cases.

A particular factor in the short-run responses is the currency in which trade is invoiced. A few months after devaluation, the original invoice prevails. This means that if prices were fixed in the domestic currency, exporters would receive what they expected. If they were fixed in US dollars, however, devaluation would augment the value of transaction. In this case, there should be no positive effect on exports when a devaluation of domestic currency occurs. Nevertheless, we should note that many exporting firms also finance their activity through dollars, including intermediate inputs. Therefore, when a significant devaluation takes place those companies face difficulties repaying their debt, paying the higher cost for inputs, and financing their exports. An additional burden is that these developing countries find it harder to obtain international credit. This situation may be worsened by episodes of capital flight that happens in countries where domestic currency has been devalued. An immediate consequence is that firms lose investments, slow down production and, therefore, exports.

The estimates for the forward dummy, D_{t+1}, reinforces the idea that a real devaluation worsens real export growth, although in this case we find that about 50 % of specific industry exports diminish one year after devaluation occurs. When the estimates for the lagged dummy, D_{t-1}, are significant, they are in general positive. From the total sample of industries, a devaluation that is going to occur in the following year increases exports in 20% of cases. Optimist expectations in the face of a real devaluation on international markets may lead to an increase in exports.

When examining the results closer we find that the greatest negative effects of real devaluations in period *t* are on exports of fertilizers manufactured (56), metalworking machinery (73) and road vehicles (78) which fall 17%, 13.7% and 12.1% respectively. In the period before a real devaluation takes place (D_{t-1}), exports of chemical materials (59), petroleum and products (33), metalliferous ores (28) and coffee tea, cocoa, and spices drop. The coefficients on these variables are 9.8% 8.3%, 4.6%, and 3.1%. The sectors most negatively affected by forward devaluation variable (D_{t+1}) are coal, coke and briquettes (32) that decrease about 28% and processed animal, vegetable fats and oils (43) that decline almost 18%.

Export sectors that experience a positive effect derived from a real devaluation are only a few. For example, in current period (D_t) there is only one industry that reacts positively before a devaluation which is war, firearms and ammunition (95). These exports improve about 5% when a significant devaluation occurs. Regarding the forward period (D_{t+1}), there are two sectors that have a positive influence which are petroleum and products (33) with a coefficient 4.4% and perfume and cleansing preparations (55) with a coefficient 4.2%. Most of the sectors that have a positive impact are included in the

lagged devaluation variables (D_{t-1}). The most significant ones are related to hides, skins, fur skins and raw (21) with 7.9% increase in exports and office machines (75) with 5.4% increase in exports.

If we observe the three dummy variables (D_{t-1}, D_t, D_{t+1}) we find that, in general, they do not have equal signs in the same regression, neither positive nor negative. The only exception is machinery for particular industries (72) which has negative effects on the three dummies although the estimate of D_{t-1} is on the margin, statistically and in value. The most common structure along the sample, whenever the three variables are statistically significant, is having positive coefficients on the lagged variable (D_{t-1}) and negative coefficients on the current (D_t) and forward variable (D_{t+1}). This suggests that when a real devaluation is going to take place, positive expectations exert a positive influence on export growth. However, when devaluation really happens, export growth worsens during the current and the following year offsetting the initial effects. Thus, fish and preparations (03), fruit and vegetables (05), electrical machinery (77), road vehicles (78), footwear (85), miscellaneous manufactured articles (89) all follow the structure of having significant dummy variables. They start as positive and change to negative values such that any positive effects on exports are offset by the negative ones during the current and next year of devaluation.

It should be noted that there are some export sectors that do not evidence statistical relationship with real devaluations (12 sectors or 18% of the sample). These sectors are: animal feeding stuff (08), oilseeds, nuts, kernels (22), pulp and waste paper (25), gas natural and manufactured (34), fixed vegetable fats and oils (42), explosives pyrotechnic(57), leather manufactures (61), other transport equipment (79), clothing (84), special transactions (93), coin other than gold (96), gold, non-monetary(97).

Finally, we find that unlike real devaluations, changes in foreign income improve export growth in 54 out of 65 industries. This represents more than 80% of export-oriented industries. Most of income elasticities range from 2 to 5. This result is consistent with those of most international trade models and confirms the influence that foreign income has as a main determinant of export behaviour.

4. Conclusion

Many countries have, more often than not, resorted to devaluations as a policy instrument designed to align an economy. They have attempted, this way, to diminish their external imbalances, increase international competitiveness and, hopefully, stimulate economic growth by promoting exports. These tasks can be accomplished if, in the first place, devaluations are taken in real terms and, second, if exports respond to relative prices in a meaningful and predictable mode. The present paper analyzes, in a direct way, the short-run effects of real devaluations/depreciations on disaggregated exports for 67 countries around the world. Many of these countries have experienced important episodes as to managing their exchange rates in the study period (1976-2006). It is important to note that when the analysis is carried out with aggregated data, the outcomes may be misleading. We have proved with this research that a real devaluation has different impacts in both signs and magnitudes for each export sector. Nevertheless, the evidence is that most of these effects are negative.

Devaluation in period t has contractionary effects on real exports in 80 per cent of specific export sectors. Real devaluations have, then, perverse consequences regardless the category where exports are classified. They affect a variety of industries without distinction as to whether products incorporate more added value or less added value. Only 1 out of 65 industries experiences favourable effects from a real devaluation in the current period (*t*). Positive effects are increased when taking into account lagged devaluations (D_{t-1}). The number of industries in this case increases to 10 although the initial positive effects are more than offset in the following two years.

The economic theory points out that in the face of a real devaluation in the short run, export demand elasticities may be positive and relatively low because existing contracts must still be honoured. One reason that could explain the perverse impact in the majority of export industries has to do with a feature that characterizes most of financing activities around the world. Many firms are indebted in dollars which means that they not only lose the incentive to invest and increase production capacity in order to supply foreign markets but also they have to repay higher debt. In the latter case, some are forced to close down their businesses as they cannot honour their debt obligations. Moreover, devaluations involve significant capital flight. This negatively affects domestic economies, investment, and production. Therefore, export sectors also suffer. Thus, in face of devaluation, developing countries find it harder to obtain international credit. This, undoubtedly, places them into a more difficult position.

Policy makers should carefully examine their country's export portfolio before recommending uniform devaluation. The effects of devaluation for a country's economy will depend on the weights of those industries exerting a negative impact on trade. Economic authorities should weigh exchange rate policies examining whether or not the particular industry is affected negatively and the importance role of that sector in the country's economy. If the export sector is crucial to the economy, then, it is likely that targeted policy solutions addressing aspects such as productivity, quality, and fiscal matters among others may be more advisable for stimulating exports in the short term.

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