WORKING paper

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Exchange Rate Undervaluation and African Surges: What Do We Learn From Exported Products?

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ABSTRACT

We investigate the role of undervaluation of African currencies in export "surges" of some primary and manufactured goods. We calculate country-product specific misalignments on the basis of the absolute purchasing power parity principle adjusted for the productivity level. Using a panel of 41 African countries and a basket of 149 primary and manufactured exported goods (4-digit HS code), we identify 96 export surges over the period 1995-2017. The complementary log-log (cloglog), which more appropriately treats rare events, brings to light undervaluation as an influential determinant for triggering an export surge then sustaining it over time. This effect is controlled for relevant covariates. Results prove robust to alternative calculations of export surges and to different estimators used in regression analyses.

Keywords: Exports Surges, Competitiveness, Exchange Rate Misalignements, Developing Countries

JEL classification: F14, O24, O55

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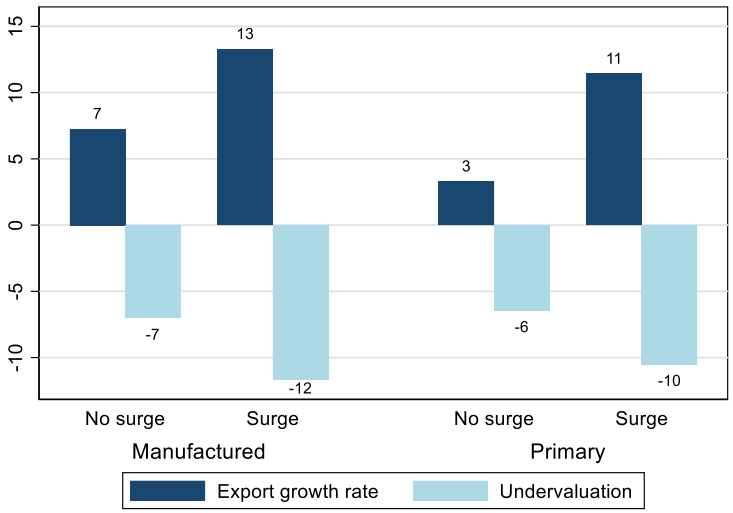
NON-TECHNICAL SUMMARY

Export growth has been a key factor in achieving sustainable development for many emerging and developing countries, notably in South and Eastern Asia. Such long-run effects are predicated on the growth of a strong export sector and product portfolio, which ensures successful integration in international trade. Export growth itself may bring about economic specialization and structural change in the non-export growth sector, with indirect and sectoral feedback effects at the root of economic emergence. A key issue in export-led growth strategies, competitiveness is a multi-faceted objective, which entail both product-specific productive efficiency, pricing choices and wider structural components, such as business climate or the quality of macroeconomic management.

For small open economies in Africa, competiveness represents a major challenge in so far as the combination of a weaker business, imperfect competition or failures for instance in logistics and labor market may challenge export capacity. African countries also rely on intermediary goods for up to 60% of export values and may be subject to high transaction costs. In low income countries with weaker and less competitive transport and logistics infrastructure, such costs may rise to 15-20% of the cost of an imported container. Aligning production costs to those of foreign competitors is also paramount for countries with limited ability to influence prices on international primary or manufactured products markets.

Unweighted average annual growth rate of exported products and average undervaluation of exchange rates by product
(Period 2001-2017, exports at constant prices, in %)



N.B. Given the time span referenced in the surge definition (7 years), surges are only observable from 2001 onwards over the sample period (1995-2017). Source: Authors using BACI 2019.

Recent literature has shown exchange rate undervaluation to be a driving force of economic performance either at the aggregated level for GDP acceleration, or at the sectoral level for exports. In this context, one important question pertains to the determinants of African

export “surges”, that is episodes during which exports of a given country has outpaced past trends and translated in gains in world market share. To our knowledge, research on the relation of export product surges and by product exchange rate misalignment has not been explored so far. Such export surges may be particularly important for overall export, and GDP growth, if they are sustained over time. They are more susceptible to bring about structural change than temporary export performance and variations of markets share driven by the business cycle or international market price changes.

While empirical research has already highlighted the relationship between export growth and exchange rate misalignments, we focus on how this particular determinant of product competitiveness may affect export surges and whether such effects are sustained beyond the take-off phase. Using a panel of 41 African countries and a basket of 149 primary and manufactured exported goods (4-digit HS code), we identify 96 export surge episodes with a 7-year time span over the period 1995-2017. The empirical analysis is based on the complementary log-log (cloglog) model for a binary dependent variable. It differs from the logit and probit models by its non-symmetric transformation allowing an appropriate treatment of rare events. It shows that exchange rate undervaluation may be an influential determinant for triggering and maintaining export surges in Africa.

Sous-évaluation du taux de change et poussées d’exportations africaines : que nous apprend une analyse par produits ?

RÉSUMÉ

Nous étudions le rôle de la sous-évaluation des monnaies africaines dans les poussées d'exportations de certains produits primaires et manufacturés. Nous calculons les désalignements spécifiques aux pays et aux produits sur la base du principe de parité de pouvoir d'achat absolu ajusté pour le niveau de productivité. En utilisant un panel de 41 pays africains et un panier de 149 produits primaires et manufacturés exportés (code HS à 4 chiffres), nous identifions 96 poussées d'exportation sur la période 1995-2017. Le modèle cloglog, plus approprié pour traiter des événements rares, met en évidence la sous-évaluation comme un déterminant significatif pour déclencher et maintenir une poussée d’exportations. Cet effet est contrôlé pour les covariables pertinentes. Les résultats s'avèrent robustes aux calculs alternatifs des poussées d'exportation et aux différents estimateurs utilisés dans les analyses de régression.

Mots-clés : poussées des exportations, compétitivité, mésalignements des taux de change, pays en développement

Les Documents de travail reflètent les idées personnelles de leurs auteurs et n'expriment pas nécessairement la position de la Banque de France. Ils sont disponibles sur publications.banque-france.fr

Introduction:

Recent literature has shown undervaluation to be a driving force of economic performance either at the aggregated level for GDP growth surges (Hausmann, Prichett and Rodrik, 2005), or at the sectoral level for exports (Freund and Pierola, 2012 ; Nouira, Plane and Sekkat, 2011)[1]. We use this methodology over a large sample of African countries to explore export performance at the product level. To our knowledge, research on the relation of export product surges and by product exchange rate misalignment has not been explored so far.

(i) All primary and manufactured exports are within the scope of this study for 41 African countries, excluding minerals, energy, and raw materials whose competitiveness is affected by idiosyncratic characteristics, such as the quality of an operating mineral deposit. The empirical analysis is conducted at the 4-digit HS code level.

ii) We calculate yearly country-product real exchange rates using the ratio of PPP conversion factor to market exchange rate adjusted for the Balassa-Samuelson effect. As in Rodrik (2008), undervaluation levels are derived from the distribution of estimated misalignments.

The complementary log-log estimator is used, which is appropriate when the probability of an event is very small, to identify what determines the surge (takeoffs or triggers) and the maintenance of performance over the time period that the surge lasts. We present cloglog regressions for lumped primary and manufactured products then for each of the two categories, controlling for relevant covariates. The determinants of surges, and in particular the impact of undervaluation, is found to vary across product categories (as already shown by Rodrik, 2008).

On average, over the period and the 41 African sample countries, the exported products we consider account for 78% of primary and 51% of manufactured products. With respect to export surges, 96 events are detected. The unconditional probability for an episode to occur is 2.3%, slightly higher for primary products. The cloglog estimator suggests that country product undervaluation preceded the surge. A one standard deviation of the undervaluation level increases the probability of this rare event by respectively 1.6 percentage points for primary products and 0.7 for manufactured goods, i.e. 22 and 11 percent increases in the occurrence of export surges. When extending econometric analysis beyond the onset phase to analyze exports dynamics during the surge period, we find no significant changes. These conclusions are also fairly robust to changes in the parameters

defining the export surge and on the use of the Rare events logistic regression (Relogit) estimator as an alternative to the cloglog estimator.

The remainder of the paper is structured as follows. Section 1 focuses on transmission channels from exchange rate misalignments on the occurrence of an export surge and calculations of country-product undervaluation levels. Section 2 depicts the methodology underlying the measurement of export surges, including the choice of the estimator to identify the determinants of take-offs and the maintenance of surges. We also provide statistical information about the data we use. Section 3 comments results and section 4 submits them to robustness checks. Section 5 concludes.

I. Misalignments, competitiveness, and export surges

1. Price-competitiveness and product export surges

For each product, the exporter must align its costs with those of foreign competitors to avoid reducing its profit margin. (Nouira *et al* 2011). Competitiveness depends on the primary factors of production and their productivity as well as the cost of purchased intermediate goods. These represent often more than 60% of gross export values. In low-income economies with market failures and weak institutions, the higher the share of intermediate goods, the higher the transaction cost level, with transport and logistics typically accounting for 15% to 20% of the value of an imported container at destination. Such high-cost levels may stem from the geographical distance to developed markets, but also from dysfunctions in the soft infrastructure, especially in the logistics chains, starting with port and customs administration, or imperfect competition in transport services. Bribes and bad institutional regulations often add to the cost level of non-tradable transport services (Plane, 2021). In many African countries, access to electricity is also a problem. It may be unreliable and expensive, with low and medium voltages prices reaching more than 10 US cents per kWh, twice as much as for their Asian competitors in the world market of processed agricultural or manufactured products. Power shortages represent a significant bottleneck, leading some firms to use in-house electricity generators. This entails high social costs, as the private cost per kwh may end up being twice the official price of national, often public, providers. Despite the average increase in broadband connectivity, access to Information and Communication Technologies (ICTs, thereafter) remains limited and costly, hindering potentially significant leapfrogging effects on productivity and private sector development, notably through financial inclusion (Chauvet and Jacolin, 2017). Access to NICT is often penalized in Africa by low population densities, poor infrastructure due to the landlockedness or remoteness to markets.

Accordingly, competitiveness and the ability to export is linked to a price index with a broad coverage of goods such as the general price level, not of some specific prices, including

the labor cost.[2] The poor quality of the business environment favors the production of non-tradables whose extra costs can be passed on consumers, depending on the extent of domestic competition and the price elasticity of the demand. Removing price distortions, reducing transaction costs and the resulting bias on the production structure can then be a matter of exchange rate adjustments. As Rodrik (2018) mentions, a real exchange rate depreciation is effectively a subsidy on all tradables, a way of undoing the costs imposed by the business environment in a relatively quick and easy manner.

Given the importance of competitiveness and the prominent role of the real exchange rate in underpinning export performance, how is a surge defined? For a country and a product, a surge is characterized by both a significant increase in the past trend and an outperformance in terms of change in world market share. Hausmann *et al* (2005) pioneered the use of surges to study growth accelerations of per capita GDP. With some methodological variations, and focusing on export surges of aggregated manufactured products, Freund and Pierola (2012) estimate that both undervaluation and the reduction of the exchange rate volatility account for the occurrence of these rare events.[3] Undervaluation of the currency improves national firms' intensive and extensive margins -i.e., the emergence of new products and the openness of new export markets. This positive outcome is in line with what Rodrik (2008) finds at the macroeconomic level. Palazzo and Rapetti (2017) also rely on the growth acceleration methodology to investigate the long run export performance of Argentina (1980-2015). They highlight that the highest proportion of surges occurred over the period 2003-2008, when the country maintained a stable and competitive exchange rate that benefited labor-intensive industries the most. Following Baldwin and Krugman (1989), and Dixit (1989), Guzman et al (2018) also argue that a Stable and Competitive Real Exchange Rate (SCRER) has a positive impact on the tradable sector, spurring apprenticeships in an environment of uncertainty, and significant fixed and sunk costs.

2. Measuring product-specific exchange rate undervaluation

For a small open economy, the absolute PPP criterion, adjusted for the country productivity level, sheds some light on the potential profitability of a given product. Assuming that the export price of a 4-digit HS code product is the same for all producers (i.e., the law of one price), we interpret misalignments relative to major foreign competitors on this product as an indicator of cost competitiveness. The general price level, a weighted average of the price of tradables and non-tradables, reflects the domestic production costs of exported goods, and hence the potential unit cost differences between exporting countries once international differences in productivity levels have been considered. That being said, let's stress some features of export surges and their relationship to exchange rate misalignments.

(i) First, the export surge of a product is a specific measure, by no means a single measure of performance. Because of the criteria underlying its calculation, a country that experiences a high but steady export growth on a product does not induce a surge although the growth can be far above that of the world economy. The presence of a break with the past export performance conditions the onset surge.

(ii) Second, our reference to the concept of "misalignment" should not be misleading. It has no normative implication for the equilibrium exchange rate of a domestic currency, which is based on the macroeconomic performance as measured by the country's internal and external balance. In other words, a country may experience undervaluation in the case of some export products and an overvaluation for others while keeping a global macroeconomic equilibrium. Therefore, measures of misalignment by product depend on the competitors the country faces in the world market. They have no direct implication per se for the appropriateness or not of the real exchange rate for the whole economy.

(iii) Third, the number of exported products per country is set at a maximum of ten, respectively 5 agricultural and 5 manufactured products. By doing so, we consider traditional products but also products of manufacturing diversification. The composition of the basket being constant and the choice of products based on the structure of exports over the period 2009-2013, the performance measure is not exclusively but mainly centered on the intensive margin. The extensive margin only arises through the potential opening of new markets. In our calculation of the surge, we are indifferent to the geographical orientation of the country's export flows.

iv) Fourth, the limited number of selected products is appropriate for most African countries. The inclusion of a sixth product for each of the two categories would refer to trade flows that are generally very limited in value and discontinuous in time. Our five-product option is however restrictive for a small number of large and developed economies for which underestimation of the number of export surges is likely. This is the case for North African countries. This limitation is the price to pay to get a continental picture avoiding overrepresentation of some large middle-income economies within the sample.

On yearly basis, we measure all country-product exchange rate misalignments. For any African country compared to the United States, we define a relationship between the purchasing power parity conversion factor in domestic currency (PPP) and the official exchange rate (ER) (i.e. number of national currency units per U.S. dollar). The ratio of these values from the World Development Indicators of the World Bank provides a Real Exchange Rate (RER). The PPP conversion factor has the advantage to be a GDP deflator. It refers to all expenditure components and thus combines the domestic price of tradables and non-tradables. This large statistical coverage of goods and services is appropriate for measuring

competitiveness as defined by a unit relative cost. We have mentioned with Gelb (2016) that beyond labor and capital costs, many intermediate non-tradable goods penalize African export competitiveness.

$$RER_{ct} = \frac{PPP_{ct}}{ER_{ct}}$$

Calculated ratios vary between 0 and 1. The upper bound reflects the value for the United States, the common reference for all countries. For a country (c) a ratio lower than unity in year (t) means an undervaluation insofar as the domestic purchasing power of the currency turns out to be higher than what the official exchange rate suggests. An appropriate interpretation of these ratios requires to adjust them for the impact of the productivity level of tradables on the price of non-tradables (i.e., Balassa – Samuelson effect). RERs ratios are then regressed on per capita GDP levels by considering a worldwide sample including high income level economies. By doing so, we obtain by-country yearly misalignments that reflect more or less the deviation to the long run international convergence rule of non-tradable good prices.

The relationship of a domestic currency to the dollar is not sufficient. African countries are systematically undervalued on the basis of the absolute PPP criterion, and a lot of them remain so after adjusting the price of non-tradables for productivity differences. Moreover, on each export product, effective competition is of course not restricted to U.S. exporters. Consequently, it is appropriate to measure country-product competitiveness by considering an appropriate set of competing countries. Based on misalignments with respect to the US dollar, by product (p) and year (t), the misalignment of a country is determined with respect to the most important exporting countries he faces. To do this, given a country (c), we calculate the difference between the misalignment of its currency and that of the ten trading competitors (j), each weighted by its average contribution into the world exports of the specific product over the period 2009-2013 (ρj). The group of countries exporting the product is constant over time. Changing the size or composition of this group would be problematic. Indeed, some small exporters do not have continuous export flows in the empirical period considered, so that changes in the weighting scheme would complicate the interpretation of the misalignments. The choice is made to maintain a fixed weighting scheme, regardless of the period in which the accelerations are realized. The focus on major global exporters and not on competitors selling in the same destination country is also understandable even if the result is to ignore the impact of physical, historical, or cultural distances. Bilateral export surges would not make much sense in our empirical framework. All else being equal, they would imply that a country's export performance, as measured by surges, could be penalized by a geographic reorientation of export flows. For both primary and manufactured goods, the average coverage of world exports is 72 percent in both cases, with a minimum of 52 percent and 42 percent respectively for each of these two types of products.

First, yearly country misalignments are identified from regression residuals on the largest sample of world economies (u_{ct}):

$$\log(RER)_{ct} = \alpha + \beta \log(GDPPC)_{ct} + f_t + u_{ct}$$

With f_t , year-fixed effects and $u_{ct} < 0$, undervaluation or $u_{ct} > 0$, overvaluation.

Second, from the misalignments as determined by the above regression, for a product (*p)* and a country (*c*), we calculate the microeconomic misalignment in year (*t*) as follows, ρ_j being the share of the *j-th* trading competitor in worldwide exports of the specific product.

$$Misalignment_{cpt} = [\, u_{ct} - \sum_{j=1}^{10} \rho_j u_{jt}]$$

Misalignments are calculated under assumptions close to those used in the application of the absolute PPP theory. (i) By using the general price level, we assume that the law of one price holds for each tradable and that misalignments only result from non-tradable prices that the productivity of tradables does not justify. (ii) In the absence of any specific information, we hypothesize that for each country, the productivity for a specific product matches with that of the average economy as reflected by the per capita GDP.

II. Methodology and data

1. Identification of export surge episodes

We define $v_{c,pt}$ as the value of exports of the product p from a country c at time t and the real growth rate of product exports $g_{c,p,t} = \Delta\ln(v_{c,pt})$. Initiation is the first year of a seven-year period of a specific product export surge (i.e., Take-off phase). Let $g^1_{c,p,t}$ and $g^0_{c,p,t}$ be the real average export growth during the take-off, and the seven-year pre-acceleration reference period, respectively. Briefly, the identification of an export surge episode relies on the joint application of four criteria:

Criterion 1. The average real export growth of the product during a seven-year take-off phase must be higher than the world average real growth.

$$g_{c,p,t} > \overline{g_p}$$

Freund and Pierola (2012) deflate exports at current prices by the US consumer price index (CPI). This option is questionable. Each tradable good has its own price evolution affecting the occurrence of a surge differently from what is assumed using the US consumer price index. Moreover, US retail prices depend on the productivity

and the labor market conditions of this domestic economy. To get values at constant prices, assuming the law of one price, the most relevant option is to use the specific export-product price. Accordingly, we deflate export value by the unit value index as determined from the ten major worldwide exporters of the given product over 2009-2013.

Criterion 2. The average real growth during the take-off phase must be 30% higher than that of the seven-year reference period (α = 1.3), and at least three percentage points higher than that of a seven-year reference period (β = 0.03).

$$g^1_{c,p,t} > \alpha \times g^0_{c,p,t} \text{ And } g^1_{c,p,t} > g^0_{c,p,t} + \beta$$

Criterion 3. The minimum value of exports during the take-off period should be higher than the maximum pre-take-off value in order to filter out surge episodes resulting from volatility phenomena of the export volume.

$$min(v_{c,pt}, \dots, v_{c,p,t+6}) > \ max(v_{c,pt-7}, \dots, v_{c,p,t-1})$$

Criterion 4. The average post-take-off growth calculated by eliminating the year of highest growth must be higher than the average pre-take-off growth. This criterion eliminates the accelerations that would depend on a single year of strong export growth.

$$g^1_{c,p,t} \ \backslash\{max\ (g_{c,p,t} \dots, g_{c,p,t+6})\} > \alpha \times g^0_{c,p,t}$$

2. Data

BACI database (CEPII) is used, built from data reported to the United Nations Statistical Division (Comtrade). From this database, we constitute a three-dimensional panel of 41 African countries and 149 products (HS4) exported over the period 1995-2017. For each country, ten main products are retained, respectively five manufactured exports and five primary products. The inclusion of manufactured products, in equal numbers with primary products, has less to do with what these products generally represent in African exports than with what they are expected to contribute in the structural transformation of economies (Rodrik 2018). To be considered, a product must have been exported consecutively for at least three years during the period and represent an average export flow of at least one million dollars. We exclude some raw materials- i.e., fuels, mineral oils. We also leave aside products included in chapter 27 as well as chapters 84 and 86 to 89 of the HS 4 nomenclature, except for chapter 87 exports for 6 countries: Algeria, Egypt, Morocco, Nigeria, South Africa and Tunisia. Such product restrictions aim at excluding exports with little domestic added value. For most African countries, the restricted chapters account for either imported goods that are re-exported in neighboring countries (mirror data only provide an imperfect correction of

such trade), or sales of secondhand products such as helicopter exports that could be an export surge of Gabon (HS-8802) over the period we consider...

Table 1 displays the contribution of the 5 selected products for primary and manufactured goods, respectively. These ones are selected on the basis of their export value in their sectoral category over the period 2009-2013 to best reflect the recent African countries specializations. On average, the top 5 primary product exports, excluding crude oil, gas and minerals, account for 78% of the category over the 41 African countries with a minimum value for Egypt (32%) and a maximum for Cabo Verde, Chad, Comoros, Central African Rep, Equatorial Guinea, Guinea-Bissau (100%). Percentages vary across African sub-regions from 53% (Northern Africa) to 92% (Central Africa). For manufactured exports, the top five products account for 51% on average. The lowest percentage is for Liberia (0.45%) and the highest for Mauritania (100%). Manufactured product percentages are lower than those for agricultural products, reflecting a productive system with few opportunities for these products to be exported while satisfying the restrictions of the filter parameters of an export surge.

Table 1: Main products and their contribution to primary and manufactured exports
(In percentages, excluding crude oil, gas and minerals)

	Mean	Standard deviation	Lower Share	Higher share
Central Africa				
Primary	92	8	80(CMR)	100 (CAF, GNQ, TCD)
Manufactured	59	38	5 (COG)	97 (TCD)
East Africa				
Primary	75	16	52 (TZA)	100 (COM)
Manufactured	48	15	24 (KEN)	81 (MWI)
Northern Africa				
Primary	53	18	32 (EGY)	81 (DZA)
Manufactured	43	17	23 (EGY)	65 (DZA)
Southern Africa				
Primary	69	26	36 (ZAF)	97 (AGO)
Manufactured	31	15	11 (AGO)	43 (ZAF)
West Africa				
Primary	84	14	51 (SEN)	100 (CPV, GNB)
Manufactured	56	29	0,4 (LBR)	100 (MRT)
Africa (total)				
Primary	78	19	32	100
Manufactured	51	27	0	100

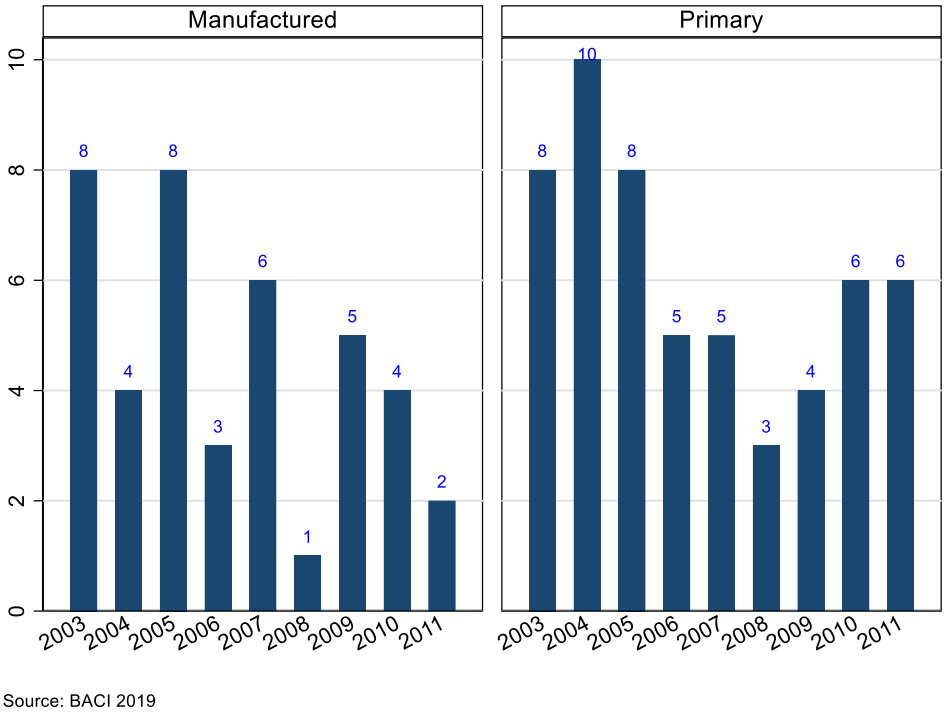
Source: Authors using BACI 2019. Countries are identified in the table by their ISO Alpha-3 code. Mean is the weighted average of the top 5 exported products over the period 2009-2013, excluding natural rent products and potential chapters for which we presume reexports or second-hand exports.

Applying the set of previously mentioned criteria to primary and manufacturing products yield 96 episodes of export accelerations over 2001-2011. Figure 1 shows when export surges occurred and Figure 2, their geographic distribution by product in Africa as well as their weight in the export basket. The earliest surge can only occur in 2001 (1995+6 years) and the latest in 2011 (2017-6 years).

The first occurrence dates back to 2003. Among the 96 episodes, 55 fall under the category of primary products, and 41 to manufactured products. Export surges are more frequent before the subprime crisis (2008) and the post subprime profile proves better for primary products, in relation with the Chinese economic growth, at least until 2011. To put it another way, although African market shares are very small for most manufactured goods, when the world economy slows down, it proves difficult for a country to increase its market share or to open new markets requiring to cover high fixed or sunk costs.

Figures 3 and 4 refer to export surges by product. For primary goods, cashew nuts (HS-0801) come first with 7 episodes. This new economic specialization is present in ten African countries, especially in West Africa. Vietnam is the world's largest processor ahead of India. It imports a lot from Côte d'Ivoire but is promoting a policy of setting up operations in nearby countries. Cocoa beans (HS-1801) follow with 6 episodes. Ghana and Côte d'Ivoire are the most important worldwide producers. Together they account for about 60% of the production. Natural rubber (HS-4001), and fruits (HS-0804) then come with 4 episodes each. As regard manufactured products, Portland cement (HS-2523) and transport articles (HS-3923) are the dominant ones, with 3 episodes each. The first product reflects the African dynamics of investments in both infrastructure and housing. These activities that benefited from the so-called "super-cycle" of raw materials have fueled the economic growth of a wide range of African countries and gave rise to intracontinental trade exchanges.

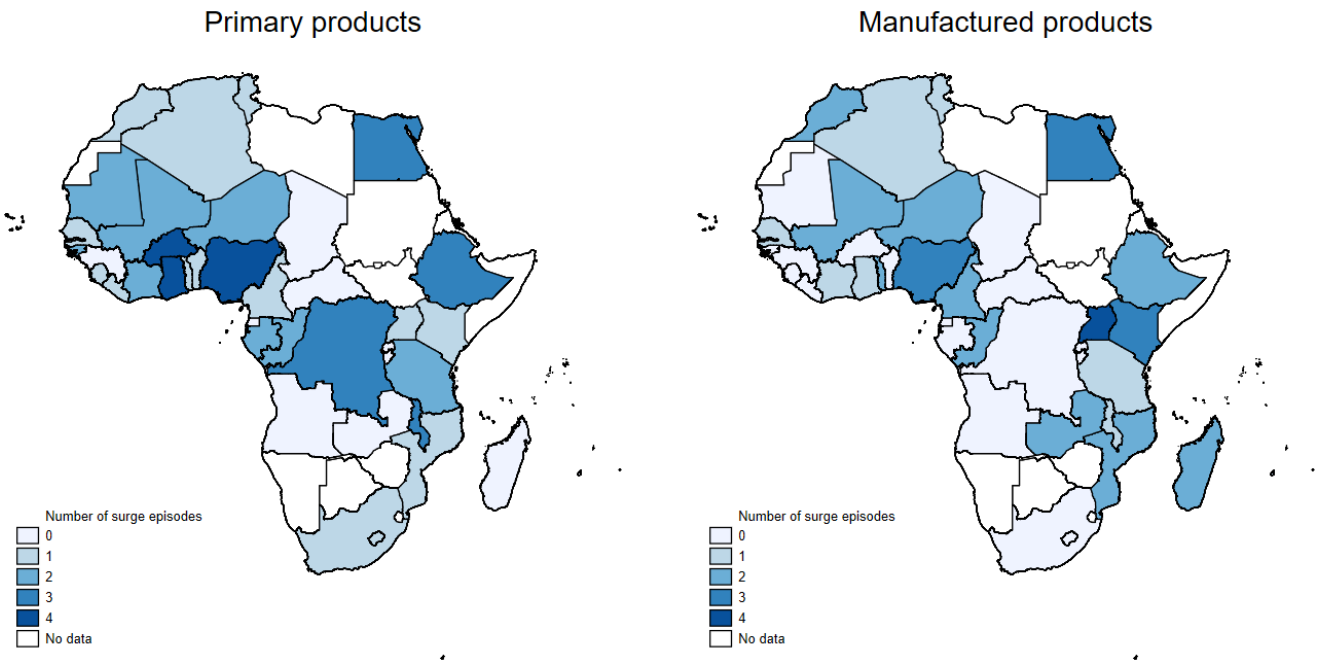
Figure 1: Africa and the timing of Export surges (by category, number of products)



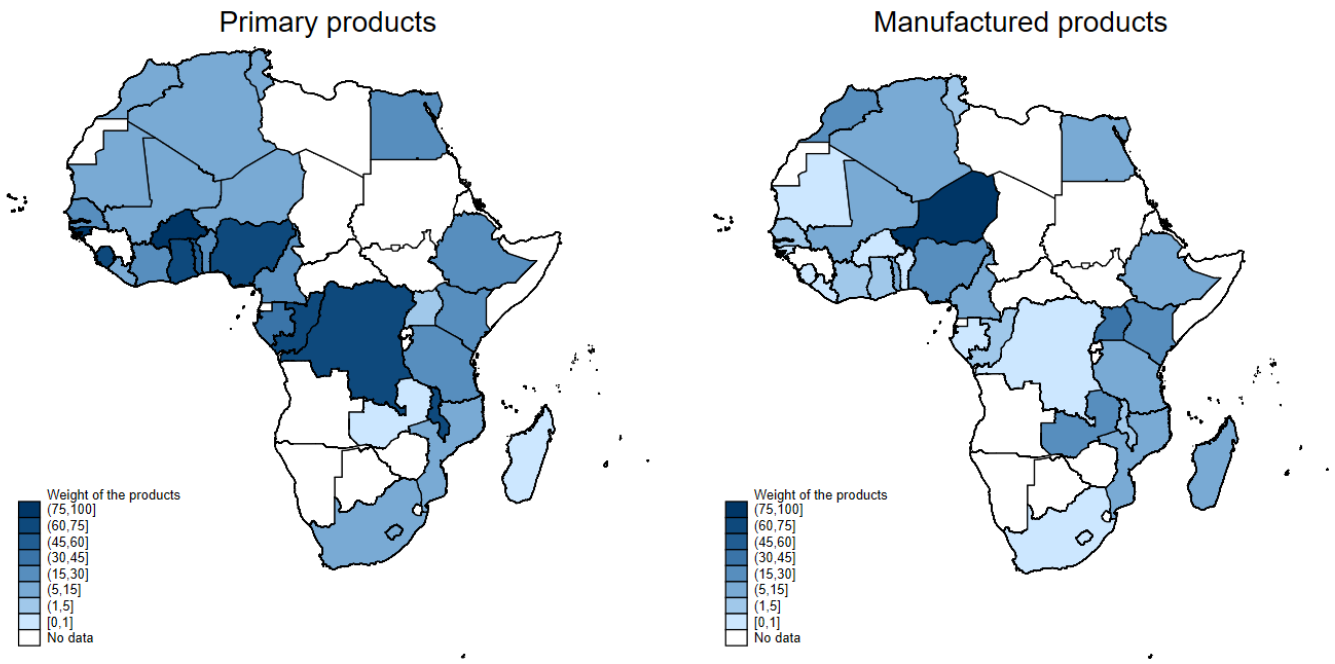
Source: Authors' calculations.

Figure 2: Geographical distribution of Export Accelerations

Number of surge episodes

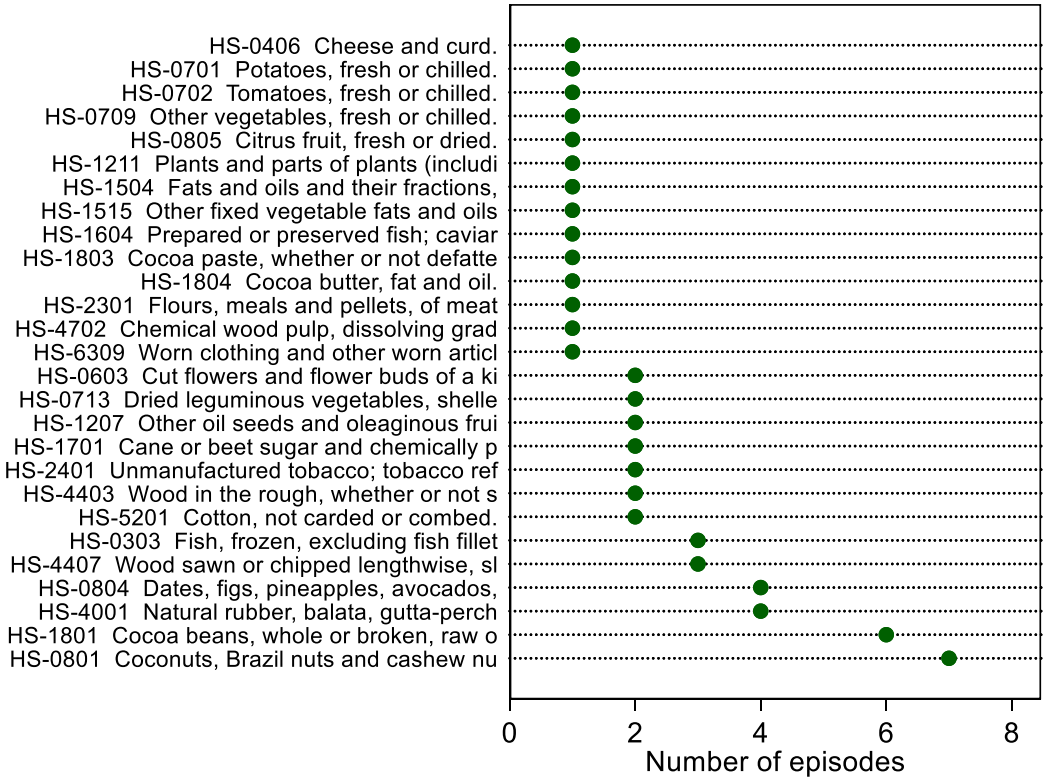


Percentage of product surges among all products considered for each category (%)



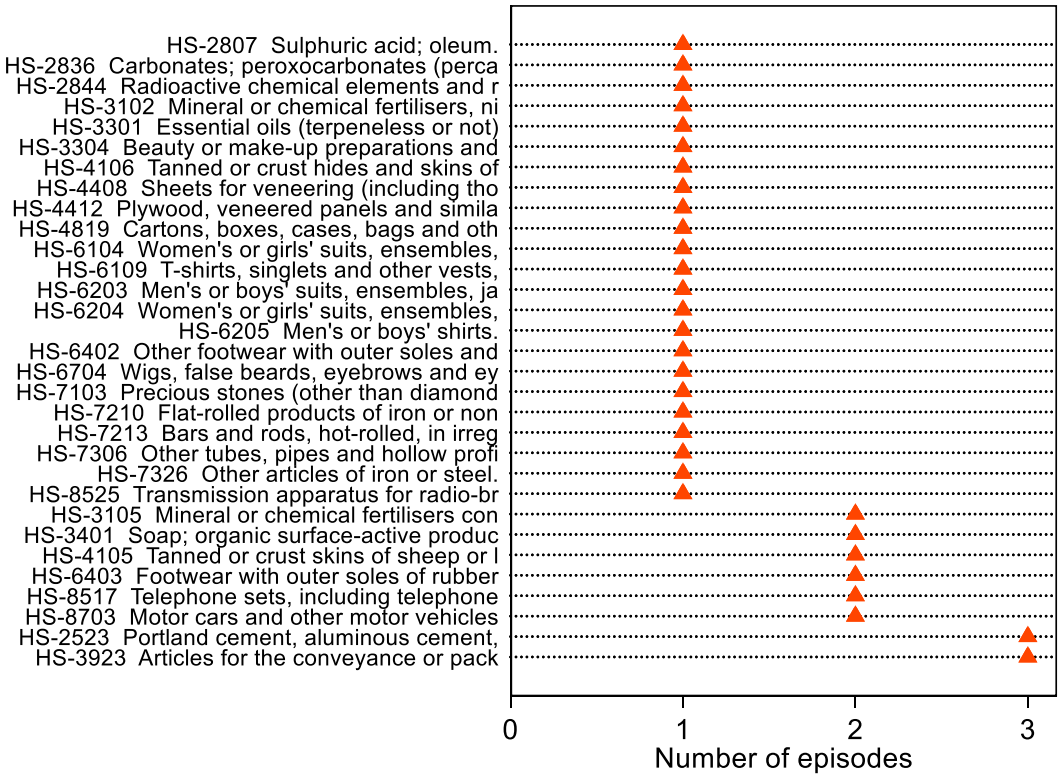
Source: Authors' calculations.

Figure 3: African export surges: primary products (2001-2011)



Source: Authors' calculations

Figure 4: African export surges: manufactured goods (2001-2011)



Source: Authors' calculations.

Table 2 mentions the unconditional probabilities of surges by type of products, per capita income levels, and regions. The occurrence of events is calculated over the total number of country-product-year observations for which an acceleration can potentially take place. As we focus on the onset of surges at this stage, the six years following the start of the episode are excluded as well as the years before 2001 and after 2011 where no surges are possible due to the defined event time span. We breakdown the whole period into two sub-periods separated by the Great Recession starting in end 2007 with the U.S. housing bubble and the global financial crisis.

Table 2: unconditional probabilities of surges over the period

	2001-2007	2008-2011	2001-2011
Overall probability	2,5%	2,1%	2,3%
By type of products			
Primary	2,6%	2,4%	2,5%
Manufactures	2,3%	1,7%	2,1%
By geographical regions			
Southern Africa	0,5%	1,7%	0,9%
Northern Africa	3,9%	1,3%	3,0%
Central Africa	2,6%	0,4%	1,8%
East Africa	2,9%	1,4%	2,4%
West Africa	2,1%	3,5%	2,6%
By per capita income quintiles			
1st quintile	0,6%	2,2%	1,1%
2nd quintile	1,4%	2,6%	1,7%
3rd quintile	3,5%	1,8%	2,8%
4th quintile	3,8%	2,3%	3,2%
5th quintile	3,7%	1,5%	2,8%

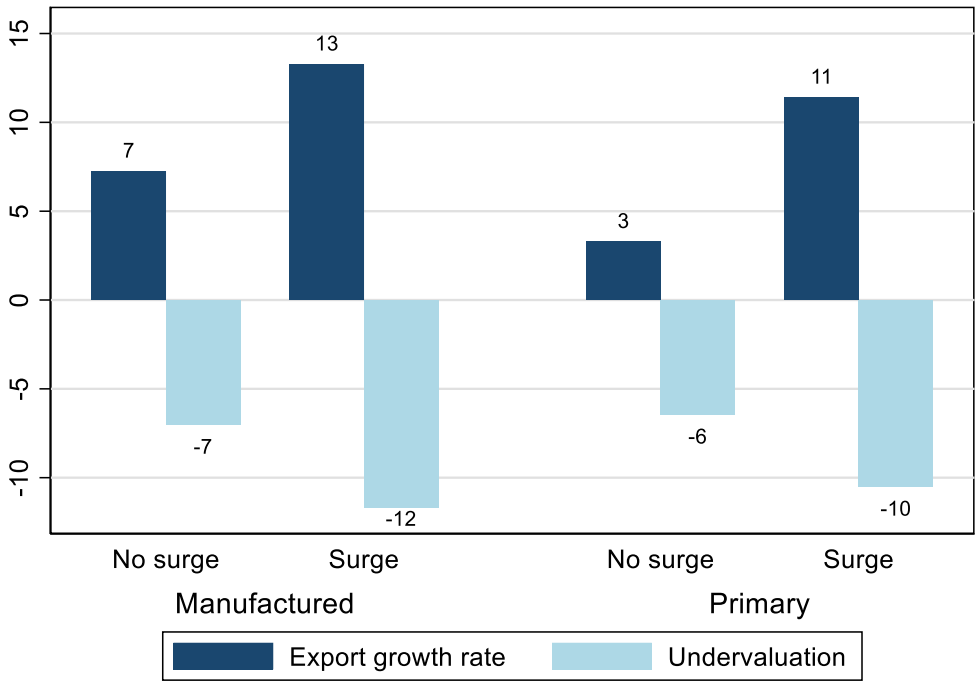
Source: Authors' calculations.

Over the whole period, the unconditional probability that an episode occurs is 2.3% with a higher probability for primary than manufactured products. An analysis by sub-regions shows that the occurrence of surges in North African countries is three times higher than in Southern Africa. Central Africa is particularly affected by the post 2007-2008 crisis, the unconditional probability of acceleration falling from 2.6 % over 2001-2007 to 0.4% after 2008. The lower part of Table 2 classifies export surges by quintiles of the per-capita income level of sampled countries. The first and second quintiles are less likely to experience an export surge than those from the third to fifth quintiles. Cerra and Woldemichael (2017) evidence similar results for more aggregated exports. This may reflect the fact that high-income countries are more successful in promoting manufactured exports. The diversification process is more difficult for low-income African agricultural exporters. Given the concentration on primary products where African market shares are non-negligible, it is more difficult to initiate export accelerations in manufactures.

How does export performance fit with exchange rate misalignments? Descriptive statistics already provide interesting preliminary information. In Figure 5 we compare all

country-product pairs with an undervaluation according to whether or not they experienced export surges over the period 2001-2017. Firstly, undervaluation goes hand in hand with higher export growth for both primary and manufactured products. Secondly, the country-product export gains associated with export surges are significantly higher in the case of primary products. The average annual export growth rate over the 2001-2017 period rises from 3 % in the absence of export surges (with an average devaluation of 6 %) to 11 % in the case of export surges (undervaluation of 10%). These descriptive statistics suggest that stronger export product-country performance has been concomitant with a product-specific undervaluation of the domestic currency vis-à-vis competing countries.

Figure 5: Unweighted average annual growth rate of exported products and average undervaluation of exchange rates by product
(Period 2001-2017, exports at constant prices, in %)



N.B. Given the time span referenced in the surge definition (7 years), surges are only observable from 2001 onwards over the sample period (1995-2017). *Source: Authors using BACI 2019.*

3. Predictors of the initiation of an export surge (take-off)

Given that an export surge is a rare event, our sample is characterized by a preponderance of zeros so that the data suffers from a class imbalance problem. In this case, standard probit or logit estimators provide biased results toward zero. To account for the structure of the sample, we use the complementary log-log (cloglog) model for a binary dependent variable.

The cloglog analysis is related to the gompit model and differs from the logit and probit models by its non-symmetric transformation allowing an appropriate treatment of rare events. The formal specification of the cloglog model comes as follows:

$$\boldsymbol{Pr}\left(\boldsymbol{ES_{c,p,t}} = \mathbf{1}|\, \boldsymbol{X_{c,p,t}}\right) = \boldsymbol{F}(\boldsymbol{\beta X_{c,p,t}})$$

Where $\mathbf{F}(\mathbf{z}) = \mathbf{1} - \mathbf{exp}\{-\mathbf{exp}(\mathbf{z})\}$, $\boldsymbol{ES_{c,p,t}}$ is a dummy variable that is equal to 1 in case of export growth acceleration (*ES*) for a country (*c*), product (p) at year (t), and zero otherwise. $\boldsymbol{X_{c,p,t}}$ is a set of controls.

Taking up Hausmann, Pritchett, and Rodrik (2005)'s approach and more recently Libman (2019), we rule out the uncertainty about the starting year of an export surge by centering the dependent variable over a three-year window around the initiation year (*t-1, t, t+1*). Given the way the filter parameters are defined (See section II.1), growth episodes cannot happen over the first and last seven-year spells. In addition, as a beginning of an acceleration is detected, observations from *t + 2* to *t + 6* are removed from the sample. By doing so we focus on the starting years of the country-product-episode. In other words, the sample only includes the three-year window for country-export-episodes, but the whole period in case of no country-export-product surge (control group).

Table 3 provides descriptive statistics for the main variables included in the regression analysis. The undervaluation level is the variable of interest. Over the period 2001-2017, its average level over the sample is 7.4%. To have an appropriate estimation of its coefficient we introduce a set of controls denoted $\boldsymbol{X_{c,p,t}}$. These variables are measured as average over the seven-year period preceding the surge. Controls range into two categories: country related variables, generally with a limited variance over time, and specific country-product variables than are related either to the international or the domestic environment.

Country related variables.

As is customary when conducting sectoral or aggregated export analyses, we introduce indicators reflecting time variant development level (Fernandes *et al,* 2016). A higher ***per capita GDP*** proxies for better established and larger firms, with a higher ability to seize market international opportunities. The real per capita GDP then positively correlates with export surges, probably more for manufactured than for primary products. We posit a potential non-linear effect that we simply test through a quadratic-type-relationship as generally the case for aggregate exports (Klinger and Lederman 2006, Parteka 2007, Cadot, Carrère and Strauss-Kahn 2011).

The secondary education index is also incorporated in the regression to assess the human capital impact. The emergence of products positively depends on the quality of this variable, which is in relation with the productivity level, the ability to use efficient available local market or foreign firms. This positive effect *a priori* applies to all types of products. This index is preferred to the primary enrollment rate which discriminates less across African countries

and prepares less for structural changes in the productive behavior. The statistical information about these variables comes from *World Development Indicators* of the World Bank and FERDI.[4]

The Exchange rate classification scheme. In order to provide a broad picture of underlying impacts of exchange rate arrangements, we use three aggregated classes from the de facto exchange rate arrangement classification (Ilzetzki *et al*,2019). The first category is for fixed (or related) exchange rate regimes. The second class is for intermediary systems based on all crawling peg options (codes 2 and 3). The third and last category gathers all exchange rate floating systems (codes 4 to 6). A fixed pegged regime may provide more stability on expectations about the macroeconomic policy but may result in rigidities or foreign exchange shortages constraining the tradable sector. Intermediate and floating exchange rate systems may offer more flexibility, but possibly at the cost of more uncertainty and less credibility of macroeconomic policy. The independence of monetary and fiscal policy increases, but at the cost of the volatility of the nominal exchange rate finally creating a "fear of floating" (Calvo and Reinhart, 2002).

Domestic conflicts. Africa's multifaceted socioeconomic and state fragility may spur violence and conflict, which may hinder macroeconomic management, free mobility of people and goods, as well as investments, hence trade and structural transformation. Conflicts have been a source of sudden and unpredictable production and trade disruptions and volatility. The good news is that large-scale organized political violence in sub-Saharan Africa have been declining over our empirical analysis. According to Straus (2012), the African civil wars in the late 2000s were about half as common compared to the mid-1990s. This decline has been potentially associated with subsequent new large and rapid catch-up phases.[5] Longer-run civil wars prevalent in West African states (e. g. Sierra Leone (1991-2002) or Côte d'Ivoire' lost decade 1999-2010) have had significant and repeated negative impacts on primary exports (e. g. cocoa) and have disincentivized investment in manufactured production and exports. To identify the consequences of domestic political disturbances or upheavals, we consider the weighted conflict index of the Cross-National Time Series (CNTS) from EUI (European University Institute). The CNTS combines 9 broad items using data coming from the *New York Times*. The dataset records occurrences of events and weights them according to gravity: general strikes, purges, government crises, riots, assassinations, anti-government demonstrations, as well as events with the highest weighted factors: guerilla warfare, and revolutions (Banks and Wilson, 2015). This conflict index ranges from zero, that characterizes a peaceful domestic environment, to 15.28, which measures the highest intensity of conflict. We expect domestic conflicts to be negatively correlated with export surges.

Country-product determinants

The main innovation of this paper is to highlight the role that exchange rate undervaluation plays in product-specific export surges. We described earlier the spirit of our approach. To give an example, an African cashew producer is indirectly affected by the

macroeconomic exchange rate misalignment, but also directly by its unit cost, *vis-à-vis* other cashew producer countries.

$$\text{Log}(\widehat{RER})_{ct} = \underset{(0.003)}{0.224^{***}}\, log(\, Per\ capita\ GDP)_{ct} - \underset{(0.03)}{2.767^{***}}$$

$$R^2 = 0.48,\ n = 176\ countries,\ t = 1995\ to\ 2017$$

The misalignments are obtained from the regression above that we estimate on the largest worldwide sample to seize the long-run average impact of productivity on the price of non-tradable goods. Thus, for each product of the set we consider and for the most worldwide trading competitors on this product, the sample provides information about misalignments of national currencies vis-à-vis the US dollar. The coefficient on the regression of GDP per capita is quite close to that identified elsewhere, notably by Rodrik (2008). As mentioned earlier, for a given country-product pair, the exchange rate misalignment is measured by the difference between the country's residual and the weighted average of those of competing countries. From the distribution of real exchange rate misalignments, only observations with an undervaluation are retained, meaning that when this event does not occur, the observation is equal to zero. The reasonable underlying assumption is that, on average, overvaluation is unlikely to lead to export surges. Including overvaluation as an additional variable in the regressions proved to be statistically insignificant, and with no impact on the coefficient of undervaluation.[6] We now extend the information space combining: country, product and time, to some controls.

Market shares. These are measured on an annual basis by a country's exports of a specific product (p) in world exports of that product. The impact of this variable seems ambiguous. In the case of primary agricultural products, African market shares can be large, as is the case for Ghanaian and Ivorian cocoa, which reduces the probability of export surges. Turning to manufactured products, a well-structured marketing and distribution network make it easier the increase of export sales in a context where initial market shares are nevertheless low. When fixed and sunk costs are partly covered, mature countries have a better resilience to unforeseen events. Accordingly, market shares are likely to influence positively manufactured goods that condition new African comparative advantages.

***The relative number of Internet users per 100 inhabitants*.** Digital infrastructure is an efficient means to reducing transaction costs and informational issues. As such, the Internet contributes to productivity gains, supports the external competitiveness and export performance (Cariolle et al, 2019; Paunov and Rollo, 2015, 2016; Asongu and Nwachukwu, 2016). Hjort and Poulsen (2019) evidence the economic implications of the arrival of broadband Internet in six African countries. By using data from the World Bank Enterprise Surveys, they show that this technological change has led to a rapid development of direct exports, due in particular to a greater fluidity in relations with foreign customers and the use of online communication between firms in customer-supplier relationships. Internet also enlarges the size of the formal sector and attracts foreign direct investments that are generally found to be a powerful channel to drive the diversification of exports (Freund and Weinhold, 2004, Jacolin *et al*, 2021). Access to ICTs is very uneven across Africa. For a country, it is

assumed that the competitive position depends on the evolution of the gap with competing countries. This hypothesis leads to test the relative impact of this variable by product with respect to the same subset of exporting competitors considered for exchange rate misalignments. We posit a positive relationship between Internet access and export surges.

***Relative Corruption index*.** Bribes and a weak governance can be akin to a tariff, discouraging international transactions by increasing costs (Anderson and Marcouiller, 2002). To investigate the role of this variable we compute the relative corruption index using Standaert (2015)'s Bayesian Corruption Index (BCI) and the same methodology as for the relative number of Internet users. By the relative corruption index, we compare the country's BCI to that of its competitors of the so-called product. Thus, the resulting measure proxies the difference in the quality of institutions with respect to transaction costs. An increase of this relative index means a less market-friendly environment.

Table 3 Descriptive statistics of export surge determinants (2001-2017)

Variables	Obs	Mean	Std.Dev.	Min	Max	Sources	Expected signs
Export Surges (=1, dummy)	4090	0.07	0.256	0	1	BACI	
Market share (in %)	6416	1.925	5.528	0	67.84	BACI	**-/+**
Undervaluation (in %)	6416	-7.4	16.4	-127.7	0	WDI	**-**
Log (per cap GDP)	5920	7.016	1.055	5.267	9.92	WDI	**+**
Log (per cap GDP) ²	5920	50.343	15.615	27.743	98.407	WDI	**-**
Relative Internet users	6416	-29.413	21.175	-82.322	24.725	WDI	**+**
Log (Secondary education)	5091	3.224	0.961	-2.323	4.605	HAI-FERDI	**+**
Relative Corruption index	6416	0.8	0.722	-.732	3.357	*Standaert (2015)*	-
Conflict index	5470	0.161	0.865	0	15.281	CNTS	-
Pegged regime	6048	0.406	0.491	0	1	Ilzetzki *et al. (*2019)	**-/+**
Intermediate regime	6048	0.561	0.496	0	1	Ilzetzki *et al. (*2019)	**-/+**
Floating regime	6048	0.033	0.179	0	1	Ilzetzki *et al. (*2019)	**-/+**

NB: for surge episodes, the dummy takes the value one. These descriptive statistics are given for the entire sample, including both primary and manufactured products. Source: Authors' calculations.

III. Regression results

1. Onset export surges (Take-off predicting)

Table 4 provides a set of econometric relations between the onset of surges and currency undervaluation vis-à-vis major competitors. The coefficient of interest is controlled or not by regional dummies. Columns distinguish aggregated from by-sector results. The expected negative sign is obtained in all cases, which means that undervaluation, a negative value, stimulates export surges. Only in column 3 does the cloglog model fail to give statistical significance at the conventional confidence levels.

Table 4: Baseline regression results. Onset of export surges: cloglog results (2001-2012)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Undervaluation	-0.047***	-0.070***	-0.044	-0.071***	-0.050**	-0.064***
	(0.018)	(0.018)	(0.030)	(0.027)	(0.021)	(0.022)
Southern Africa		-0.086***		-0.108***		-0.066**
		(0.023)		(0.039)		(0.026)
Central Africa		-0.023		-0.003		-0.043**
		(0.015)		(0.020)		(0.021)
East Africa		0.001		-0.011		0.011
		(0.014)		(0.020)		(0.017)
West Africa		0.005		0.033*		-0.028
		(0.013)		(0.017)		(0.017)
Observations	4,090	4,090	2,150	2,150	1,940	1,940
# of surges	96	96	55	55	41	41

Notes: Cloglog estimates. The regression coefficients are marginal effects. The dependent variable is the dummy variable equal to 1 over a 3-year window centered on the onset date of the surge. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

In Table 5, these initial results are robust to the introduction of the set of controls. Several of them prove relevant with some variations according to the category of products we look at. For primary products, the relative corruption and the secondary school enrollment are significant as well as the exchange rate regime. About this last covariate, it appears that both fixed and intermediate exchange rate regimes outperform the floating exchange rate system, our reference category in the regressions. Manufactured goods prove sensitive to the number of Internet users. This expected result fits with what Huang et al. (2018) and Huang and Song (2019) or at the provincial level, Fernandes *et al*. (2019) found for Chinese firms' probability to export. It is also in accordance with Hjort and Poulsen (2019) who show, for twelve Sub Saharan African countries, that access to a fast Internet connection has increased firm entry, productivity, and exports.

It can appear somewhat surprising that for manufactured goods, the impact of the relative corruption index is weaker than for primary products against the "sand in the wheel" hypothesis of the corruption-trade linkage literature (Anderson and Marcouiller, 2002). In a context of acute external competition with low firm profit margins, corruption is an additional obstacle for export surges. One potential reason for this weak correlation is that the so-called impact is already captured by other controls, especially those reflecting the development level (per capita GDP, Secondary education, Internet users…). The main finding is that undervaluation remains statistically highly significant. As with the set of simple regression analysis, the coefficient again varies by sector. It is higher for primary than for manufactured goods. The sensitivity to current undervaluation is therefore stronger for the triggering of export surges of traditional products which are less subject to international marketing uncertainties, less demanding in terms of investments and profitability horizon,

more open to substitutions between crops, especially for those with an annual production cycle.

Table 5: Regression results. Onset of export surges: cloglog results (2001-2012)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Log (Per cap GDP)	0.031	0.084	-0.082	-0.062	0.163**	0.269***
	(0.068)	(0.068)	(0.100)	(0.099)	(0.082)	(0.083)
Log (Per cap GDP)^2	-0.004	-0.008*	0.004	0.003	-0.013**	-0.021***
	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.006)
Log (Secondary education)	0.022***	0.023***	0.031***	0.030***	0.014**	0.011
	(0.005)	(0.006)	(0.007)	(0.010)	(0.007)	(0.007)
Undervaluation	-0.072***	-0.073***	-0.078**	-0.090**	-0.054**	-0.040**
	(0.020)	(0.018)	(0.038)	(0.035)	(0.022)	(0.020)
Market share	-0.001*	-0.001*	-0.001	-0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Relative Internet users	0.001**	0.001**	0.001	0.001	0.001**	0.001**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Relative Corruption index	-0.020***	-0.018**	-0.023**	-0.022**	-0.017*	-0.000
	(0.007)	(0.008)	(0.010)	(0.010)	(0.010)	(0.011)
Conflict index	0.055	0.062	0.086	0.077	0.026	0.054
	(0.053)	(0.055)	(0.090)	(0.089)	(0.057)	(0.057)
Pegged regime	0.713***	0.691***	0.723***	0.645***	0.607***	0.545***
	(0.087)	(0.070)	(0.087)	(0.111)	(0.080)	(0.089)
Intermediate regime	0.703***	0.684***	0.699***	0.636***	0.611***	0.539***
	(0.084)	(0.072)	(0.083)	(0.110)	(0.079)	(0.090)
Southern Africa		-0.019		-0.034		-0.020
		(0.020)		(0.031)		(0.022)
Central Africa		0.028		0.041		0.004
		(0.021)		(0.032)		(0.022)
East Africa		0.010		0.021		-0.001
		(0.015)		(0.022)		(0.020)
West Africa		-0.008		0.032		-0.051***
		(0.015)		(0.022)		(0.018)
Observations	2,815	2,815	1,478	1,478	1,337	1,337
# of surges	66	66	36	36	30	30

Notes: Cloglog estimates. The Regression coefficients are marginal effects. The dependent variable is the dummy variable equal to 1 over a 3-year window centered on the onset date of the surge. Control variables are averages over the 7 year-period prior the surge. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Over the sample, a one-standard-deviation of the undervaluation level increases the probability of an export acceleration by 1.31 percentage points, or a 19 percent increase in the probability of experiencing an onset surge.[7] When we decompose the sample, the effect is respectively 1.62 for primary products, and 0.72 percentage point for manufactured goods, respectively an increase of 22 and 11 percent in the occurrence of export surges. Countries

with a better human capital are more likely to experience export surges while the reverse occurs with a higher level of the relative corruption index. Broadly speaking, the results we get for these product export surges are in line with what Freund and Pierola (2012) find at a more aggregated level.

2. During country product export surges

Just as currency undervaluation helps trigger export surges, does it support performance over the duration of these surges? The interest of this new facet of the empirical analysis is to exploit the intra-individual dimension of undervaluation. It is based on unbalanced panel data. Right hand side regressors are lagged to get a proper interpretation of the causal relationship. Country-product pairs of observations are considered on a yearly basis. The dependent variable takes the value 1 for each year of the seven-year period defining the surge, and then we stop the series for the years beyond. By contrast, in case of no country-product surge (control group), the dependent variable takes the value 0 over the whole period (2001-2017).

Table 6: Baseline regression results. During surges: cloglog results (2001-2017)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Undervaluation	-0.079***	-0.094***	-0.089**	-0.124***	-0.072**	-0.056*
	(0.026)	(0.027)	(0.041)	(0.039)	(0.032)	(0.033)
Southern Africa		-0.132***		-0.164***		-0.102***
		(0.025)		(0.043)		(0.028)
Central Africa		-0.036**		0.007		-0.079***
		(0.017)		(0.023)		(0.023)
East Africa		-0.002		-0.013		0.004
		(0.015)		(0.023)		(0.018)
West Africa		0.007		0.063***		-0.060***
		(0.014)		(0.020)		(0.019)
Observations	5,596	5,596	2,947	2,947	2,649	2,649
# of surges	96	96	55	55	41	41

Notes: cloglog estimates. The coefficients reported are marginal effects evaluated at the sample mean. The dependent variable is the dummy variable equals to 1 over a 7-year window following the onset date. Undervaluation is lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

In Table 6 as for the onset phase, the regression coefficient of undervaluation is statistically significant for both categories of products, whether we control or not for regional heterogeneities by dummy variables.

In Table 7, we keep the previous covariates and then add a post 2008 dummy variable in order to capture the effects of the worldwide financial crisis. We also add a variable to

control for the catching up effect for country-products whose performance may have benefited from the violent social and political unrest in the years preceding the surge period. The list of country-product pairs in this situation limits to 17 out of the 96 export surges. To set up this list, the conflict index has been normalized to vary between 0 and 100. Severe conflict cases are those with at least a 15 percentage points less when comparing the period during which the acceleration takes place and the period preceding its triggering (Appendix 3 a and b). A lower conflictuality, a situation reportedly experienced by quite a few African countries (Straus, 2012), stimulates economic recovery and may alter the impact of undervaluation if the post-conflict period is concomitant with an export boom. To capture this phenomenon, a dummy variable taking the value 1 for the 13 identified cases is created. It captures the average catch-up impact resulting from previous troubles and associated disorganizations within the economy. We also consider this dummy in a multiplicative form with the conflict index.

Regression results are close to the previous ones. A structural variable such as the per capita GDP level plays a significant role. ICTs also matter. This variable probably correlates to other components of the domestic infrastructure for which information on yearly basis is limited. The multiplicative variable about the conflict index is not significant, but the positive dummy suggests the presence of a catch-up effect with respect to pre-triggering social or political disorganizations. Regardless the method we use, the coefficient of the undervaluation remains robust. Moreover, while the number of observations varies according to the specification of the model, the sensitivity to this variable is systematically the highest for primary products. Dropping from the sample the particular case of the 13 country-product pairs with a catching-up process in post-conflict period does not affect the outcome significantly (Appendix 3c).

Unlike our previous findings, the *fear of floating* is no longer a factor influencing the performance during the seven-year period of surges. It's also worth noting that the pegged regime does not penalize export surges as some arguments potentially suggest in line with the rigidity of a hard anchoring to a currency. The franc zone achieves, for example, 18% of the total export surges with a CFA franc that is fixed since 1994 vis-à-vis the French franc, and the euro after 1999.

Table 7 confirms what we found for the onset phase. In other words, undervaluation still remains an efficient instrument to stimulate exports. From columns 2, 4 and 6, we note that a one standard deviation decrease in undervaluation raises the probability of an export surge by 3.5 percentage points for primary products, 1.6 for manufactured goods. By contrast to what happens for the take-off, country-related structural variables are more significant and strengthen the performance during the surge.

Table 7: Regression results. During surges: cloglog estimations (2001-2017)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Log(Per cap GDP)	0.267***	0.305***	0.073	-0.025	0.503***	0.675***
	(0.058)	(0.060)	(0.073)	(0.068)	(0.080)	(0.087)
Log(Per cap GDP)^2	-0.020***	-0.022***	-0.007	0.000	-0.036***	-0.047***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.006)	(0.006)
Log(Secondary education)	0.006	-0.002	0.016**	0.010	-0.006	-0.015**
	(0.005)	(0.005)	(0.007)	(0.008)	(0.007)	(0.007)
Undervaluation	-0.133***	-0.133***	-0.163***	-0.175***	-0.101***	-0.089***
	(0.026)	(0.027)	(0.040)	(0.045)	(0.031)	(0.028)
Market share	-0.000	-0.000	-0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Relative Internet users	0.001***	0.001***	0.001***	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	0.007	0.010	0.011	0.002	0.001	0.024***
	(0.006)	(0.007)	(0.010)	(0.009)	(0.007)	(0.008)
Conflict index	-0.060***	-0.064***	-0.137***	-0.131***	-0.019*	-0.017
	(0.017)	(0.018)	(0.044)	(0.042)	(0.011)	(0.011)
Conflict dummy	0.188***	0.181***	0.189***	0.161***	0.190***	0.164***
	(0.014)	(0.014)	(0.018)	(0.018)	(0.021)	(0.021)
Conflict index * Conflict dummy	-0.142	-0.128	-0.127	-0.072	-0.100	-0.096
	(0.111)	(0.109)	(0.147)	(0.140)	(0.168)	(0.157)
Pegged regime	0.064**	0.042	0.099**	0.049	0.025	0.039
	(0.030)	(0.031)	(0.048)	(0.047)	(0.035)	(0.034)
Intermediate regime	0.074**	0.054*	0.091*	0.064	0.057	0.038
	(0.030)	(0.031)	(0.048)	(0.046)	(0.035)	(0.033)
Southern Africa		-0.080***		-0.094**		-0.071**
		(0.025)		(0.043)		(0.028)
Central Africa		-0.002		0.051*		-0.063**
		(0.021)		(0.029)		(0.027)
East Africa		0.013		-0.003		0.040*
		(0.017)		(0.023)		(0.023)
West Africa		0.003		0.062***		-0.052**
		(0.016)		(0.023)		(0.023)
Post 2008	0.080***	0.079***	0.084***	0.088***	0.072***	0.061***
	(0.011)	(0.011)	(0.016)	(0.015)	(0.014)	(0.013)
Observations	5,596	5,596	2,947	2,947	2,649	2,649
# of surges	96	96	55	55	41	41

Notes: cloglog estimates. The coefficients reported are marginal effects evaluated at the sample mean. The dependent variable is the dummy variable that equals 1 over the 7-year period following the onset surge. All control variables are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

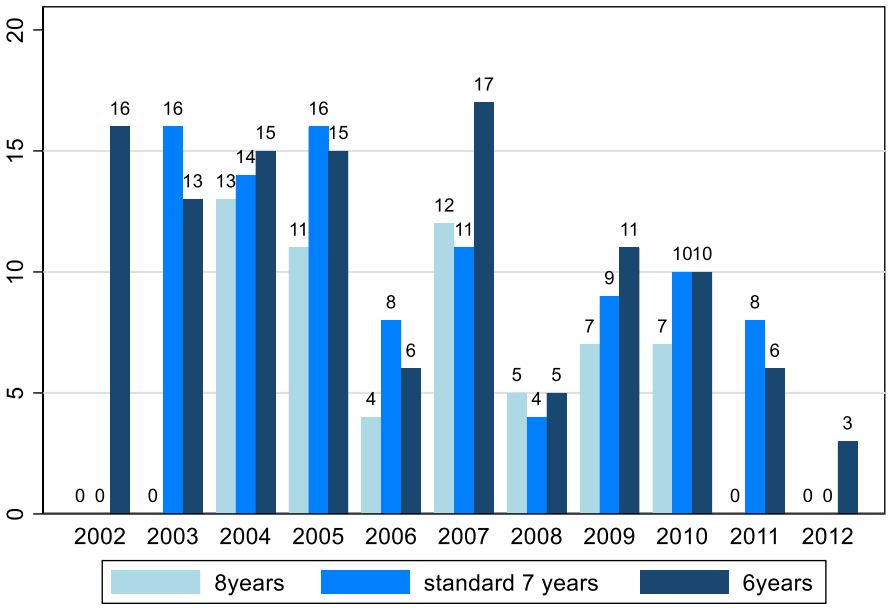
IV. Robustness and sensitivity

Robustness checks are implemented in two ways. First, we modify the way export surges are calculated. In a second empirical analysis, we ask to what extent a change of the estimator alters the findings about the undervaluation level of currencies.

1. Export surges and the choice of alternative parameters

The export surge has been defined with respect to a seven-year period. Do the results change if we extend the period to 8 years or restrict it to 6 ? As shown in Figure 6, export surges drop by almost half with the 8-year window, and only 25 episodes out of the 59 relate to manufactured products. When a 6-year window is considered, we get 117 exports surges with 66 episodes for primary products and 51 for manufactured.

Figure 6 : **Sensitivity of export surges to the time window**



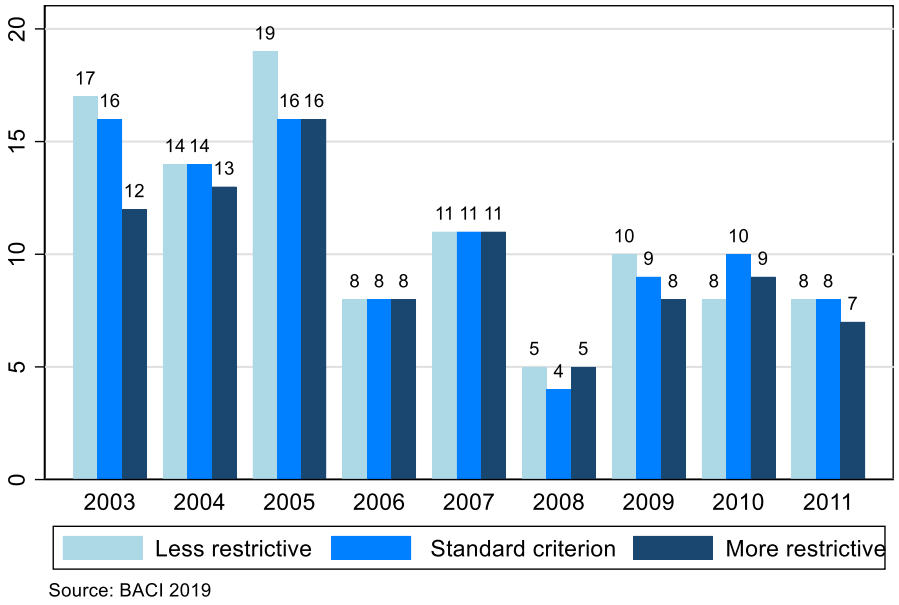
Source: BACI 2019

The second robustness check consists in modifying criterion 2 (Cf., section II.1). The real average growth that has been considered so far for calculating export surges $g^1_{c,p,t}$ was 30% and at least 3 percentage points higher than that of the previous seven-year period ($\alpha = 1.3$, $\beta = 0.03$). What happens for alternative pairs of parameters: $\alpha = 1.1$ and $\beta = 0.02$; or $\alpha = 1.5$ and $\beta = 0.04$. Figure 7 depicts the number of export surges under these two modalities of measurement. Compared to the standard criterion, episodes moderately change and the proportion of surges across categories of products is quite stable. We detect 100 episodes for the first option, respectively 56 and 44 for primary and manufactured products, against 89 episodes for the second option: 52 and 37, respectively.

Table 8 summarizes the results for onset surges (column 1 to 3) and during surges (column 4 to 6). To save space, only our interest variable, undervaluation, is reported. Full regressions are provided in the Appendix 4. For onset surges, regardless the specification,

undervaluation remains negative and statistically significant at the conventional statistical levels except in one case for manufactured goods (Horizon 6), which is only significant at 81%. For the period of surges, the impact of undervaluation is more significant, undervaluation remaining negative and significant across all specifications.

Figure 7 : criterion 2 and the timing of export surges



Source: BACI 2019

Table 8: Robustness checks with alternative filter parameters and time horizons

	(1) All	(2) Primary	(3) Manuf	(4) All	(5) Primary	(6) Manuf
	Onset of surges			During surges		
Horizon 6 (a = 1.3 and β = 0.03; 6 years)						
Undervaluation	-0.106***	-0.092**	-0.039[b]	-0.119***	-0.131***	-0.086***
	(0.026)	(0.044)	(0.031)	(0.028)	(0.045)	(0.032)
Horizon 8 (a = 1.3 and β = 0.03; 8 years)						
Undervaluation	-0.057***	-0.060*	-0.022*	-0.106***	-0.106***	-0.095***
	(0.017)	(0.032)	(0.011)	(0.019)	(0.032)	(0.017)
Lower criterion 2 (a = 1.1 and β = 0.02; 7 years)						
Undervaluation	-0.084***	-0.101***	-0.048**	-0.128***	-0.169***	-0.085***
	(0.019)	(0.035)	(0.021)	(0.028)	(0.048)	(0.031)
Higher criterion 2 (a = 1.5 and β = 0.04; 7 years)						
Undervaluation	-0.065***	-0.075**	-0.037**	-0.120***	-0.124**	-0.100***
	(0.017)	(0.031)	(0.016)	(0.025)	(0.048)	(0.023)

Notes: cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. For the onset of the surges (column 1-3), the dependent variable is the dummy variable equal to 1 over a 3-year window centered on the onset date. All controls are averages over 7 years prior to the surge initiation. During surges (column 4-6), the dependent variable is the dummy that is equal to 1 over a 7-year window following the onset date. Controls are lagged. The Table only displays the coefficient of the variable of interest. Refer to Appendix 4 for all results. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

2. Alternative estimation technique

For rare events, King and Zeng (2001), propose the Relogit. Regression results are presented in Table 9 and 10 for the onset and for the period of the surge over the initial time horizon (7 years) and filter parameters (α = 1.3 and β = 0.03). In both cases, the undervaluation variable remains strongly statistically significant.

Table 9: Onset of export surges - ReLogit estimates (2001-2012)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Log (Per cap GDP)	-0.767***	-0.618***	-0.821	-0.309	-0.430***	-0.089
	(0.212)	(0.197)	(1.243)	(0.977)	(0.162)	(0.237)
Log (Per cap GDP) ²	0.008	-0.008	0.019	-0.008	-0.019	-0.060**
	(0.019)	(0.019)	(0.083)	(0.063)	(0.017)	(0.026)
Log (Secondary education)	0.483***	0.532***	0.573***	0.589***	0.368**	0.415**
	(0.105)	(0.129)	(0.140)	(0.183)	(0.152)	(0.171)
Undervaluation	-1.642***	-1.710***	-1.396**	-1.713**	-1.782***	-1.511***
	(0.412)	(0.406)	(0.712)	(0.679)	(0.499)	(0.554)
Market share	-0.017	-0.016	-0.017	-0.013	-0.011	-0.016
	(0.011)	(0.012)	(0.012)	(0.011)	(0.041)	(0.051)
Relative Internet users	0.017**	0.018**	0.015	0.016	0.019**	0.023**
	(0.007)	(0.007)	(0.010)	(0.010)	(0.009)	(0.010)
Relative Corruption index	-0.433***	-0.428***	-0.451**	-0.439**	-0.385*	-0.160
	(0.159)	(0.161)	(0.213)	(0.192)	(0.219)	(0.260)
Conflict index	1.120	1.165	1.955	1.805	0.249	0.651
	(1.081)	(1.114)	(1.626)	(1.610)	(1.398)	(1.519)
Pegged regime	1.366*	0.947	1.090	-1.910	0.633	0.889
	(0.700)	(0.609)	(4.533)	(3.805)	(0.558)	(0.562)
Intermediate regime	1.081	0.754	0.657	-2.054	0.505	0.533
	(0.696)	(0.553)	(4.522)	(3.757)	(0.492)	(0.453)
Southern Africa		-0.412		-0.475		-0.399
		(0.409)		(0.634)		(0.557)
Central Africa		0.548		0.912		0.068
		(0.428)		(0.624)		(0.600)
East Africa		0.012		0.515		-0.543
		(0.297)		(0.411)		(0.496)
West Africa		-0.193		0.688*		-1.354***
		(0.305)		(0.411)		(0.499)
Observations	2,815	2,815	1,478	1,478	1,337	1,337
# of surges	66	66	36	36	30	30

Notes: ReLogit estimates. The coefficients reported are not marginal effect. The dependent variable is the dummy variable equal to 1 over a 3-year window centered on the onset date. All control variables are averages over 7 years prior to the surge initiation. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Table 10: During surges - ReLogit estimates

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manuf	(6) Manuf
Log (Per cap GDP)	-0.562***	3.285***	-0.693***	-0.760***	-0.430***	-0.366**
	(0.094)	(0.754)	(0.144)	(0.183)	(0.121)	(0.163)
Log (Per cap GDP) ²	0.012	-0.238***	0.022*	0.035**	0.005	0.009
	(0.009)	(0.051)	(0.013)	(0.015)	(0.011)	(0.015)
Log (Secondary education)	0.102**	-0.043	0.180***	0.095	-0.017	-0.061
	(0.051)	(0.062)	(0.066)	(0.082)	(0.081)	(0.079)
Undervaluation	-1.864***	-1.579***	-1.908***	-2.065***	-1.843***	-1.525***
	(0.294)	(0.311)	(0.405)	(0.474)	(0.418)	(0.448)
Market share	-0.003	-0.003	-0.004	0.001	-0.000	-0.006
	(0.005)	(0.006)	(0.006)	(0.005)	(0.014)	(0.016)
Relative Internet users	0.011***	0.011***	0.014***	0.014***	0.006*	0.002
	(0.003)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Relative Corruption index	-0.012	0.093	0.073	-0.006	-0.131	0.048
	(0.072)	(0.074)	(0.111)	(0.099)	(0.086)	(0.115)
Conflict index	-0.679***	-0.679***	-1.359***	-1.364***	-0.227	-0.324*
	(0.198)	(0.205)	(0.465)	(0.472)	(0.156)	(0.185)
Conflict Dummy	2.375***	2.275***	2.227***	2.027***	2.684***	2.590***
	(0.202)	(0.193)	(0.243)	(0.251)	(0.391)	(0.428)
Conflict index * Conflict dummy	-2.452	-1.996	-2.013	-1.475	-2.257	-2.122
	(1.586)	(1.574)	(1.945)	(1.988)	(2.984)	(3.004)
Pegged regime	0.528*	0.380	0.895*	0.426	0.114	0.255
	(0.297)	(0.363)	(0.462)	(0.515)	(0.383)	(0.400)
Intermediate regime	0.498*	0.550	0.733	0.608	0.283	0.091
	(0.287)	(0.357)	(0.448)	(0.508)	(0.368)	(0.372)
Southern Africa		-0.886***		-0.926**		-0.957***
		(0.280)		(0.465)		(0.342)
Central Africa		-0.008		0.564*		-1.180***
		(0.227)		(0.320)		(0.369)
East Africa		0.139		-0.063		-0.167
		(0.191)		(0.260)		(0.293)
West Africa		0.083		0.742***		-0.805**
		(0.186)		(0.253)		(0.319)
Post 2008	0.882***	0.874***	0.884***	0.961***	0.843***	0.712***
	(0.140)	(0.121)	(0.192)	(0.193)	(0.199)	(0.193)
Observations	5,596	5,596	2,947	2,947	2,649	2,649
# of surges	96	96	55	55	41	41

Notes: ReLogit estimates. The coefficients reported are not marginal effect. The dependent variable is the dummy variable equals to 1 over a 7-year window following the onset date. All control variables are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1. ES = number of export surges

Conclusion

Our study focuses on the role of undervaluation of the currency for African exports. Recent literature highlights the stimulating role of this instrument for GDP or export surges. We mobilize this literature to apply it to main primary and manufactured export products. Misalignments are an expression of the cost competitiveness of each country-product pair with respect to main international exporters for a given product.

A panel of 41 African countries and a basket of 149 primary and manufactured exported goods (4-digit HS code) are used for the period 1995-2017. With our basic scenario we identify 96 episodes, a majority of them in middle-income countries. The 2007-08 financial crisis has affected the occurrence of these events, including for manufactured goods, demonstrating the difficulty to improve the export performance and product market share on a product in times of economic slowdown. To investigate the role of currency undervaluation for triggering and maintaining an export surge, we calculate country-product specific misalignments on a yearly basis and use the cloglog model to identify economic determinants.

We show that export surges are preceded by exchange rate undervaluation. Over the full sample, a one-standard-deviation of the devaluation level increases the probability of a surge by 1.3 percentage points. When we split the sample into primary and manufactured products the effect is respectively 1.6 and 0.72 percentage points, or 22% and 11% increase in the occurrence of surges. The analysis of what happens during the surge does not evidence significant changes (during the length of the surge?). Undervaluation still remains an influential econometric determinant. A one standard deviation of the undervaluation rate raises the probability to maintain the surge by 3.5 percentage points for primary products, and 1.06 for manufactured goods. Results are robust to modifications of the filter parameters, the time length of surges, or when we substitute the Relogit to the cloglog estimator.

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Appendix:

Appendix 1: Sample and data

List of countries

Algeria, Angola, Benin, Burundi, Burkina Faso, Cabo Verde, Central African Rep, Cameroon, Chad, Cote D'Ivoire, Comoros, Congo Dem. Rep., Congo Rep. of, Egypt, Ethiopia, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Tanzania, Sierra Leone, South Africa, Togo, Tunisia, Uganda, Zambia.

List of primary products

1	**HS-0303**	Fish, frozen, excluding fish fillets	34	**HS-0701**	Potatoes, fresh or chilled.
2	**HS-0306**	Crustaceans, whether in shell or not	35	**HS-0805**	Citrus fruit, fresh or dried.
3	**HS-0901**	Coffee, whether or not roasted or decaff	36	**HS-0603**	Cut flowers and flower buds of a kind
4	**HS-2301**	Flours, meals and pellets, of meat or me	37	**HS-0713**	Dried leguminous vegetables, shelled
5	**HS-4403**	Wood in the rough, whether or not stripp	38	**HS-2403**	Other manufactured tobacco and manufactu
6	**HS-0902**	Tea, whether or not flavoured.	39	**HS-4406**	Railway or tramway sleepers (cross-ties)
7	**HS-2203**	Beer made from malt.	40	**HS-1202**	Ground-nuts, not roasted or otherwise
8	**HS-2402**	Cigars, cheroots, cigarillos and cigaret	41	**HS-1508**	Ground-nut oil and its fractions
9	**HS-5201**	Cotton, not carded or combed.	42	**HS-0708**	Leguminous vegetables, shelled or unshelled
10	**HS-0207**	Meat and edible offal, of the poultry of	43	**HS-4002**	Synthetic rubber and factice derived fro
11	**HS-0801**	Coconuts, Brazil nuts and cashew nuts	44	**HS-0307**	Molluscs, whether in shell or not, live,
12	**HS-1006**	Rice.	45	**HS-0702**	Tomatoes, fresh or chilled.
13	**HS-0804**	Dates, figs, pineapples, avocados, guava	46	**HS-0810**	Other fruit, fresh.
14	**HS-1207**	Other oil seeds and oleaginous fruits	47	**HS-0102**	Live bovine animals.
15	**HS-1515**	Other fixed vegetable fats and oils	48	**HS-5203**	Cotton, carded or combed.
16	**HS-1701**	Cane or beet sugar and chemically pure	49	**HS-0302**	Fish, fresh or chilled, excluding fish f
17	**HS-4407**	Wood sawn or chipped lengthwise, sliced	50	**HS-1504**	Fats and oils and their fractions, of fi
18	**HS-1801**	Cocoa beans, whole or broken, raw	51	**HS-0106**	Other live animals.
19	**HS-1803**	Cocoa paste, whether or not defatted.	52	**HS-1703**	Molasses resulting from the extraction o
20	**HS-1804**	Cocoa butter, fat and oil.	53	**HS-0104**	Live sheep and goats.
21	**HS-4001**	Natural rubber, balata, gutta-percha	54	**HS-6309**	Worn clothing and other worn articles.
22	**HS-0803**	Bananas, including plantains, fresh or d	55	**HS-0401**	Milk and cream, not concentrated nor con
23	**HS-1211**	Plants and parts of plants	56	**HS-1101**	Wheat or meslin flour.
24	**HS-2401**	Unmanufactured tobacco; tobacco refuse.	57	**HS-2104**	Soups and broths and preparations
25	**HS-4401**	Fuel wood, in logs, in billets, in twigs	58	**HS-1301**	Lac; natural gums, resins, gum-resins an
26	**HS-0905**	Vanilla.	59	**HS-1509**	Olive oil and its fractions, whether or
27	**HS-0907**	Cloves (whole fruit, cloves and stems).	60	**HS-0304**	Fish fillets and other fish meat
28	**HS-4402**	Wood charcoal (including shell or nut	61	**HS-0806**	Grapes, fresh or dried.
29	**HS-1604**	Prepared or preserved fish; caviar	62	**HS-0808**	Apples, pears and quinces, fresh.
30	**HS-0709**	Other vegetables, fresh or chilled.	63	**HS-2204**	Wine of fresh grapes
31	**HS-1001**	Wheat and meslin.	64	**HS-4702**	Chemical wood pulp, dissolving grades.
32	**HS-2202**	Waters, including mineral waters	65	**HS-1005**	Maize (corn).
33	**HS-0406**	Cheese and curd.	66	**HS-2208**	Undenatured ethyl alcohol of an alcoholi

List of manufactured products

1	**HS-2523**	Portland cement, aluminous cement, slag
2	**HS-2804**	Hydrogen, rare gases and other non-metal
3	**HS-2807**	Sulphuric acid; oleum.
4	**HS-2809**	Diphosphorus pentaoxide; phosphoric acid
5	**HS-2814**	Ammonia, anhydrous or in aqueous solutio
6	**HS-2822**	Cobalt oxides and hydroxides; commercial
7	**HS-2836**	Carbonates; peroxocarbonates
8	**HS-2844**	Radioactive chemical elements
9	**HS-2901**	Acyclic hydrocarbons.
10	**HS-2905**	Acyclic alcohols and their halogenated,
11	**HS-3004**	Medicaments (excluding goods of heading
12	**HS-3102**	Mineral or chemical fertilisers,
13	**HS-3105**	Mineral or chemical fertilisers
14	**HS-3301**	Essential oils (terpeneless or not)
15	**HS-3304**	Beauty or make-up preparations
16	**HS-3401**	Soap; organic surface-active products
17	**HS-3507**	Enzymes; prepared enzymes not elsewhere
18	**HS-3802**	Activated carbon; activated natural mine
19	**HS-3811**	Anti-knock preparations, oxidation
20	**HS-3823**	Industrial monocarboxylic fatty acids
21	**HS-3902**	Polymers of propylene or of other
22	**HS-3923**	Articles for the conveyance or packing
23	**HS-3924**	Tableware, kitchenware, other household
24	**HS-4105**	Tanned or crust skins of sheep or lambs,
25	**HS-4106**	Tanned or crust hides and skins of other
26	**HS-4107**	Leather further prepared after tanning
27	**HS-4408**	Sheets for veneering
28	**HS-4412**	Plywood, veneered panels
29	**HS-4802**	Uncoated paper and paperboard
30	**HS-4804**	Uncoated kraft paper and paperboard
31	**HS-4819**	Cartons, boxes, cases, bags
32	**HS-4907**	Unused postage, revenue or similar stamp
33	**HS-5205**	Cotton yarn (other than sewing thread)
34	**HS-5208**	Woven fabrics of cotton, containing 85 %
35	**HS-5408**	Woven fabrics of artificial filament yar
36	**HS-5701**	Carpets and other textile floor covering
37	**HS-6104**	Women's or girls' suits, ensembles, jack
38	**HS-6107**	Men's or boys' underpants, briefs, night
39	**HS-6109**	T-shirts, singlets and other vests, knit
40	**HS-6110**	Jerseys, pullovers, cardigans, waistcoat
41	**HS-6203**	Men's or boys' suits, ensembles, jackets
42	**HS-6204**	Women's or girls' suits, ensembles, jack
43	**HS-6205**	Men's or boys' shirts.
44	**HS-6206**	Women's or girls' blouses, shirts
45	**HS-6210**	Garments, made up of fabrics of heading
46	**HS-6304**	Other furnishing articles
47	**HS-6305**	Sacks and bags
48	**HS-6402**	Other footwear with outer soles
49	**HS-6403**	Footwear with outer soles of rubber
50	**HS-6405**	Other footwear.
51	**HS-6406**	Parts of footwear (including uppers)
52	**HS-6704**	Wigs, false beards, eyebrows and eyelash
53	**HS-6810**	Articles of cement, of concrete
54	**HS-7005**	Float glass and surface ground or polish
55	**HS-7010**	Carboys, bottles, flasks, jars, pots
56	**HS-7102**	Diamonds, whether or not worked, but not
57	**HS-7103**	Precious stones (other than diamonds) an
58	**HS-7113**	Articles of jewellery and parts thereof,
59	**HS-7202**	Ferro-alloys.
60	**HS-7208**	Flat-rolled products of iron or non-allo
61	**HS-7210**	Flat-rolled products of iron or non-allo
62	**HS-7213**	Bars and rods, hot-rolled
63	**HS-7214**	Other bars and rods of iron or non-alloy
64	**HS-7215**	Other bars and rods of iron or non-alloy
65	**HS-7225**	Flat-rolled products of other alloy
66	**HS-7304**	Tubes, pipes and hollow profiles,
67	**HS-7306**	Other tubes, pipes and hollow profiles
68	**HS-7308**	Structures (excluding prefabricated buil
69	**HS-7326**	Other articles of iron or steel.
70	**HS-8207**	Interchangeable tools for hand tools
71	**HS-8502**	Electric generating sets and rotary
72	**HS-8504**	Electrical transformers
73	**HS-8517**	Telephone sets, including telephones for
74	**HS-8525**	Transmission apparatus for radio
75	**HS-8536**	Electrical apparatus for switching
76	**HS-8537**	Boards, panels, consoles, desks, cabinet
77	**HS-8544**	Insulated (including enamelled
78	**HS-8703**	Motor cars and other motor vehicles
79	**HS-8704**	Motor vehicles for the transport of good
80	**HS-8708**	Parts and accessories of the motor
81	**HS-9015**	Surveying
82	**HS-9401**	Seats (other than those of heading 94.02
83	**HS-9406**	Prefabricated buildings.

List of export surge episodes for primary products

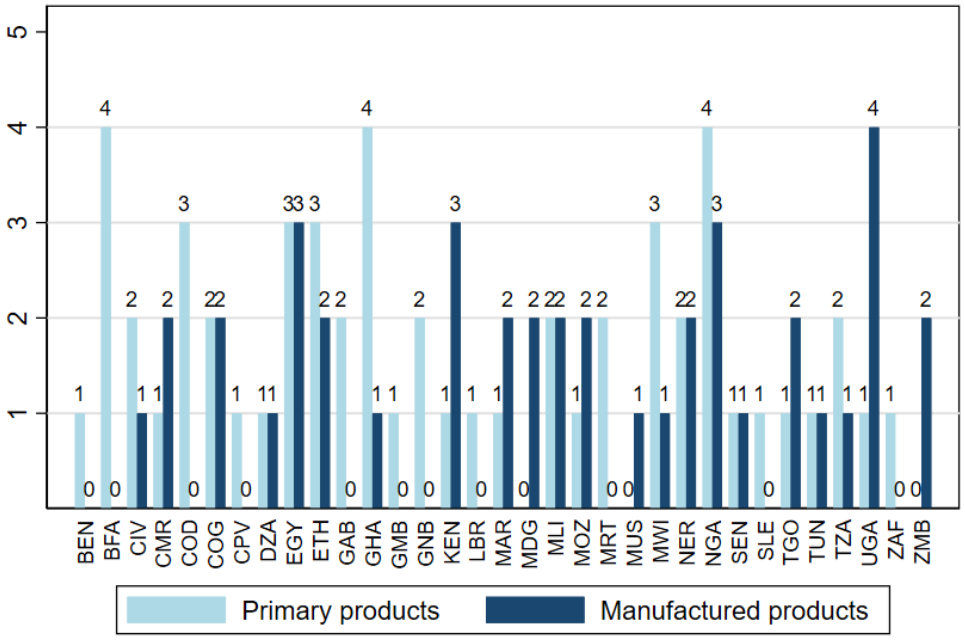
Country	Product (HS-4)	Weight	Year
Algeria	HS-0804 Dates, figs, pineapples, avocados,	7,0	2011
Benin	HS-0801 Coconuts, Brazil nuts and cashew nuts	27,0	2008
Burkina Faso	HS-0804 Dates, figs, pineapples, avocados,	1,5	2003
Burkina Faso	HS-1515 Other fixed vegetable fats and oils	1,3	2011
Burkina Faso	HS-0801 Coconuts, Brazil nuts and cashew nuts	4,7	2011
Burkina Faso	HS-5201 Cotton, not carded or combed.	74,5	2003
Cabo Verde	HS-1604 Prepared or preserved fish; caviar	46,7	2009
Cameroon	HS-1801 Cocoa beans, whole or broken, raw	26,0	2004
Congo Dem. Rep. of	HS-4407 Wood sawn or chipped lengthwise	23,8	2006
Congo Dem. Rep. of	HS-4403 Wood in the rough, whether or not	40,7	2004
Congo Dem. Rep. of	HS-1211 Plants and parts of plants	4,3	2006
Congo Rep. of	HS-4001 Natural rubber, balata, gutta-perch	4,7	2005
Congo Rep. of	HS-4403 Wood in the rough, whether or not	65,6	2007
Cote D' Ivoire	HS-4001 Natural rubber, balata, gutta-perch	11,7	2010
Cote D' Ivoire	HS-0801 Coconuts, Brazil nuts and cashew nuts	4,5	2004
Egypt	HS-0406 Cheese and curd.	7,5	2003
Egypt	HS-0805 Citrus fruit, fresh or dried.	11,4	2003
Egypt	HS-0701 Potatoes, fresh or chilled.	4,7	2005
Ethiopia	HS-0713 Dried leguminous vegetables	7,3	2010
Ethiopia	HS-0603 Cut flowers and flower buds	9,8	2003
Ethiopia	HS-0709 Other vegetables, fresh or chilled.	12,7	2006
Gabon	HS-4001 Natural rubber, balata, gutta-perch	11,0	2005
Gabon	HS-4407 Wood sawn or chipped lengthwise	30,9	2011
Ghana	HS-1801 Cocoa beans, whole or broken	52,8	2004
Ghana	HS-1803 Cocoa paste, whether or not defatte	9,0	2004
Ghana	HS-1804 Cocoa butter, fat and oil.	4,5	2009
Ghana	HS-0801 Coconuts, Brazil nuts and cashew nuts	4,2	2011
Guinea Bissau	HS-0801 Coconuts, Brazil nuts and cashew nuts	84,4	2011
Guinea Bissau	HS-0303 Fish, frozen, excluding fish fillet	11,1	2010
Kenya	HS-0603 Cut flowers and flower buds	18,5	2004
Liberia	HS-1801 Cocoa beans, whole or broken	6,7	2008
Malawi	HS-2401 Unmanufactured tobacco; tobacco	65,8	2005
Malawi	HS-0713 Dried leguminous vegetables	5,3	2007
Malawi	HS-5201 Cotton, not carded or combed.	3,6	2004
Mali	HS-0804 Dates, figs, pineapples, avocados,	3,3	2003
Mali	HS-1207 Other oil seeds and oleaginous	6,5	2006
Mauritania	HS-1504 Fats and oils and their fractions,	1,2	2009
Mauritania	HS-2301 Flours, meals and pellets, of meat	6,0	2010
Morocco	HS-0702 Tomatoes, fresh or chilled.	11,2	2007
Mozambique	HS-4407 Wood sawn or chipped lengthwise	6,9	2007
Niger	HS-1701 Cane or beet sugar and chemically	3,2	2010
Niger	HS-6309 Worn clothing and other worn article	7,4	2005
Nigeria	HS-0801 Coconuts, Brazil nuts and cashew nuts	4,9	2003
Nigeria	HS-4001 Natural rubber, balata, gutta-perch	19,4	2006
Nigeria	HS-1207 Other oil seeds and oleaginous	6,3	2005
Nigeria	HS-1801 Cocoa beans, whole or broken	31,0	2003
Senegal	HS-0303 Fish, frozen, excluding fish fillet	17,7	2007
Sierra Leone	HS-1801 Cocoa beans, whole or broken	67,0	2004
South Africa	HS-4702 Chemical wood pulp, dissolving grad	5,7	2010
Tanzania	HS-0801 Coconuts, Brazil nuts and cashew nu	8,8	2009
Tanzania	HS-2401 Unmanufactured tobacco; tobacco ref	15,9	2005
The Gambia	HS-0303 Fish, frozen, excluding fish fillet	4,6	2008
Togo	HS-1801 Cocoa beans, whole or broken, raw o	45,1	2004
Tunisia	HS-0804 Dates, figs, pineapples, avocados,	13,3	2004
Uganda	HS-1701 Cane or beet sugar and chemically	4,6	2005

List of export surge episodes for manufactured products

Country	Product (HS-4)	Weight	Year
Algeria	HS-8703 Motor cars and other motor vehicles	11,8	2005
Cameroon	HS-4819 Cartons, boxes, cases, bags	3,9	2005
Cameroon	HS-3401 Soap; organic surface-active produc	8,2	2005
Congo Rep. of	HS-4408 Sheets for veneering	1,2	2007
Congo Rep. of	HS-7326 Other articles of iron or steel.	1,1	2005
Cote D' Ivoire	HS-3923 Articles for the conveyance or pack	4,1	2009
Egypt	HS-6204 Women's or girls' suits, ensembles,	2,6	2004
Egypt	HS-3102 Mineral or chemical fertilisers	8,5	2006
Egypt	HS-6203 Men's or boys' suits, ensembles	3,5	2003
Ethiopia	HS-6109 T-shirts, singlets and other vests	3,7	2010
Ethiopia	HS-6403 Footwear with outer soles of rubber	3,2	2005
Ghana	HS-3304 Beauty or make-up preparations and	4,8	2011
Kenya	HS-2523 Portland cement, aluminous cement,	5,0	2005
Kenya	HS-2836 Carbonates; peroxocarbonates	7,1	2003
Kenya	HS-3923 Articles for the conveyance or pack	3,6	2006
Madagascar	HS-6205 Men's or boys' shirts.	5,4	2007
Madagascar	HS-3301 Essential oils (terpeneless or not)	4,8	2007
Malawi	HS-4412 Plywood, veneered panels	2,7	2004
Mali	HS-8517 Telephone sets, including telephone	2,2	2003
Mali	HS-4105 Tanned or crust skins of sheep	7,1	2010
Mauritius	HS-6104 Women's or girls' suits, ensembles	4,3	2009
Morocco	HS-8703 Motor cars and other motor vehicles	4,5	2007
Morocco	HS-3105 Mineral or chemical fertilisers	10,8	2010
Mozambique	HS-7103 Precious stones (other than diamond	6,1	2011
Mozambique	HS-7306 Other tubes, pipes and hollow	6,8	2010
Niger	HS-8517 Telephone sets, including telephone	0,5	2009
Niger	HS-2844 Radioactive chemical elements	92,0	2009
Nigeria	HS-4105 Tanned or crust skins of sheep	4,8	2004
Nigeria	HS-4106 Tanned or crust hides and skins	14,9	2003
Nigeria	HS-6402 Other footwear with outer soles	4,4	2006
Senegal	HS-7213 Bars and rods, hot-rolled	3,3	2007
Tanzania	HS-3105 Mineral or chemical fertilisers	6,1	2005
Togo	HS-6704 Wigs, false beards, eyebrows	2,5	2009
Togo	HS-3923 Articles for the conveyance or pack	5,5	2003
Tunisia	HS-6403 Footwear with outer soles of rubber	3,5	2003
Uganda	HS-3401 Soap; organic surface-active produc	4,7	2003
Uganda	HS-2523 Portland cement, aluminous cement,	17,6	2004
Uganda	HS-8525 Transmission apparatus for radio	17,0	2005
Uganda	HS-7210 Flat-rolled products of iron or non	4,4	2003
Zambia	HS-2807 Sulphuric acid; oleum.	10,9	2007
Zambia	HS-2523 Portland cement, aluminous cement,	12,1	2008

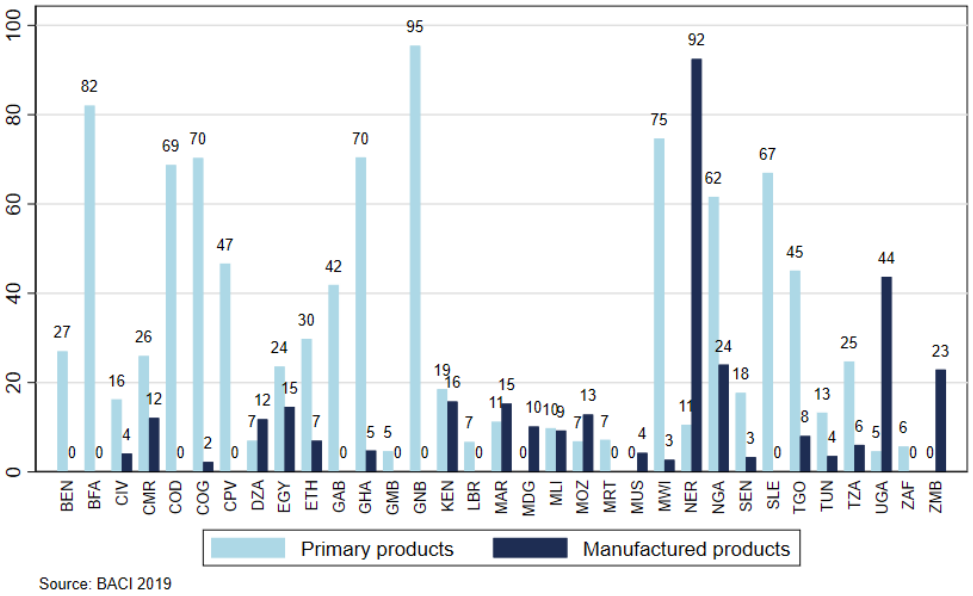
Appendix 2: Surge episodes and their contribution to product categories

Number of export surges, by country among top 5 products of each category



Source: BACI 2019

Percentage of product surges among all products considered for each category (%)



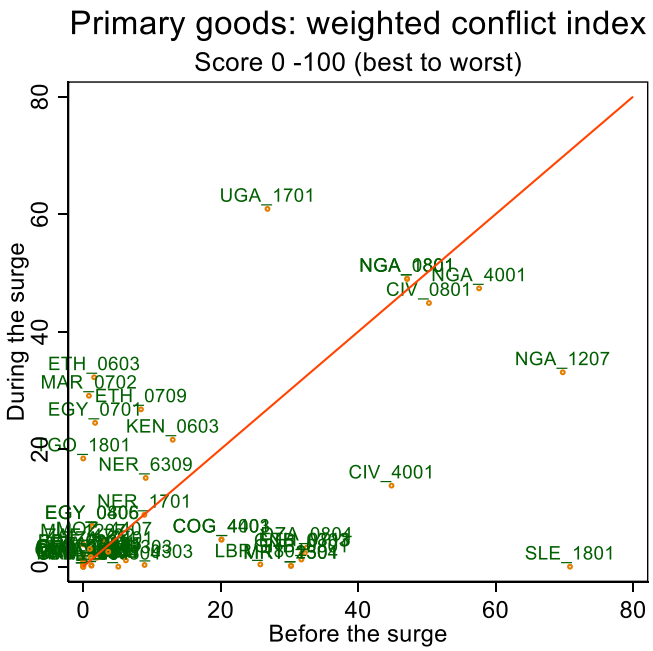
Source: BACI 2019

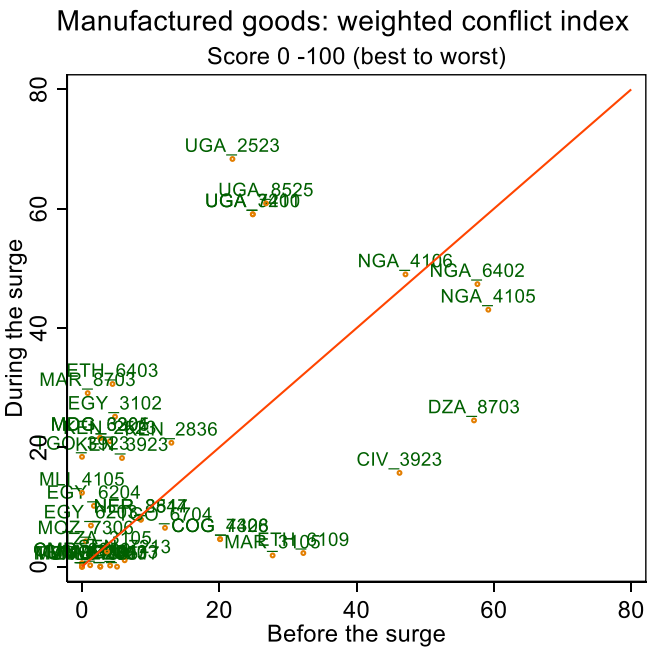
Appendix 3: Severe conflict issues and the list of country products

Appendix 3a: List of countries and products with severe conflict issues

Country	Product (HS-4)	Type	year	Country	Product (HS-4)	Type	year
Algeria	0804	Primary	2011	Guinea-Bissau	0303	Primary	2010
Congo	4408	Manu	2007	Guinea-Bissau	0801	Primary	2011
Congo	7326	Manu	2005	Liberia	1801	Primary	2008
Congo	4001	Primary	2005	Mauritania	1504	Primary	2009
Congo	4403	Primary	2007	Mauritania	2301	Primary	2010
Ethiopia	6109	Manu	2010	Morroco	3105	Manu	2010
Ethiopia	0713	Primary	2010				

Appendix 3b: Conflict patterns before and during export surge episodes





Appendix 3c: Regression without severe conflict country-product pairs episodes (surge periods: cloglog results, 2001-2017)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manu	(6) Manu
Log(per cap GDP)	0.208***	0.215***	-0.031	-0.122*	0.468***	0.648***
	(0.062)	(0.064)	(0.074)	(0.068)	(0.086)	(0.096)
Log(per cap GDP)²	-0.017***	-0.016***	-0.001	0.007	-0.034***	-0.045***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.006)	(0.007)
Log(Secondary education)	0.005	-0.005	0.015**	0.005	-0.006	-0.015**
	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)	(0.006)
Undervaluation	-0.151***	-0.152***	-0.212***	-0.227***	-0.088***	-0.057**
	(0.024)	(0.024)	(0.031)	(0.035)	(0.031)	(0.027)
Market share	-0.000	-0.000	-0.001	-0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Relative Internet users	0.001***	0.001***	0.001***	0.001***	0.001***	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	-0.003	-0.002	-0.002	-0.010	-0.004	0.020**
	(0.007)	(0.007)	(0.010)	(0.008)	(0.008)	(0.008)
Conflict index	-0.057***	-0.062***	-0.129***	-0.118***	-0.017*	-0.018*
	(0.017)	(0.018)	(0.041)	(0.040)	(0.010)	(0.010)
Pegged regime	0.043	0.011	0.073*	0.010	0.009	0.022
	(0.028)	(0.029)	(0.044)	(0.042)	(0.034)	(0.032)
Intermediate regime	0.051*	0.026	0.050	0.016	0.048	0.029
	(0.028)	(0.029)	(0.043)	(0.041)	(0.033)	(0.031)
Southern Africa		-0.082***		-0.081**		-0.086***
		(0.025)		(0.041)		(0.026)
Central Africa		-0.007		0.047		-0.092***
		(0.023)		(0.029)		(0.030)
East Africa		0.004		-0.000		0.010
		(0.018)		(0.025)		(0.024)
West Africa		0.012		0.077***		-0.068***
		(0.017)		(0.023)		(0.023)
Post 2008	0.060***	0.060***	0.060***	0.068***	0.055***	0.044***
	(0.012)	(0.012)	(0.016)	(0.015)	(0.015)	(0.013)
Observations	5,418	5,418	2,821	2,821	2,597	2,597
# of surges	83	83	46	46	37	37

Notes: cloglog estimates. The coefficients are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 7-year window following the onset date. All controls are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Appendix 4: Robustness - alternative parameters (Cloglog)

Robustness about the onset surges: Horizon 6 and 8

	(1) All	(2) Primary	(3) Manu	(4) All	(5) Primary	(5) Manu
	Horizon 6 (α = 1.3 and β = 0.03; 6 years)			**Horizon 8 (α = 1.3 and β = 0.03; 8 years)**		
Log(Per cap GDP)	0.069	0.067	0.114	0.023	-0.082	0.105**
	(0.084)	(0.115)	(0.102)	(0.071)	(0.113)	(0.043)
Log(Per cap GDP)^2	-0.008	-0.006	-0.012*	-0.004	0.005	-0.009***
	(0.006)	(0.007)	(0.007)	(0.005)	(0.007)	(0.003)
Log(Secondary education)	0.034***	0.019*	0.042***	0.016***	0.018**	0.007
	(0.009)	(0.011)	(0.010)	(0.006)	(0.008)	(0.004)
Undervaluation	-0.106***	-0.092**	-0.039	-0.057***	-0.060*	-0.022*
	(0.026)	(0.044)	(0.031)	(0.017)	(0.032)	(0.011)
Market share	-0.003***	-0.002**	-0.009	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.008)	(0.001)	(0.001)	(0.001)
Relative Internet users	0.000	0.001	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	-0.030**	-0.022	-0.013	-0.012*	-0.005	-0.007
	(0.013)	(0.015)	(0.014)	(0.007)	(0.007)	(0.006)
Conflict index	0.090	0.140	0.028	0.046	-0.006	0.063**
	(0.082)	(0.102)	(0.090)	(0.048)	(0.079)	(0.028)
Pegged regime	0.097	0.890***	0.072	0.006	-0.059	0.188***
	(0.080)	(0.122)	(0.059)	(0.043)	(0.050)	(0.054)
Intermediate regime	0.071	0.880***	0.027	0.027	-0.044	0.205***
	(0.080)	(0.125)	(0.057)	(0.043)	(0.049)	(0.053)
Southern Africa	-0.033	-0.068	0.000	-0.004	-0.028	-0.005
	(0.027)	(0.042)	(0.027)	(0.017)	(0.031)	(0.010)
Central Africa	0.027	0.041	-0.017	0.032*	0.012	0.020
	(0.027)	(0.036)	(0.029)	(0.019)	(0.030)	(0.014)
East Africa	0.023	0.034	-0.002	-0.007	0.006	-0.016*
	(0.022)	(0.026)	(0.028)	(0.014)	(0.022)	(0.009)
West Africa	-0.014	0.058**	-0.104***	-0.007	0.032	-0.029***
	(0.021)	(0.026)	(0.022)	(0.014)	(0.021)	(0.011)
Observations	2,686	1,403	1,283	2,647	1,397	1,250
# of surges	84	46	38	41	23	18

Notes: cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 3-year window centered on the onset date of the surge. Controls are averages over the 7 year-period prior the surge. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Robustness about the onset surges: Lower criterion 2 and Higher criterion 2

	(1) All	(2) Primary	(3) Manu	(4) All	(5) Primary	(6) Manu
	Lower criterion (α = 1.1 and β = 0.02; 7 years)			**Higher criterion (α = 1.5 and β = 0.04; 7 years)**		
Log(Per cap GDP)	0.078	-0.108	0.294***	0.078	-0.075	0.247***
	(0.074)	(0.112)	(0.084)	(0.062)	(0.085)	(0.075)
Log(Per cap GDP)^2	-0.008	0.006	-0.022***	-0.007*	0.004	-0.019***
	(0.005)	(0.007)	(0.006)	(0.004)	(0.005)	(0.005)
Log(Secondary education)	0.025***	0.030***	0.011	0.023***	0.026***	0.013**
	(0.007)	(0.009)	(0.007)	(0.006)	(0.008)	(0.007)
Undervaluation	-0.084***	-0.101***	-0.048**	-0.065***	-0.075**	-0.037**
	(0.019)	(0.035)	(0.021)	(0.017)	(0.031)	(0.016)
Market share	-0.001**	-0.001	-0.002	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)
Relative Internet users	0.001***	0.001*	0.001***	0.001**	0.001	0.001*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	-0.018**	-0.024**	0.008	-0.018**	-0.020**	-0.004
	(0.008)	(0.010)	(0.012)	(0.007)	(0.009)	(0.011)
Conflict index	0.053	0.057	0.047	0.072	0.057	0.087*
	(0.059)	(0.093)	(0.062)	(0.048)	(0.074)	(0.048)
Pegged regime	0.696***	0.688***	0.588***	0.597***	0.589***	0.459***
	(0.080)	(0.104)	(0.089)	(0.069)	(0.048)	(0.077)
Intermediate regime	0.690***	0.678***	0.582***	0.601***	0.592***	0.461***
	(0.079)	(0.104)	(0.090)	(0.068)	(0.043)	(0.077)
Southern Africa	-0.022	-0.039	-0.023	0.000	-0.012	-0.002
	(0.021)	(0.033)	(0.024)	(0.018)	(0.031)	(0.019)
Central Africa	0.036*	0.037	0.013	0.052**	0.064**	0.025
	(0.022)	(0.033)	(0.023)	(0.021)	(0.032)	(0.020)
East Africa	0.015	0.023	0.007	0.024*	0.035	0.013
	(0.016)	(0.024)	(0.020)	(0.015)	(0.023)	(0.018)
West Africa	-0.005	0.036	-0.056***	0.007	0.049**	-0.036**
	(0.016)	(0.024)	(0.019)	(0.015)	(0.022)	(0.016)
Observations	2,811	1,477	1,334	2,827	1,480	1,347
# of surges	71	39	32	60	33	27

Notes: cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 3-year window centered on the onset date of the surge. Controls are averages over the 7 year-period prior the surge. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Robustness during surges: Horizon 6 and 8

	(1) All	(2) Primary	(3) Manu	(4) All	(5) Primary	(6) Manu
	Horizon 6 (α = 1.3 and β = 0.03; 6 years)			**Horizon 8 (α = 1.3 and β = 0.03; 8 years)**		
Log(Per cap GDP)	0.380***	0.293***	0.451***	0.212***	0.072	0.337***
	(0.062)	(0.076)	(0.095)	(0.053)	(0.071)	(0.057)
Log(Per cap GDP)^2	-0.028***	-0.021***	-0.033***	-0.015***	-0.005	-0.024***
	(0.004)	(0.005)	(0.007)	(0.004)	(0.005)	(0.004)
Log(Secondary education)	0.010*	0.017**	0.003	0.001	0.021***	-0.017***
	(0.006)	(0.008)	(0.007)	(0.005)	(0.006)	(0.005)
Undervaluation	-0.119***	-0.131***	-0.086***	-0.106***	-0.106***	-0.095***
	(0.028)	(0.045)	(0.032)	(0.019)	(0.032)	(0.017)
Market share	-0.002***	-0.001*	-0.006**	-0.000	-0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.000)	(0.000)	(0.001)
Relative Internet users	0.001***	0.001***	0.000	0.001***	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	0.002	0.001	0.013	0.008*	0.005	0.009
	(0.009)	(0.012)	(0.010)	(0.004)	(0.004)	(0.005)
Conflict index	-0.090***	-0.126***	-0.040*	-0.026**	-0.030	-0.012*
	(0.024)	(0.040)	(0.022)	(0.011)	(0.020)	(0.006)
Conflict issues	0.156***	0.119***	0.149***	0.108***	0.092***	0.094***
	(0.017)	(0.021)	(0.025)	(0.010)	(0.013)	(0.014)
Conflict index*Conflict dummy	-0.209	-0.166	-0.114	-0.145*	-0.366**	0.051
	(0.146)	(0.186)	(0.194)	(0.087)	(0.151)	(0.085)
Pegged regime	0.074**	0.059	0.113**	0.048*	0.014	0.090**
	(0.037)	(0.053)	(0.046)	(0.028)	(0.033)	(0.042)
Intermediate regime	0.092**	0.098*	0.085*	0.067**	0.028	0.101**
	(0.037)	(0.052)	(0.046)	(0.028)	(0.032)	(0.042)
Southern Africa	-0.089***	-0.135***	-0.071***	-0.010	-0.012	-0.025
	(0.024)	(0.047)	(0.025)	(0.016)	(0.028)	(0.015)
Central Africa	0.000	0.087***	-0.114***	0.002	0.032*	-0.027
	(0.020)	(0.026)	(0.028)	(0.015)	(0.018)	(0.021)
East Africa	0.006	0.019	-0.008	0.002	0.017	-0.008
	(0.017)	(0.022)	(0.024)	(0.012)	(0.017)	(0.015)
West Africa	-0.016	0.078***	-0.127***	0.006	0.063***	-0.044**
	(0.016)	(0.022)	(0.023)	(0.013)	(0.017)	(0.018)
Post 2008	0.033***	0.029*	0.034**	0.076***	0.076***	0.056***
	(0.012)	(0.016)	(0.014)	(0.008)	(0.011)	(0.009)
Observations	5,350	2,810	2,540	5,838	3,089	2,749
# of surges	117	66	51	59	34	25

Notes: cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 7-year window following the onset date. All controls are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Robustness during surges: Lower criterion 2 and Higher criterion 2

	(1) All	(2) Primary	(3) Manu	(4) All	(5) Primary	(6) Manu
	Lower criterion (α = 1.1 and β = 0.02; 7 years)			**Higher criterion (α = 1.5 and β = 0.04; 7 years)**		
Log(Per cap GDP)	0.334***	-0.022	0.714***	0.339***	0.015	0.647***
	(0.064)	(0.079)	(0.091)	(0.058)	(0.064)	(0.078)
Log(Per cap GDP)^2	-0.024***	-0.000	-0.050***	-0.024***	-0.002	-0.044***
	(0.004)	(0.005)	(0.006)	(0.004)	(0.004)	(0.005)
Log(Secondary education)	-0.001	0.006	-0.011	-0.003	0.004	-0.014**
	(0.006)	(0.008)	(0.007)	(0.005)	(0.008)	(0.006)
Undervaluation	-0.128***	-0.169***	-0.085***	-0.120***	-0.124**	-0.100***
	(0.028)	(0.048)	(0.031)	(0.025)	(0.048)	(0.023)
Market share	-0.001	-0.000	-0.001	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Relative Internet users	0.001***	0.001***	0.001*	0.001***	0.002***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	0.017**	0.005	0.037***	0.005	0.003	0.011
	(0.007)	(0.009)	(0.008)	(0.006)	(0.008)	(0.007)
Conflict index	-0.070***	-0.142***	-0.021*	-0.049***	-0.107***	-0.011
	(0.020)	(0.044)	(0.012)	(0.015)	(0.036)	(0.008)
Conflict issues	0.192***	0.172***	0.166***	0.165***	0.142***	0.148***
	(0.015)	(0.020)	(0.022)	(0.013)	(0.017)	(0.018)
Conflict index*Conflict dummy	-0.121	-0.050	-0.099	-0.310***	-0.384**	-0.104
	(0.113)	(0.145)	(0.171)	(0.116)	(0.160)	(0.129)
Pegged regime	0.047	0.042	0.053	0.025	0.036	0.018
	(0.031)	(0.044)	(0.036)	(0.029)	(0.044)	(0.029)
Intermediate regime	0.059*	0.062	0.046	0.045	0.053	0.033
	(0.031)	(0.044)	(0.036)	(0.029)	(0.044)	(0.028)
Southern Africa	-0.059**	-0.035	-0.079***	-0.044*	-0.061	-0.036
	(0.024)	(0.034)	(0.030)	(0.024)	(0.044)	(0.023)
Central Africa	-0.007	0.042	-0.067**	0.046**	0.081***	-0.008
	(0.022)	(0.030)	(0.028)	(0.021)	(0.030)	(0.023)
East Africa	0.014	-0.013	0.044*	0.042***	0.021	0.066***
	(0.017)	(0.025)	(0.024)	(0.016)	(0.026)	(0.019)
West Africa	-0.004	0.055**	-0.066***	0.033**	0.096***	-0.022
	(0.018)	(0.025)	(0.024)	(0.016)	(0.024)	(0.020)
Post 2008	0.078***	0.089***	0.062***	0.081***	0.087***	0.062***
	(0.012)	(0.016)	(0.013)	(0.011)	(0.016)	(0.011)
Observations	5,576	2,929	2,647	5,635	2,960	2,675
# of surges	100	56	44	89	52	37

Notes: cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 7-year window following the onset date. All controls are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Appendix 5: Regressions with the overvaluation level as an additional control (Cloglog)

Baseline regression results. Onset of export surges: cloglog results (2001-2012)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manu	(6) Manu
Log(GDP per cap)	0.024	0.076	-0.082	-0.065	0.143*	0.253***
	(0.067)	(0.069)	(0.099)	(0.098)	(0.086)	(0.084)
Log(GDP per cap)²	-0.004	-0.008*	0.004	0.003	-0.012**	-0.020***
	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.006)
Log(Secondary educ)	0.022***	0.024***	0.031***	0.030***	0.015**	0.012*
	(0.005)	(0.006)	(0.007)	(0.009)	(0.007)	(0.007)
Undervaluation	-0.069***	-0.071***	-0.078**	-0.088**	-0.050**	-0.038*
	(0.020)	(0.019)	(0.039)	(0.035)	(0.024)	(0.020)
Overvaluation	**-0.012**	**-0.014**	**0.000**	**-0.005**	**-0.034**	**-0.019**
	(0.028)	**(0.027)**	**(0.034)**	**(0.032)**	**(0.049)**	**(0.041)**
Market share	-0.001*	-0.001*	-0.001	-0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Relative Internet users	0.001***	0.001***	0.001	0.001*	0.001**	0.001**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Relative Corruption index	-0.020***	-0.018**	-0.023**	-0.022**	-0.017	-0.000
	(0.007)	(0.008)	(0.010)	(0.009)	(0.010)	(0.012)
Conflict index	0.055	0.063	0.086	0.077	0.020	0.051
	(0.052)	(0.055)	(0.091)	(0.089)	(0.058)	(0.058)
Pegged regime	0.712***	0.637***	0.723***	0.645***	0.604***	0.545***
	(0.044)	(0.068)	(0.102)	(0.086)	(0.117)	(0.071)
Intermediate regime	0.701***	0.630***	0.698***	0.636***	0.605***	0.538***
	(0.047)	(0.069)	(0.101)	(0.083)	(0.119)	(0.070)
Southern Africa		-0.019		-0.034		-0.020
		(0.020)		(0.031)		(0.022)
Central Africa		0.029		0.041		0.004
		(0.021)		(0.032)		(0.022)
East Africa		0.009		0.021		-0.002
		(0.015)		(0.022)		(0.020)
West Africa		-0.008		0.032		-0.051***
		(0.015)		(0.022)		(0.017)
Observations	2,815	2,815	1,478	1,478	1,337	1,337
ES	66	66	36	36	30	30

Notes: Cloglog estimates. The Regression coefficients are marginal effects. The dependent variable is the dummy variable equal to 1 over a 3-year window centered on the onset date of the surge. Control variables are averages over the 7 year-period prior the surge. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

Regression results. During surges: cloglog estimations (2001-2017)

	(1) All	(2) All	(3) Primary	(4) Primary	(5) Manu	(6) Manu
Log(GDP per cap)	0.263***	0.302***	0.081	-0.020	0.458***	0.637***
	(0.057)	(0.059)	(0.072)	(0.068)	(0.079)	(0.085)
Log(GDP per cap)²	-0.020***	-0.022***	-0.008	0.000	-0.034***	-0.044***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.006)
Log(Secondary educ)	0.006	-0.002	0.016**	0.010	-0.005	-0.014**
	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)
Undervaluation	-0.130***	-0.131***	-0.171***	-0.180***	-0.085***	-0.079***
	(0.027)	(0.028)	(0.041)	(0.046)	(0.032)	(0.030)
Overvaluation	**-0.012**	**-0.008**	**0.025**	**0.019**	**-0.079****	**-0.053***
	(0.024)	**(0.024)**	**(0.031)**	**(0.030)**	**(0.036)**	**(0.032)**
Market share	-0.000	-0.000	-0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Relative internet users	0.001***	0.001***	0.001***	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative Corruption index	0.008	0.010	0.009	0.001	0.003	0.025***
	(0.006)	(0.007)	(0.010)	(0.008)	(0.007)	(0.008)
Conflict index	-0.060***	-0.064***	-0.136***	-0.131***	-0.019*	-0.018
	(0.017)	(0.018)	(0.043)	(0.042)	(0.011)	(0.011)
Conflict Dummy	0.188***	0.181***	0.190***	0.161***	0.183***	0.160***
	(0.014)	(0.014)	(0.018)	(0.018)	(0.022)	(0.021)
Conflict index*Conflict Dummy	-0.141	-0.128	-0.129	-0.073	-0.096	-0.099
	(0.111)	(0.109)	(0.147)	(0.140)	(0.169)	(0.158)
Pegged regime	0.063**	0.041	0.101**	0.052	0.023	0.037
	(0.030)	(0.031)	(0.048)	(0.047)	(0.035)	(0.034)
Intermediate regime	0.072**	0.053*	0.094*	0.066	0.051	0.034
	(0.030)	(0.031)	(0.048)	(0.047)	(0.034)	(0.033)
Southern Africa		-0.080***		-0.095**		-0.068**
		(0.025)		(0.043)		(0.028)
Central Africa		-0.001		0.047		-0.060**
		(0.021)		(0.029)		(0.027)
East Africa		0.013		-0.004		0.038*
		(0.016)		(0.023)		(0.023)
West Africa		0.003		0.061***		-0.052**
		(0.016)		(0.023)		(0.023)
Post 2008	0.080***	0.080***	0.084***	0.088***	0.076***	0.064***
	(0.011)	(0.011)	(0.016)	(0.015)	(0.014)	(0.013)
Observations	5,596	5,596	2,947	2,947	2,649	2,649
ES	96	96	55	55	41	41

Notes: Cloglog estimates. The coefficients reported are marginal effect evaluated at the sample means. The dependent variable is a dummy that is equal to 1 over a 7-year window following the onset date. All controls are lagged. Standard errors are adjusted for clustering at the product-year level: *** p<0.01, ** p<0.05, * p<0.1.

[1] This methodology has been used in several domains including to study the relation between fiscal expenditure and economic growth (Carrère and de Melo, 2012).

[2] In some countries real wages may be high enough given the low productivity level or tight market conditions on some segments of the supply. Gelb *et al.*, (2016) mention such a situation for specific middle manager jobs or skilled workers whose supply lags far behind productive sector needs.

[3] At an HS6 level of disaggregation, Cadot et al. (2015) focus on export surges in bilateral trade flows for 8 developing countries over the period 1995-2012.

[4] SE Index is a subindex of the FERDI's Human Assets Index (HAI) retrospective series. See Feindouno and Goujon (2019).

[5] Cerra and Saxena (2008) study the response of output to different crises. They find that civil wars lead to a larger short-run decline in output (6 percent on average) but allow for a rapid rebound in growth, while the impact of financial crises is more persistent.

[6] Results incorporating the overvaluation variable are provided in Appendix 5.

[7] This result is obtained from column 2 of Table 5 and determined as follows: -0.073×-0.18= 1.31, where -0.18 represents a one-standard deviation in undervaluation. To figure out what this represents across our sample, the following procedure is adopted: 1.31/(3×2.3), where 1.31 is the marginal effect induced by a one-standard deviation decrease in undervaluation. 2.3 is the unconditional probability of observing an acceleration which we multiply by 3 since the dates t-1 and t+1 around the detected acceleration year also take on the value 1.