universität wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

"An empirical analysis of the determinants of current account imbalances in developing countries"

verfasst von / submitted by

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angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, 2017 / Vienna, 2017

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	A 066 913
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Volkswirtschaftslehre
Betreut von / Supervisor:	Univ.-Prof. Alejandro Cuñat, PhD

ABSTRACT

International trade and financial integration have strengthened the economic ties among countries. Even developing countries with the weakest economic fundamentals have opened up their borders to international transactions, reaping gains from trade and benefitting from capital and financial inflows. However, this development has come hand in hand with a rise in vulnerabilities. External crises have shown the importance of monitoring external imbalances, such as large and persistent current account deficits, before they become unsustainable. The purpose of this thesis is to investigate the determinants of the current account balance of 125 developing countries between 1990 and 2014 by employing pooled ordinary least squares with clustered standard errors in the main estimation process. Results show that the current account balance is positively related to fiscal balance, level of development, net foreign asset position, while it has an inverse relationship to age dependency ratios and foreign direct investment inflows. Furthermore, in this thesis it is shown for the first time the crucial role played by the category of goods exported in shaping current account balances.

ABSTRAKT

Internationaler Handel und finanzielle Integration haben die wirtschaftlichen Verflechtungen zwischen Ländern verstärkt. Auch Entwicklungsländer mit den schwächsten wirtschaftlichen Rahmenbedingungen haben ihre Grenzen internationalen Transaktionen geöffnet und dabei von Handel und Kapitalzuflüssen profitiert. Diese Entwicklung ist jedoch Hand in Hand mit einem Anstieg der wirtschaftlichen Vulnerabilität gegangen. Externe Krisen haben gezeigt, wie wichtig es ist, externe Ungleichgewichte wie große und langanhaltende Leistungsbilanzdefizite zu überwachen, bevor diese unhaltbar werden. Ziel dieser Diplomarbeit ist es, die Bestimmungsfaktoren der Leistungsbilanz von 125 Entwicklungsländern zwischen 1990 und 2014 zu untersuchen. Im Hauptschätzverfahren wird dazu ein gepoolter Kleinstquadratschätzer mit geclusterten Standardfehlern verwendet. Die Ergebnisse zeigen, dass die Leistungsbilanz positiv von der Steuerbilanz, dem Entwicklungsniveau und dem Nettoauslandsvermögensstatus sowie negativ von dem Altersabhängigkeitsverhältnis und von passiven ausländischen Direktinvestitionen abhängt. Außerdem wird zum ersten Mal die tragende Rolle, die die Kategorie der exportierten Güter bei der Gestaltung der Leistungsbilanz spielt, gezeigt.

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1. Introduction

In recent decades, international trade has increased dramatically as countries have gradually opened up to global competition. With the progressive removal of trade tariffs and the substantial reduction of shipping costs, borders stopped being barriers to international transactions. Integration in global value chains, international movement of capital and delocalization of production processes have made countries increasingly more interconnected. While this process has been generally seen as a positive development and has been accompanied by periods of remarkable economic growth, concepts such external balance have become of central importance for policymakers. Higher interdependence among countries has also resulted in significant exposure to external shocks. Especially in an environment in which financial crises develop very fast and swiftly spread from country to country.

The focus of this master's thesis is on the structural features of countries and how they affect the current account balance, which is regarded as one of the most insightful indicators of external imbalances. It must be pointed out that current account deficits are not a negative thing per se. Nor is a current account surplus necessarily positive for an economy. Regardless of the sign, the wider and the more persistent the current account imbalance, the more cautious policymakers should be. Past experience has already shown that external crises and subsequent adjustments can be extremely painful for an economy.

The objective of this master's thesis is to identify through an empirical analysis the key determinants of current account imbalances in developing countries. The current account balance over GDP will be regarded as the dependent variable and the statistical significance of diverse potential drivers of imbalance will be tested. The reason to distinct developing countries from advanced economies is because countries are subject to different dynamics and consequently different types of shock according to their level of development. Although the opening up of the economies of developing countries is a relatively recent phenomenon, it has significantly transformed their economic models by boosting international trade and by providing easily accessible financial resources. Nevertheless, weak economic fundamentals and a number of constraints make them more vulnerable to adverse circumstances. For example, volatile sources of foreign exchange earnings and developments in global financial markets, like an increase in

international interest rates, can expose them to external crises if large external imbalances lead them to have sizeable external financing needs.

This thesis is structured as follows. In chapter 2, I provide a review of the literature on external imbalances and on the determinants of current account balances. Chapter 3 analyzes the components of the current account balance, the balance of payments identity, the saving-investment perspective and the intertemporal approach in order to gather insights on possible drivers of the current account. Chapter 4 is dedicated to external imbalances and their relationship to external crises, with special focus on developing countries. In chapter 5 the potential key determinants are presented. The methodology of the empirical analysis is explained in chapter 6, while the results and their implications are reported in chapter 7. In chapter 8 robustness checks are undertaken, while Chapter 9 presents the conclusions. Bibliography and appendix are included in chapters 10 and 11 respectively.

2. Literature review

Studies on current account imbalances, their causes and their implications are abundant. In the literature, current account imbalances have often been connected with the topics of external imbalances and external crises. Catão and Milesi-Ferretti (2014) found that current account deficits are the best predictors for external crises. Edwards (2004) concluded that major reversals of current account deficits negatively affect economic activity and generate external crises as they are strongly linked to sudden stops of capital inflows and to exchange rate crises. Frankel and Saravelos (2012) reviewed 83 papers and found that the current account balance is among the most frequent statistically significant determinants of crisis incidence. Large current account imbalances were among the main causes of the great global recession (Cheung et al., 2013) and a core unattended issue which led to the Eurozone crisis (Baldwin et al., 2015).

One common framework to analyze the current account balance is the intertemporal approach, introduced by Sachs (1981) and further developed by Obstfeld and Rogoff

(1994) according to which the current account balance is the result of forward-looking saving and investment decisions. However, as pointed out by Ca' Zorzi et al. (2012), simple intertemporal models are found to have a poor empirical fit in explaining the current account balance.

Among the previous empirical research on determinants of current account imbalances, Calderon et al. (2002) found in their sample of 44 developing countries that current account deficits are persistent, and increase together with GDP growth and real exchange rate appreciation. They also found that countries with lower per capita GDP have higher current account deficits, thus supporting the stages of development hypothesis. Chinn and Prasad (2003) focused on a sample of 89 countries, 71 of which were developing, and found that government balance and net foreign asset position have a positive impact on the current account, while trade openness has a negative effect for developing countries. Conversely, Ca' Zorzi et al. (2012) found that trade openness has a positive effect on the current account in their sample of 181 countries. They also found that oil balance and civil liberties (a variable on institutional strength, legal rights and functioning markets) positively impact the current account balance, while high age dependency ratios have a negative influence.

The introduction of the share of the main export categories to total exports as determinant of the current account balance has not appeared in the literature yet. However, McMillan and Rodrik (2011) used the various shares of export categories to show how specialization of exports in developing countries has driven structural change. They considered the relative importance of the export categories as a representation of the country's comparative advantage.

In addition to other factors already identified by previous research, variables such as foreign direct investment inflows, stock of foreign direct investment liabilities as well as geographical variables like isolation and small population, are part of the empirical investigation of this thesis, although they have been largely ignored by the literature on the drivers of external imbalances.

3. What is the current account balance

In order to understand the determinants of the current account balance, it is important to analyze what the current account is by examining its components, the saving-investment perspective, the balance of payments identity and the intertemporal approach.

3.1 Components of the current account balance

Following the methodology of the Balance of Payments manual provided by the International Monetary Fund (2009), the current account balance (CA) involves transactions between residents and nonresidents which can be categorized in three major groupings, namely the goods and services account (also known as the trade balance, TB), the primary income account (PI) and the secondary income account (net current transfers, NCT).

$$CA = TB + PI + NCT \quad (1)$$

All these components have an impact on the current account balance. The trade balance is normally the biggest and refers to transactions involving outcomes of production activities. Variations in the terms of trade, competitiveness or in the exchange rates affect the trade balance and in turn the current account. The primary income account comprises earnings coming from different factors of production, such as compensations to employees, interest payments and dividends. Therefore, in this category fall the returns from foreign assets and foreign liabilities, indicating that the net foreign asset position has direct repercussions on the current account. Finally, the secondary income accounts include current transfers, such as remittances and foreign aid. This category is not necessarily the least important as especially in the poorest countries current transfers can make a difference. Foreign aid is a fundamental engine of development and remittances are one of the major drivers of consumption in some underdeveloped economies. For example, on average they accounted for 38.53% of GDP between 2007

and 2016 in Tajikistan[1]. The more all these factors weigh on total GDP, the more domestic economies are exposed to the economic activity of foreign countries.

3.2 Balance of payments identity

The current account is part of the balance of payments and it is jointly determined with its other parts. The sum of current account balance and net capital inflows (NKF, net nonreserve inflows or sum of balances on the capital and financial accounts) equals the change in the official foreign exchange reserves (ΔFR).

$$CA + NKF = \Delta FR \quad (2)$$

Therefore, a current account deficit is financed through net capital inflows, a reserve drawdown or a combination of the two. Assuming no change in the foreign exchange reserves, a current account deficit is associated with a net capital inflow (capital and/or financial account surplus). Similarly, assuming no change in the nonreserve inflows, a current account surplus is associated with an increase in the foreign exchange reserves.

A country's net foreign asset position is the difference between the country's total foreign assets and liabilities and reflects the sum of past current account balances, besides movements in the prices of assets and liabilities. Every current account surplus has an overall positive effect on the net foreign asset position (foreign assets increase with respect to foreign liabilities), while a deficit has a negative effect.

A persistent current account deficit is associated with an increase in external indebtedness, as foreign reserves cannot shrink indefinitely. In turn, rising external indebtedness cannot expand indefinitely, as creditors will soon or later question the sustainability of the country's external position.

[1] Source: World Bank database

3.3 Saving-Investment perspective

The current account balance can be expressed as the difference between total saving (S) and total investment (I) in the economy.

$$CA = S - I \quad (3)$$

In a closed economy, the current account balance is at zero as no transaction is made with foreign countries. Hence, saving perfectly matches investment.

Saving and investment can only differ if the economy is open to international trade. As a result, a current account surplus is generated by an excess of saving with respect to investment, while a current account deficit mirrors lower saving than investment in the domestic economy.

By making a distinction between private and public sectors, the current account balance can be expressed as the difference between private saving (S_p) and investment (I_p) plus the difference between public saving and investment, which is the general government fiscal balance (T-G). Therefore, (3) can be rewritten as:

$$CA = (S_p - I_p) + (T - G) \quad (4)$$

From this perspective, it can be seen that an expansionary fiscal policy has a positive effect on the current account. In the same way, also the factors impacting saving decisions, such as demographic variables, and those influencing private investment are determinants of the current account balance.

3.4 The intertemporal approach to the current account

According to the intertemporal approach[2], the current account balance is the result of individuals' optimal saving and investment decisions. Current consumption equals the present value of future expected net output and assets. Economic agents tend to smooth consumption over time by borrowing or lending from abroad. Adjustments in the

[2] See Obstfeld and Rogoff (1996)

current account balance therefore limit consumption variation in case of output fluctuations due to unexpected turbulences, such as productivity shocks or interest rate movements. For example, following a negative exogenous shock (such as a destructive earthquake), the current account balance is expected to decline on account of lower saving, as consumption levels tend to remain relatively constant despite a negative short-term effect on output. This happens because consumption hinges on future expected output which is largely unaffected by temporary shocks.

In this framework, current account deficits are a sign of an expected output increase and underline that the country is importing present consumption which will be compensated by an export of future consumption (as the country will run current account surpluses in the future). As both saving and investment depend on intertemporal factors, so does the current account balance.

4. Current account imbalance

Although the topic of external imbalance is widely covered in the literature, it is hard to find a unique and unambiguous definition. Krugman et al. (2012: 505) referred to external balance as the position in which the "current account is neither so deeply in deficit that the country may be unable to repay its foreign debts in the future nor so strongly in surplus that foreigners are put in that position".

In few occasions, policymakers have specified a clear-cut threshold to define external imbalances. In the April 2007 World Economic Outlook, the IMF[3] provided a rare definition of large and persistent external imbalances as "episodes where the current account balance remained above 2 percent of GDP (in absolute value) for at least five years". In an UNCTAD's paper, Moussa (2016) asserted that as a rule of thumb sustainability problems are posed by current account deficits above 5% of GDP. Moreover, since 2011 the legislation of the European Union precisely defines when a current account position is in imbalance. As the euro crisis was unfolding, the European

[3] International Monetary Fund (2007)

Commission introduced the macroeconomic imbalance procedure with the aim of identifying, preventing and addressing macroeconomic imbalances. According to it, if the three-year average of current account balance over GDP exceeds 6% or alternatively is lower than -4% it constitutes an external imbalance[4]. Specifically, if the thresholds imposed are trespassed, the country may be subject to an excessive imbalance procedure.

These three definitions already show large diversity of positions on the topic, reflecting that a strong consensus is lacking on when an external position is in imbalance. There is heterogeneity on the quantitative threshold, on whether or not to treat surpluses in the same way as deficits and on how long an imbalance has to last before being considered as such.

In recent times, disputes mostly involving deficit countries addressing countries with large and persistent current account surpluses have become increasingly frequent. For instance, China has been long accused of currency manipulation from the USA[5] and has received pressures from the International Monetary Fund to adopt a more flexible exchange rate in order to reduce its trade imbalances. Similarly, inside the European Union Germany has often been criticized for its wide current account surplus.

In 2009, the Group of 20 (G20) acknowledged the importance of intervention in case of presence of external imbalances. During the Pittsburgh Summit the 20 countries committed to attain more balanced current accounts, perhaps indirectly pointing at large current account imbalances as one of the causes of the Great Recession. All in all, these elements point to the fact that large current account imbalances, and especially deficits. have increasingly become a matter of concern for policymakers.

However, on the matter there are two prevalent views. According to the "Lawson doctrine[6]" there is no need to intervene. The government should only focus on a good administration of the public finances without interfering in the private sector. Following this approach, the current account does not matter and therefore does not require any policy actions as a remedy. The alternative view is what Blanchard (2007) defines as "the prudential or the IMF view", according to which economic policy interventions are

[4] European Commission (2012)
[5] See Morrison and Labonte (2013)
[6] The "Lawson doctrine" is named after Nigel Lawson, Chancellor of the Exchequer in the 1980s

crucial to reduce excessive and persistent current account imbalances. In this view, investment and saving decisions can be affected by distortions, such as an overly expansionary fiscal policy, wrong expectations about the future, lacking financial intermediation and other factors upon which an intervention is desirable.

Ultimately, the current account balance is important because it provides an indicator for countries' solvency with regard to their foreign liabilities. Constantly embarking more and more debt is likely to eventually lead to financial distress. Policy interventions through reforms, although potentially painful for an economy in the short-term, can avoid major financial disasters in the medium-to-long term.

4.1 Persistent current account imbalances and external crises

While we assisted to remarkable growth rates in international trade, global markets have become increasingly integrated. This phenomenon has come hand in hand with a widening of external imbalances. As trade openness[7] rose, so did current account deficits and surpluses. According to Bracke et al. (2010), between mid-1980s and 2008 the aggregate current account positions as a share of world GDP have doubled, while gross foreign assets have increased fourfold.

Some studies have shown how globalization, together with a welcome increase in international trade, has brought to rising imbalances in developing countries. Chinn and Prasad (2003) found that openness to international trade has an inverse relationship to current account balance for developing countries. Similarly, Moussa (2016) argued that increasing trade openness in Sub-Saharan Africa has been accompanied by a deterioration in the current account, mainly due to the low productivity and import dependence of the region.

Additionally, since the end-1980s, in a phenomenon widely known as financial globalization, huge capital account movements have characterized economic relations between developing and advanced countries, providing financial resources to fuel current account imbalances. Countries have been impacted in different ways, depending

[7] Trade openness is normally referred to as the sum of exports and imports over GDP.

on their economic prospects and regulations. Some countries retained a tight control on international capital movements while others did not. In general, when the increased availability of capital has not been utilized in a productive way, easily accessible external financing has contributed to the rise of current account imbalances.

According to the intertemporal approach, a current account deficit signals the expectation of a rapidly rising output, as rational economic agents borrow present consumption from abroad and intend to pay back the accumulated debt when the economy is more mature. However, as an empirical evidence, some countries tend to run wide surpluses or deficits in their current account for very extensive periods of time. This trend is becoming progressively more evident and has brought to episodes of external crises, especially in developing countries.

Bracke et al. (2010) also noted a strong persistence in current account positions since mid-1990s, as current account surpluses and deficits tend to become chronic and only rarely switch from one side to the other. Furthermore, in the IMF World Economic Outlook of October 2015[8], it is reported that between 2012 and 2014, 62 countries had an average current account deficit larger than 7% of their respective GDP.

There are different causes leading to the presence of wide imbalances. However, it must be underlined, that a large and persistent current account deficit is not necessarily a danger for the economy. If a large deficit is the result of sizeable inflows destined to productive investment, it can well stimulate economic growth, while providing the country with the adequate returns to pay back the external loans. If conversely it originates from chronic unproductive consumption of foreign goods, doubts about the future solvency of the country on its foreign liabilities will eventually arise. In the latter case, it will be more difficult to find domestically the resources needed not only to rebalance the deficit position, but also to run substantial current account surpluses, which are necessary to service and pay down the external debt that has been accumulated.

One reason why large and persistent current account deficits are cause of concern is that while external debt grows, debt servicing costs tend to increase more than proportionally. As net foreign liabilities rise, the creditworthiness of the country

[8] International Monetary Fund (2015), Box 1.2.

diminishes and as a consequence, risk premiums and therefore interest rates on foreign loans surge. High debt servicing costs have a negative effect on the current account balance as they are part of the primary income account and thus they directly push the current account downwards. As a result, the worse the net foreign asset position, the costlier it is to rebalance the overall current account position. In a self-fulfilling mechanism, the excessive external debt accumulated put countries in situation of debt overhang. In turn, getting foreign financing becomes increasingly more difficult and sudden stops of financial inflows are more likely.

A sudden stop is an abrupt interruption of financing, which is necessary to cover a country's current account deficit. Such episodes are more likely when deficits are large and persistent. The type of liabilities that have been accumulated also play a role. The higher the share of portfolio inflows, "hot money", the easier it is for foreign investors to flight as soon as they assist to a negative development in the economy. If debt represent the major share of liabilities, the reversal will be relatively more gradual. External investors will progressively ask for higher yields as debt keeps increasing. When foreign debt becomes too expensive, a correction of the current account deficit becomes necessary. On the other hand, sudden stops are more unlikely if previous current account deficits have been funded through foreign direct investment (FDI), as for a foreign company it takes time to revert its fixed investment.

Sudden stops are associated with a fast and often disordered exit of foreign investors from the country's assets. This is likely to exert notable pressure on the currency and in turn consume the international reserves of the central bank if it tries to counter the capital flight by selling foreign exchange for domestic currency. Eventually, the reserves may prove insufficient and the currency could suffer a fast depreciation. Currency devaluation cause inflation, makes debt denominated in foreign currency more expensive and could trigger a banking crisis if domestic banks have unhedged exposure in foreign currency. Following a sudden stop, a country loses access to foreign funding and thus is no longer in the position to run current account deficits. The reversal of a current account deficit implies an increase in savings and a drop in investment, which are two measures that adversely affect domestic economic activity.

4.2 Reasons for focusing on developing countries

Literature has dedicated less attention to external imbalances in developing countries than in advanced economies, possibly because of their relative limited importance in terms of world GDP or because of their worse accountability, which hinders empirical research. Nevertheless, major external imbalances in the world involve developing countries.

Although developing economies are quite a heterodox group of countries, in comparison to advanced economies they are on average characterized by lower institutional quality, more political instability, higher susceptibility to wars and social conflicts, more volatile foreign exchange earnings, weaker fiscal positions and less effective monetary policy. Their economies are subject to infrastructural constraints and capital market imperfections to which advanced countries are less exposed to and that have a direct impact on both saving and investment. For example, as Chinn and Ito (2007) argued in the case of East Asian emerging markets, the overall level of saving in a country is higher if the financial sector is more developed.

Poverty and weak financial institutions restrain the level of saving in developing economies. Therefore, these countries are generally left with a limited domestic capital endowment, which provides little financing for investment. However, if developing countries open up their capital account, they are likely to receive capital inflows from more developed countries. As returns on investment are expected to be higher in developing countries, capital tends to flow from more developed countries to less developed countries following what is envisaged by the stages of economic development hypothesis.

As countries run current account deficits, they receive net capital inflows and in turn foreign liabilities rise. Yet, sometimes they reach unsustainable levels. There are many examples of developing countries which have abruptly lost access to foreign financing in the past, experiencing a sudden stop of capital inflows together with large capital outflows. For example, as Tirole (2002) reported, during the East Asian crisis, in Indonesia, Korea, Malaysia, Philippines and Thailand the difference between the combined net inflows of 1996 and net outflows of 1997 amounted to 85 billion US dollars, equivalent to 10% of their combined GDP, which had huge repercussions on the single economies.

Capital flight can be highly disruptive and rapidly cause massive currency depreciations, private and sovereign debt defaults and prolonged economic crises. They are more common in developing countries as they have weaker fundamentals, more volatile economies, more instable financial sectors and lower precautionary holdings such as foreign exchange reserves. Therefore, a close monitoring of their current account position appears to be even more crucial for authorities than in the case of advanced countries.

Moreover, developing countries have lower income levels in the first place, thus financial crises and economic recessions turn out to be particularly painful for the country.

Furthermore, another typical source of weakness for developing countries is the so-called original sin. It comes from the difficulties of these economies to be granted financing in their own currency because of their history of recurrent currency devaluations and high inflation. As a result, the great bulk of their external debt is denominated in foreign exchange currency and is thus vulnerable to currency risk and to global macroeconomic developments, such as an increase in interest rates in advanced economies. Hence, current account deficits in developing countries normally concur in generating debt in foreign currency, whereas more developed countries generally can afford to finance their current account deficits in their own currency and therefore at a relatively more limited risk.

The current account position of developing economies has become especially important in recent times, as more and more developing countries abandoned concessional debt and have started to issue sovereign bonds in international markets for the first time.

5. Description of the key variables

The significance of a set of variables will be tested to determine their incidence on the current account balance.

Among the variable tested there is a fiscal variable (government budget balance), demographic variables (percentages of young and old population), economic variables (per capita GDP and per capita economic growth), financial variables (net foreign assets, de jure and de facto capital openness, foreign direct investment as a flow and as a stock), trade variables (exports of food, ores and metals, fuel, high and low technology manufactures, as well as trade openness, export concentration and diversification, trade restrictions) and geographical variables (population, island and landlocked dummies). A description of the variables, together with a brief explanation of how they may play a role, is provided in the followings.

5.1 Government balance

The fiscal balance is one of the most important instruments in the hands of the government to influence the economic activity of a country. The fiscal stance of the government, be it expansionary or contractionary, has also repercussions on the current account.

As shown in section 3.3, the fiscal balance has a direct impact on the current account balance. Assuming that private saving and investment do not change, a fiscal surplus, which indicates public sector saving, pushes the current account balance upwards, while a fiscal deficit pushes the current account balance downwards.

However, movements in the fiscal balance can potentially have a direct impact on private savings and investment decisions. For example, if the government were to implement a sizeable investment plan (which taken alone means an expansionary move), it could provoke a decline in the level of private investment (crowding out effect). Another example could be an unexpected decision of the government to reduce pension benefits (keeping contribution constant), which would prompt overall saving to rise. In both cases, the relative reactions of the private sector could potentially offset the government moves, leaving the current account balance largely unaffected.

On the issue, the literature is divided between the twin deficits hypothesis and the Ricardian equivalence hypothesis. According to the former, fiscal deficits push the current account downwards, as an increase in total disposable income raises

consumption and in turn increases imports. According to the latter, fiscal deficits make taxpayers save more so to compensate for a future fiscal consolidation and therefore the overall effect on the current account is negligible.

Abell (1990) found evidence of causality between budget and current account balance, arguing that the drivers of the link are the transmission mechanisms of interest rates and exchange rates. The overlapping generations model (Obstfeld and Rogoff, 1994) also envisages a positive relation between budget balance and current account balance. In their framework, fiscal deficits were represented as a redistribution of resources from future to current generations.

5.2 Age structure: the role of demographic variables

As saving is a key determinant of the current account balance, the age structure is taken into account. Following Modigliani's life-cycle hypothesis, the higher the share of the population in working age, the higher the overall level of savings. Therefore, I take into account in the model the percentage of young and old population on the total. The former refers the population aged 14 or below, while the latter refers to the population aged 65 or above.

Herbertsson and Zoega (1999) are among those who found empirical evidence in support of the theory and underline how current account imbalances driven by demographic factors are welcome as they reflect optimal consumer behavior and well-functioning international capital markets.

5.3 GDP per capita

Standard economic theory predicts that countries in early stages of development attract capital from advanced countries. This follows from the common assumption of diminishing marginal returns on capital, typical of neoclassical economic models. Investment in developing countries (which have low capital-labour ratios) is expected to be more profitable than investment in advanced countries (which have higher capital-labour ratios). As a result, poor countries should be subject to significant inflows

of capital from richer countries and thus run current account deficits in their catch-up process. This framework, known as the "stages of economic development hypothesis", has been contradicted by the evidence provided by Lucas (1990)[9]. In practice, even though the returns from investing in developing countries may be higher, some structural distortions in place increase risks, preventing capital from actually flowing "downhill". For instance, due to weaker institutions poorer countries are subject to more elevated political risk, low protection of property rights and enforceability of contracts.

In the regression, GDP per capita will be considered as an indicator of the level of development and the stages of economic development hypothesis will be empirically tested.

5.4 Per capita real GDP growth

Economic growth is expected to exert a negative effect on the current account balance as high economic growth raises the expected future output and provokes a decrease in current saving, in line with the intertemporal approach.

Moreover, sustained economic growth generally fuels imports thus lowering the current account balance, as gains in disposable income may be spent on goods and services produced abroad. On the other hand, a domestic recession generally impacts consumption and in turn it dampens imports. Under the condition that concurrently external demand remains sustained, the current account balance is therefore expected to improve.

5.5 Capital mobility

Capital mobility reflects how much a country is open to international financial flows. Two different indicators, namely de jure and de facto measures, are taken into account.

[9] The Lucas Paradox

De jure capital mobility is derived using the Chinn-Ito index[10] which focuses on countries' regulations to limit or to foster financial openness. De facto capital mobility is instead the sum of total foreign assets and liabilities as a percentage of GDP.

Theoretically, constraints on the capital account may eventually limit current account deficits by restraining external financing (Chinn and Prasad 2003). Moreover, Wong and Carranza (1999) argued that very open capital account may themselves be the cause of current account instability, as sizeable capital movements coordinated in one direction impact the exchange rate, which in turn has repercussions on the current account. For example, net capital inflows can cause a currency appreciation, with negative effects on the competitiveness of exports. Conversely, as capital openness is associated with financial market development, it can increase saving and therefore positively impact the current account balance (Cheung et al. 2013). Empirical evidence is mixed on the effects of capital mobility on the current account balance.

5.6 Net foreign assets

The larger the net foreign asset positions with respect to GDP in absolute terms, the higher the repercussions on the current account balance. Returns on foreign assets and foreign liabilities are part of the current account balance through the primary income account. Their effects can indeed be quite substantial. According to Moussa (2016), since 1984 investment income payments have been the main source of the current account deficit in Sub-Saharan African countries. This well shows how the accumulation of high levels of liabilities, both in the forms of debt-generating inflows and equity-like inflows (such as foreign direct investment), generates current account shortfalls, respectively in the form of interests and dividends.

As a result, countries with high net foreign liabilities tend to run recursively a deficit in the primary income account, which in turn has negative effects on the overall level of indebtedness. Conversely, countries with high net foreign assets tend to have a surplus in the primary income account with positive repercussions on the current account position.

[10] Chinn and Ito (2006)

On the other hand, countries with negative net foreign asset positions are expected to eventually repay their liabilities despite the negative pressures that increasing levels of borrowing entail. Chronic current account deficits lead to increasing net liabilities and to external crises if they are never rebalanced.

It is therefore of interest to analyze whether the relation between net foreign assets and current account balance is positive, which implies that the level of indebtedness tends to increase recursively, or negative, which implies that large net foreign assets and net foreign liabilities positions tend to rebalance in time).

5.7 Foreign direct investment

Foreign direct investment is a major driver of the capital account. It refers to the purchase or creation of a company abroad and it involves control of its activity. In developing countries, large foreign direct investment inflows are typically associated with a parallel worsening of the current account balance, especially when they are directed to capital intensive activities. For example, the discovery of mineral fields in poorer countries normally attract significant investment from abroad. Before the exports start, significant imports of capital goods are needed, such as machinery and equipment, which are more often shipped from abroad than produced locally. As a result, the immediate effect of foreign direct investment inflows on the current account balance is expected to be negative.

Additionally, also the effect on the current account of the stock of foreign direct investment accumulated in the liabilities will be tested. Many foreign firms invest in developing countries with the aim of subsequently exporting what they produce. As a result, it will be investigated whether this variable has a positive impact on the current account.

5.8 Trade variables

Along with globalization, international trade has risen dramatically. In order to benefit the most from trade, countries tend to specialize in sectors in which they have a comparative advantage.

A clear empirical evidence is that countries with comparative advantage in energy products (oil, natural gas) have typically been running higher current account balances than countries with comparative advantage in soft commodities such as coffee or tea. Those high current account surpluses derive from high saving, which can be justified by precautionary motives (such as accumulation of financial resources for the times of lower commodity prices or for when reserves of hydrocarbons end) or are simply the result of inability of consumption levels to expand as fast as the output. However, only some categories of exports provide enough wealth to significantly impact the level of saving. In countries exporting other commodities (for instance, agricultural products or metals), the impact on wealth and saving can be much more limited. Consequently, these countries typically run lower current account balances than oil-exporting countries.

Moreover, according to data, current account balances of Asian countries exporting mainly manufactures is generally better than that of other countries in Africa and South America, which mainly export lower value added manufactures, agricultural commodities and minerals.

In light of this, the type of exports is taken into account as a possible determinant of the current account balance. Relying on the COMTRADE database, share over total exports of diverse categories of exports is taken into account and namely fuel, manufactures, high technology exports, ores and metals, as well as food and agricultural raw materials.

Furthermore, by employing the UNCTAD's export product concentration and diversification indices, it will be tested if high specialization of exports has beneficial or adverse effects on the current account balance, if any.

Finally, it will be tested if imposing trade restrictions is effective in obtaining a higher current account balance.

5.9 Geography

International trade is affected by geographical conditions. If a country is difficult to reach, it will inevitably tend to trade less than a country that can easily enter world markets. Natural barriers that hamper international trade can be, for instance, mountain ranges, no access to the sea or at the contrary remoteness, in the case of some island nations.

These difficulties may translate into high transportation costs, which effectively work as a tariff on imports as well as exports and prevent a full exploitation of the gains from trade. However, the effect on trade may affect exports more than imports in case the demand for imports is non-elastic. For example, the cost of stopping imports of food and energy for some countries is respectively famine and meltdown of economic activities. Therefore, even though remoteness may hinder exports, imports of strategic goods remain crucial.

Small countries too have been regarded by the literature as particularly vulnerable. For example, Alesina (2003) described some of the constraints that affect small economies. If a country misses some determinate critical dimensions in terms of domestic market, its development is hampered and its integration in international trade may be subject to distortions. A small domestic market imposes serious limitations to diversification and in general to the development of industries, as economies of scale will be particularly hard to achieve. Small countries are normally the ones attaining the highest levels of trade openness. Nevertheless, low diversification and high reliance on trade leave them exposed to significant external shocks and terms of trade volatility. As a result, their exports, and in turn their economic performance, can turn out to be quite erratic.

In the empirical part, dummy variables for countries affected by natural barriers are added as an attempt to test whether adverse geographical conditions, i.e. being an island with no terrestrial borders to other countries, having no access to the sea or low population, have a statistically significant negative impact on the current account balance.

6. Methodology

The empirical strategy is presented in this section. The selected estimation method is discussed (section 6.1), a description of the dataset is provided (6.2), outliers are identified and excluded (6.3) and finally the issue of multicollinearity is examined (6.4).

6.1 Pooled ordinary least squares with clustered standard errors

The main estimation on the determinants of the current account balance is performed by employing pooled ordinary least squares (POLS) with clustered standard errors. This estimator emphasizes cross-country variation, which is considered to be particularly important in the sample as many key variables[11] vary more markedly across country than within country. Nevertheless, this estimator neglects the time component and thus the panel structure of the data, as it simply treats every observation as independent from the others.

Two measurements originating from the same country in two different points in time, are considered by default just as two independent observations. This is due to the fact that, by using the POLS estimator, a simple cross-sectional regression is run. Clearly, in case two or more observations come from the same individual (country), then they are no longer independent. As a result, error terms would not be uncorrelated anymore, violating one of the assumptions that make Ordinary Least Squares the Best Linear Unbiased Estimator (BLUE).

If no adjustment is provided to this flaw, in case of serial correlation true standard errors of estimators are underestimated (assuming positive within-cluster correlation) and parameter estimates can be inconsistent (Cameron and Trivedi, 2005). It is therefore necessary to correct the formula with which standard errors are calculated. The solution to the issue is obtained by employing cluster robust standard errors in the POLS regression. Hence, each country for which there is more than one temporal observation is treated as a cluster in the regression. In this manner, consistent

[11] Age dependency ratio, GDP per capita, net foreign asset position, type of exports.

estimation is safeguarded as error terms are now assumed to be independent only across clusters, while serial correlation and heteroskedasticity are not subject to restriction within each cluster. To ensure consistent estimation of the parameters it is necessary that clusters are numerous but small. This condition is respected in the main estimation that is provided in section 7, as there are 125 clusters comprising up to 5 observations each.

The focus of the estimation is on medium-term determinants of current account imbalances. Therefore, in order to stress the importance of structural features while mitigating the effects of short-run business-cycle related variations, every variable (with the exception of net foreign assets, stock of FDI liabilities and per capita GDP growth[12]) was rearranged into 5-year non-overlapping averages before running the estimation.

Moreover, by adopting this procedure potential bias coming from measurement errors is appreciably attenuated. This is a matter of special concern when dealing with data coming from developing countries. For these countries in particular, the respective national statistical systems are often incapable of delivering precise data, due to lack of adequate funding, weak collection systems or even absence of independence, which may result in data manipulation. Ultimately, averaging provides a practical solution to enhance the accuracy of data in presence of random errors[13]. However, it is ineffective if data is subject to systematic measurement errors.

Applying the pooled least squares estimator on data rearranged into non-overlapping averages is not uncommon in the literature. This method was already employed in investigation on the determinants of the current account balance by Ca' Zorzi et al. (2012), Chinn and Ito (2007) and Chinn and Prasad (2003) among others. Still, in their works they do not explicitly point out whether they have used cluster-robust standard errors or not.

[12] For the variables net foreign assets and stock of FDI liabilities, data refer to the values at the start of the respective timeframe to avoid endogeneity issues. As regards per capita GDP growth, the values of the variable refer to the variation between average per capita GDP in the period as compared to the average of the previous period.

[13] While random errors are inaccuracies which have no pattern, systematic errors are mistakes that always point in the same direction.

6.2 Data description

The initial sample comprising only developing countries observed between 1990 and 2014, includes 125 countries for a total of 399 observations. The details regarding countries and relative timeframes are reported for each country in the Appendix (see 11.1 Sample List).

Observations are part of the sample only if for each country there were data for every variable part of the regression and for the 5 respective consecutive years. The 5-year non-overlapping averages refer to the following 5 timeframes: 1990-1994, 1995-1999, 2000-2004, 2005-2009 and 2010-2014.

The final sample includes every country for which data were found. On average, there are 3.19 observations per country, denoting the presence of gaps in the sample. If it had been possible to collect data in each timeframe for all the 125 countries, the sample would have been 226 observations richer.

Unfortunately, for some developing countries there is no observation. It is typically the least developed countries, together with those with dictatorial regimes, that lack an appropriate data collection system and thus they cannot be included of the analysis. Their absence make the sample available not a random draw from the population of the countries of the world. Nevertheless, this is the best and widest dataset I could assemble and it is the result of research in the main public available databases, including World Bank and International Monetary Fund.

Not surprisingly, the time-slot with the most missing observations is the furthest away in time (1990-1994), for which only 24 observations were collected. Luckily the availability of data has markedly improved with time and for all the last three timeframes at least 100 observations could be obtained. Missing data in the database for type of exports provided by the World Bank and COMTRADE was one of the main causes for the presence of gaps in the sample, while for other variables more completed databases were found.

As for the countries that are part of the sample, all the countries that were not classified as advanced by the IMF as of end-1989[14], are considered developing countries in the analysis. Even if throughout the years some of them have become advanced according to the IMF official classification[15], they still remain in the sample as developing countries. No distinction is then considered between so called "developing countries" and "emerging markets".

In this regard, an additional analysis is provided in section 8.1, in which a regression using also 24 advanced countries for a total of 115 additional observations is run for completeness. This analysis was carried out to show that the current account balances of developing have different drivers than that of advanced economies. If the database were not split, estimation outcomes would have been far less precise and the final implications of the results of this thesis would have in turn be weakened. Therefore, the dataset was divided in accordance with the level of development of each country right from the beginning of the estimation process.

The sources and the description of each variable are reported in the Appendix (see 11.2 Variable Description and Data Sources).

6.3 Outliers

Of the initial 399 observations on developing countries for which data were available, 3 of them had been discarded as they were deemed as representing outliers, i.e. observations with values very far from the others in the same population and that the model fails to explain. When possible, the extreme values have been double-checked with other databases to make sure that they were not the result of a recording error. The three excluded observations were Malta (2005-2009), owing to its extraordinary level of net foreign direct investment inflows in the period (269.07% of GDP), Mauritius (2010-2014) for its net foreign assets equivalent to 1726.77% of GDP, and Trinidad and Tobago (2005-2009) for its current account surplus of 25.19% of GDP. The first two observations were found to exert a notable influence on the variable of interest, i.e.

[14] International Monetary Fund (1989), World Economic Outlook, October
[15] Israel (1997), Korea, Rep. (1997), Singapore (1997), Cyprus (2001), Slovenia (2007), Malta (2008), Czech Republic (2009), Slovak Republic (2009), Estonia (2011), Latvia (2014).

distortive effects on coefficients and significance. Instead, Trinidad and Tobago was excluded because of the incapacity of the model to provide an adequate prediction as underlined by its very high residual and the fact that regression results changed considerably when performing a regression with and without it.

While acknowledging that discarding observations is generally not a good practice as it impoverishes the dataset (especially if the values are confirmed by different databases and the dataset has already a number of gaps), it is necessary to underline that OLS regressions are very sensitive to extreme values. Being Malta, Mauritius as well as Trinidad and Tobago all countries with a relatively small GDP, it is not very surprising that in such countries a shock can produce abnormal economic values as a consequence. It was therefore chosen to discard them to safeguard the truthfulness of the results, thus avoiding that just one special value compromised the relation between variables that all the other observations displayed.

The exclusion of the outliers from the estimation process visibly changes the parameters for FDI inflows and net foreign asset position, making the estimation of their coefficients more accurate. Moreover, it impacts the R-squared, which as a result climbed from 0.6014 to 0.6631. Addition exclusions of observations with extreme values would have further increased the R-squared but they were avoided to keep the sample as wide as possible.

6.4 Multicollinearity

The simultaneous inclusion of fuel, ores and metals, food, high technology exports and non-high technology manufactures exports as a percentage of merchandise exports is inappropriate as these 5 categories taken together represent the entire set of exports, i.e. for each observation their sum is 100 or it is very close to it. Hence, if all of these 5 categories are included, a multicollinearity issue arises and coefficients become unstable.

The solution to the issue is straight forward, as it is enough to remove one of these variables from the regression equation. In this way, no information is lost and all the other variables assume a value that is to be interpreted as relative to the excluded

regressor. The variable that was chosen to be left out is low tech manufactures exports. This variable has the highest mean among the export variables with 39.14%. As a consequence, it is the one that is likely to be more related with the others. This result is supported by the variance inflation factor (VIF), which provides a measure of multicollinearity. As reported in the Appendix (section 11.3), the variable for low tech manufactures exports tops table 7 with a value of 12.64, indicating that it is the one with the highest correlation with all the other variables. As a rule of thumb, if values are above 10, we are in the presence of a serious problem of multicollinearity. After the exclusion of low tech manufactures, multicollinearity is no longer a hurdle for the estimation. Even though the variance inflation factor still indicates a relation between young and old, between ores and ores squared and between per capita growth and per capita growth squared as evidenced by table 8 in the Appendix, this does not seem to affect estimation results, as demonstrated by the low standard errors obtained in the estimation for these regressors, as presented in section 7.

7. Empirical Results

In this section, the outcome of the pooled ordinary least squares regression estimation with clustered standard errors is provided and the main implications of the results are illustrated.

Table 1 shows that the model has an overall good fit. This is witnessed by the R-squared at 0.6631, which indicates the percentage of variance of the dependent variable, the current account balance, that the model is capable of explaining.

Of the 16 explanatory variables estimated in the regression, 11 of them resulted statistically significant at a 1% level of confidence. The other five are anyway significant at a 5% level, allowing for a meaningful interpretation of their effects, also considering the fact that there is a relatively modest total number of observations.

For most of the regressors, a simple linear relationship was determined between them and current account balance. Per capita real GDP growth as well as exports of Ores and

metals represent an exemption since they were both found to have a quadratic relationship with the dependent variable.

Table 1 – Main regression output

Linear regression

Number of obs	= 396
F(16, 124)	= 25.81
Prob > F	= 0.0000
R-squared	= 0.6631
Root MSE	= 4.4808

(Std. Err. adjusted for 125 clusters in Country)

CAB	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
FB	.5021648	.1013622	4.95	0.000	.3015406	.702789
young	-.1751493	.0729986	-2.40	0.018	-.319634	-.0306646
old	-.4071172	.1433877	-2.84	0.005	-.6909217	-.1233127
GDPpc	5.118417	2.476374	2.07	0.041	.2169797	10.01985
pcGrowth	-4.844113	.9501106	-5.10	0.000	-6.724648	-2.963578
pcg2	2.112385	.5783148	3.65	0.000	.9677384	3.257032
NFA	.0163951	.0065375	2.51	0.013	.0034555	.0293348
FDI	-.4272058	.1081086	-3.95	0.000	-.6411829	-.2132286
FDI_stock	.0134454	.0039724	3.38	0.001	.0055829	.0213079
Exp_FoodAgri	-.037897	.0159529	-2.38	0.019	-.0694723	-.0063218
Exp_Fuel	.0593847	.0200478	2.96	0.004	.0197045	.0990649
Exp_Ores	-.1801874	.0597123	-3.02	0.003	-.2983747	-.0620002
Exp_ores2	.0026785	.0009146	2.93	0.004	.0008683	.0044887
Exp_HT_Manu	.143309	.0428185	3.35	0.001	.0585591	.2280588
LowPop	-3.703238	1.075971	-3.44	0.001	-5.832886	-1.57359
Island	-1.807889	.7900829	-2.29	0.024	-3.371684	-.2440934
_cons	9.477416	3.283678	2.89	0.005	2.978097	15.97674

Starting the analysis of the results from the regressors linearly related to the dependent variable, the variables found to have a positive impact on the current account balance are fiscal balance (FB), per capita GDP (GDPpc), net foreign asset position (NFA), stock of FDI liabilities (FDI_stock), fuel exports expressed as a percentage of total merchandise exports (Exp_Fuel) and high technology exports expressed as a percentage of total merchandise exports (Exp_HT_Manu). Keeping every other variable constant, an increase equivalent to 1% of GDP in the fiscal balance causes a 0.502 percentage points (pp) increase in the current account balance over GDP ratio. This result is in line with the twin deficit hypothesis, according to which fiscal deficits cause current account

deficit, while it is in contrast with the Ricardian equivalence hypothesis. The interpretation of the coefficient of the variable GDPpc is a bit trickier, since the variable is expressed as a share of the US GDP in the relative timeframe. According to the results, if ceteris paribus two countries have a difference in terms of per capita GDP equivalent to the per capita US GDP, the richer country is expected to have a current account balance 5.12pp higher than that of the other country. To be clearer, the current account balance will be 1pp of GDP higher if per capita GDP increases by around one fifth of the US per capita GDP. This result is in line with the stages of economic development hypothesis. Going forward, if net foreign asset position increases by 1 (100% of GDP), the current account balance rises by 1.64 pp of GDP. Data points to the fact that countries with high net liabilities (or assets) tend to recursively run current account deficits (surpluses) and therefore net liabilities (assets) tend to increase rather than rebalance. If the stock of FDI liabilities amounted to 100% of GDP at the beginning of the timeframe, this is expected to increase the current account balance by 1.34pp. Finally, the higher the share of exports of fuel and high technology, the higher the current account balance. The estimates show that a 1-pp increase in exports of fuel or high technology in the share of total merchandise exports raises the current account of 0.06 pp and 0.14 pp of GDP respectively.

On the other side, the variables found to have a negative and linear impact on the current account balance are both the demographic variables (young and old), foreign direct investment net inflows as a percentage of GDP (FDI), food and agricultural raw materials exports expressed as a percentage of total merchandise exports (Exp_FoodAgri), and both the dummy variables for population lower than half a million (LowPop) and for country being an island or a group of islands with no terrestrial border with any other country (Island)[16]. According to the outcomes of the estimation, an increase of 1 pp in the share young and in the share old population, decreases the current account balance of 0.18 and 0.41 pp of GDP respectively. The signs of the coefficient of the demographic variables is in line with the expectations, as according to the life cycle hypothesis a higher share of population in non-working age population is associated with a lower level of saving (and therefore lower current account balance), given that workers are those who save while old people dissave and young people do

[16] Following this definition, both Bahrain and Singapore, despite being on islands, cannot be considered as "Island" as they have terrestrial borders with Saudi Arabia and Malaysia respectively.

not have an income. An increase of 1 pp in net FDI inflows as a share of GDP provokes a worsening of 0.43 pp in the current account balance. The result is not surprising as FDI inflows raise the level of investment in the domestic economy and are often associated with high capital imports, thus they have an overall negative effect on the current account balance. A 1pp-increase in exports of food and agricultural raw materials in the share of total merchandise exports is associated with a decrease in the current account balance equivalent to 0.04 pp of GDP. Low population, and specifically population below half a million, is found to diminish the current account balance by 3.7pp of GDP. Finally, island countries are found to have a current account balance lower by 1.81pp.

Turning now to the two variables for which a quadratic term was added and found statistically significant (namely, per capita real GDP growth: pcGrowth, pcg2; and ores and metals exports as a percentage of merchandise exports: Exp_Ores, Exp_ores2) they both resulted to have a convex relationship with the current account balance, as notable from the positive coefficient of their square terms. Per capita GDP growth has a negative effect on current account balance, unless the economic expansion has been remarkably high. According to the estimation, the relationship is positive if average per capita GDP increased by more than 229.32% compared to the previous 5-year period. This is equivalent to an annual average growth per capita of at least 26.92%, which is a level that in the sample only Azerbaijan and Kazakhstan, both between 2005 and 2009, have attained. The variable is found to become increasingly negative until 1.15 (equivalent to an annual growth rate of 16.5%) and after that it becomes increasingly positive. This outcome is only partially in line with the predictions of the intertemporal approach. Similarly, exports of ores and metals are found to have a negative impact on the current account balance if they represent less than 67.27% of total exports, with an effect that becomes increasingly negative up to 33.64.

In order to provide a better interpretation of the impact of per capita GDP growth and share of exports of ores and metals, figures 1 and 2 show their quadratic relationships with the dependent variable together with confidence intervals at 95% level.

Figure 1 - Estimated effect of per capita real GDP growth on current account balance

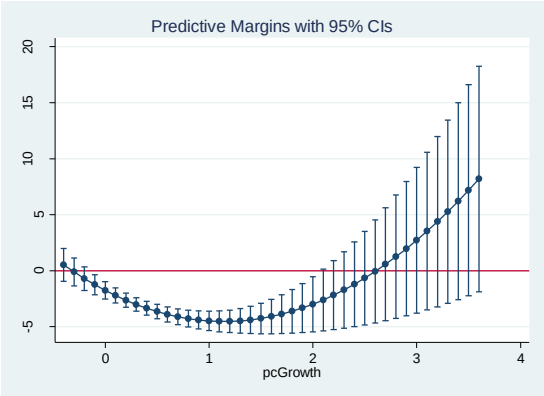
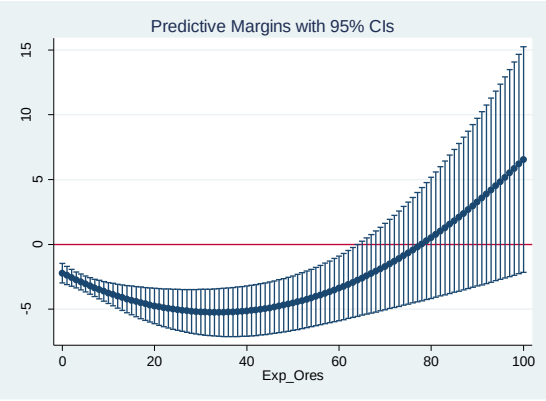


Figure 2 - Estimated effect of exports of ores and metals on current account balance



To sum up, negative fiscal balances, high age dependency ratios, negative net foreign asset positions, high net foreign direct investment inflows but low stock of foreign direct investment liabilities, population below 0.5 million, being on an island, low exports of fuel, high technology and high exports of food as a percentage of total merchandise exports are found to negatively affect the current account balance.

7.1 Implications of the results

In this section, the most important implications coming from the empirical results are discussed, namely the effects on current account balance of fiscal balance, per capita GDP, financial variables (net foreign asset position, FDI and capital openness), types of exports and geography (population and island).

It is also important to underline that the following variables were not included in the final results as they have always been far from obtaining statistically significant levels: Chinn and Ito's index for de jure capital openness, de facto capital openness, trade openness, dummy variable for landlocked country, UNCTAD's export product concentration and diversification indices, globalization variables such as the KOF globalization index (Dreher, 2006) and its sub-index economic restrictions, which refers to tariffs and other barriers to trade. The effect of the addition of dummy variables for continents is provided in section 8.5.

7.1.1 Twin deficit hypothesis

The fiscal balance is found to be a crucial determinant of the current account balance. According to estimation results, a fiscal surplus (deficit) equivalent to 1pp of GDP has a positive (negative) effect equivalent to 0.502 on the current account balance. This provides support to the twin deficit hypothesis, i.e. fiscal deficits push the current account balance downwards. The coefficient between 0 and 1 shows that the Ricardian offset is not complete, meaning that an increase in saving (dissaving) of the public sector is only partially compensated by an increase in private sector dissaving (saving).

The outcome is broadly in line with the results exposed in previous literature. It moderately exceeds the 0.4 estimated by Chinn and Prasad (2003) for developing countries. However, estimations that included in the sample data coming from both developing and advanced countries found considerably lower coefficients (see Ca' Zorzi et al., 2012; Cheung et al., 2013).

7.1.2 Stages of economic development

The model finds that capital flows to less developed countries or countries with lower per capita GDP. The coefficient of 5.12 practically indicates that ceteris paribus a country like Chile with an average GDP per capita of 14590.29 US dollars between 2010 and 2014 (or equivalent to 28.40% of the US GDP) is foreseen as having a current account balance about 1pp of GDP higher than Paraguay, with a GDP per capita of 4052.40 US dollars in the same period (or equivalent to 7.89% of the US GDP). Although the result is statistically significant, it implies a moderate effect. Being the sample made only of non-advanced economies, it still confirms that a higher per capita GDP tends to be accompanied by a higher current account balance. This is in line with the stages of economic development hypothesis, which envisages that capital flows to less developed countries. It is however in discordance with the Lucas paradox, which provides some explanations for the reasons why capital in fact flows from poor countries to rich countries. Although Lucas based his reasonings on empirical evidence, Reinhardt et al. (2013) found that his theory may now be outdated. In fact, they showed that the gradual opening of the capital accounts from the 1990s has brought to a confirmation of the

predictions of standard neoclassical theory. They basically relate the Lucas paradox to the fact that in the 1980s capital accounts were much closer.

Another element that may have played a role is the increasing importance of international financial institutions interventions in least developed countries. Concessional loans provided by International Monetary Fund or World Bank among others, may have reduced obstacles to investment in poor countries by supporting the construction of infrastructures and the strengthening of institutions. As a result of the better environment, private investment from abroad are more likely to flow in.

7.1.3 Financial variables

The two variables on capital openness, namely de jure and de facto capital openness, were omitted from the final regression output (section 7) because of their high statistical insignificance. Actually, the coefficient of de facto capital openness only becomes insignificant after the inclusion of the stock of FDI liabilities, without which an increase by 1 (100% of GDP) in de facto capital openness provokes an improvement of 0.27pp of GDP in the current account balance, showing that higher capital mobility would have a positive, albeit modest, effect on the current account balance. Being stock of FDI liabilities an important part of de facto capital openness, the two variables are highly correlated, thus only one of the two should be included in the regression. The choice to include stock of FDI liabilities was based on its better fit as compared to that of de facto capital openness.

Now turning to the effects of net foreign asset (NFA) position in the model, results are somewhat puzzling at a first glance. The coefficient for NFA is quite below the value that I would have imagined for it beforehand. Owing to interest income derived from foreign assets and interest payments on foreign liabilities, the initial stock of net foreign assets directly affects the primary income account, which is part of the current account balance (see section 3.1). Both financing net liabilities and the returns on net assets are likely to generate well above the level that the model foresees. An interest rate close to 1.64% greatly underestimates the actual costs of lending.

However, there are some explanations for this result. First of all, developing countries normally have access to concessional loans through international financial institutions. These loans offer particularly favourable terms for borrowers as interest rates are typically far below the level offered in the market. Even though these loans are normally conditional to the implementation of a set of reforms meant to improve macroeconomic conditions and reduce country-specific weaknesses, they provide fresh financing in terms of capital inflows, which can be used in turn to finance imports. As a matter of facts, finding the resources to secure basic imports (like food and energy) is fundamental for the development of poor countries.

Secondly, the low coefficient of NFA could be due to high FDI-related flows. The stock of FDI, together with debt-generating flows and portfolio equity represent the three main components of total foreign assets and liabilities. Foreign exchange reserves are also an important factor, though they only figures on the asset side. While portfolio equity is relatively limited for developing countries, FDI liabilities/assets can be quite substantial. Furthermore, debt, be it concessional or not, generates payments that, although in different degrees, negatively affect the current account balance. Conversely, the presence of large stocks of FDI has a more ambiguous effect on the current account balance, as witnessed by the regression output. In the beginning FDI inflows are related to an increase in imports, resulting in the negative effect on the current account balance that the model is catching for the variable FDI. However, in the medium to long term, those FDI inflows have beneficial effects on the exports, as again shown in the regression output by the positive and significant effect associated with the variable FDI_stock. For instance, a reason for this is that FDI inflows are one way to obtain the necessary financing to start harnessing mineral resources, which require particularly high costs of extraction. Moreover, a positive externality of FDI is represented by the transfer of knowledge, as foreign investors accessing the market of developing countries bring along their know how. Indeed, their entry was found to enhance the quality of exports in terms of unit values of exports by Harding and Javorcik (2012). In the same way, while reinvesting the profits coming from foreign investment raises liabilities, it also increases the potential to expand exports in the future. All in all, this shows that the stock of FDI liabilities impact the current account balance in a different manner as compared to liabilities related to debt-generating flows.

7.1.4 Export categories

One of the key results of the regression estimation is the fact that the different types of goods exported have diverse effects on the current account balance. These results are underpinned by high statistical significance.

The level of aggregation of the variables reflects the categories offered by the World Bank in its dataset, which are Food, Agricultural raw materials, Fuel, Ores and Metals, Manufactures and High-technology Manufactures. A more detailed description of every grouping is provided in section 11.2. Starting from the original data, the variable Exp_FoodAgri was constructed as the sum of exports of food and agricultural raw materials and the variable Exp_LowManu was obtained as the difference between total manufactures and high technology manufactures. As already pointed out earlier, all the variables are expressed as a percentage of total merchandise exports.

Table 2 provides a quick description of the behavior of the 5 variables in the sample that refer to export categories.

Table 2 – Export variables – key statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Exp_FoodAgri	396	30.08025	26.49576	0.028421	99.46078
Exp_Fuel	396	15.24698	24.81961	0	97.80119
Exp_Ores	396	8.316602	13.94926	0.005802	81.20227
Exp_HT_Manu	396	5.063355	9.924729	0	66.34912
Exp_LowManu	396	39.13819	25.79795	0.393495	96.95155

Among these variables, only Exp_LowManu was not included in the estimation process, so as to avoid dummy trap-related type of problems. The other variables were all found to be statistically significant and, as explained above, their coefficients are meant to be interpreted as in comparison with the effect produced by the excluded variable Exp_LowManu.

The regression output exposed in section 7 clearly indicates that high technology exports have the strongest positive effect on the current account balance, followed by fuel exports, while food is the worst exports as per its effect on the dependent variable. The interpretation of the impact of exports of ores and metals is less straight forward as they have a quadratic effect. Their impact however hovers around that of the Exp_LowManu variable. Compared to it, it has a better effect on the current account balance only if exports of ores and metals represent more than 67.27% of total merchandise exports, which is quite a rare case in the sample (it is the case only for 6 of the final 396 observations).

In order to get an idea of the effects of the export category variables I included also the following table 3. Column (2) shows the effects on the current account balance envisaged by the model in case the respective variable accounts for the totality of the country's exports. Results are expressed as compared to a country that is exporting only low manufactures.

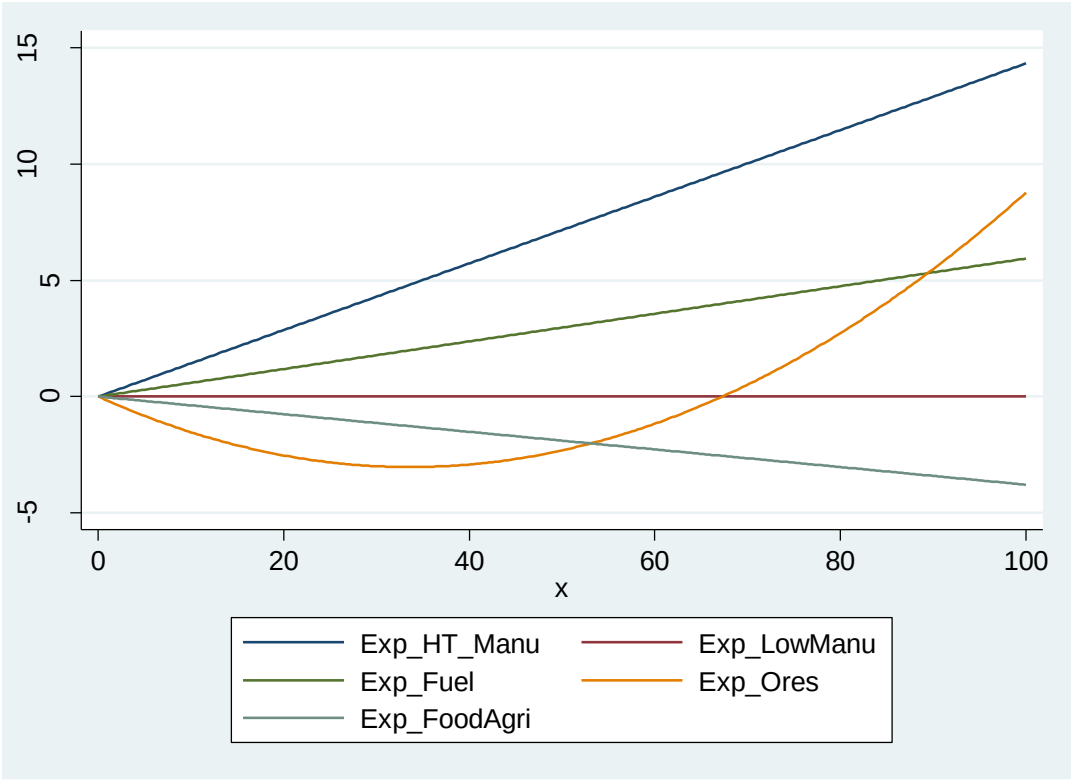
In columns (3), another simplistic simulation is run. In this scenario, a minimum of diversification is envisioned. In fact, it is assumed that low manufactures represent 50% of the exports and the other export category (column 1) just accounts for the other half. In this way, it is possible to appreciate how the effect of the quadratic variable Exp_Ores changes, while linear variables just see their effect halved as compared to column (2). Moreover, as notable in table 2 it must be underlined that, in the sample, exports of high technology as well as Ores and Metals never exceeded respectively 66.35% and 81.20% of total merchandise exports, indicating that the scenario as in column (2) in which they amount to 100% is far from reality for any of the observations.

Table 3 – Two scenarios on the interaction among export variables

(1) Variable name	(2) Country exports only column 1 variable	(3) Country exports only low manufactures and column 1 variable (50:50)
Exp_FoodAgri	-3.7897	-1,89485
Exp_LowManu	0	0
Exp_HT_Manu	14.3309	7,16545
Exp_Fuel	5.93847	2,969235
Exp_Ores	8.76626	-2.31312

The following figure 3 aims to provide a better explanation of the results presented above on the effects of each export type part of the regression. Specifically, it shows the contribution on the current account balance (y-axis) of each export variable taken singularly when its share on total merchandise exports increases from 0 to 100% (x-axis).

Figure 3 – Effects of the export variables on the current account balance



The results reported above are far-reaching. However, their interpretation should be prudent. As seen in column (2) of table 3, a potential difference exceeding the 18pp of GDP in the current account balance between a food-exporting country and a high technology manufacturer represents a very extreme result, capable of having wide repercussions on the whole economy, especially given the fact that in the estimates the level of development, as expressed by GDP per capita, has been already accounted for. Export of minerals or high technologies require much higher standards in terms of infrastructures, investment and skills of the workforce than exports of basic textiles or

agricultural commodities. This shows how level of development, production capacities and natural resource endowment make trade inherently asymmetric between developing countries. Those exporting higher value added goods such as fuel and high technologies are more prone to accumulate savings, while those exporting food, low manufactures and metals are likely to ultimately become net borrowers. As chronical borrowing can lead to external crisis, countries exporting lower value added goods should be aware of this position of weakness and take preventive measures to counter their vulnerabilities.

High exposition to food and agriculture exports has particularly harmful consequences on the balance of payments. These products are exposed to both commodity prices fluctuations and weather-related shocks. Weather conditions can be very instable and besides leading to famine in the most adverse cases, they can make agricultural export earnings very volatile. Lack or excess of rain, as well as too cold or too warm temperatures can damage agriculture productions. Adverse weather conditions can turn net exporters of food in net importers of food, with negative implications for the current account balance. As a consequence, it is not that surprising that exports of food and agricultural raw materials are found to have a negative effect on average.

Another striking element is the difference between the effect of technologically advanced manufactures against the rest of manufactures, which shows how much the specialization in higher value added exports positively impacts the current account balance.

Finally, among natural resources energy-related commodities amply outperform exports of metal and ores. This may be related to the massive demand for fuel, on which the activities of both industry and simple household hinge. Effectively, the same does not happen for metals, or at most it happens in a much more limited fashion. Diverse dynamics in the market, in terms of demand and supply, may be at the root of the different contribution to the current account balance. After all, as fuel is a basic need, it has a direct effect on disposable income. Data unsurprisingly points to the fact that importing it implies a reduction of disposable income, while exporting it provides a boost. Hence, it shows that fuel exporting countries have drained savings from fuel importing countries. This has happened despite huge variations in the energy-related commodities within the time frame of reference: for example, the price of oil has swung from about 10 US dollars per barrel in 1998 to almost 150 US dollars ten years later.

However, the export of commodities poses a risk to the balance of payments that exports of manufactures do not. The recent collapse of commodity prices, also known as the "end of commodity supercycle"[17] may be representing the end of an era for oil-exporting countries. Some of the world's largest current account surpluses were swiftly turned into wide deficits. It also caused steep currency devaluations and dramatic external crises in many developing countries exporting commodities. However, this recent crisis is not mirrored in the results of the regression since data is only included up to 2014.

Focusing now on the curious quadratic relationship between current account balance and the share of exports of ores and metals, it must be pointed out that it is the only export variable for which the quadratic term was found to be significant. One possible explanation for this relation could be that developing countries with exports highly specialized in ores and metals fare better than more diversified countries for which ores and metals still represent a significant but not predominant portion of exports. Therefore, instead of accepting that the relationship is actually quadratic and convex, results may be pointing in the direction of a possible "Dutch disease[18]" type of effect on the other kinds of exports coexisting with ores and metals. Frankel (2012), among others, described a number of side effects produced by the export of commodities on the exports of manufactures. The most important are the real appreciation of the currency (due to an increase in capital inflows to obtain the financing necessary to start exploiting natural resources as well as higher foreign currency earnings once the exports of the commodity start) and potentially the overheating of the economy when exports of minerals thrive, due to simultaneous growth in the non-traded goods sector and likely procyclical fiscal stance of the government, which especially in developing countries incautiously increases spending as soon as revenues rise. As a result, exports of manufactures may lose competitiveness.

This process fits with the results offered above. The negative relation between current account balance and exports of ores and metals when they represent between 0 and 67.27% of total exports as envisaged by the model, may reflect the fact that exporting ores and metals has a mild negative effect on the other exported products. In fact, the

[17] See Sharma (2012)
[18] The term "Dutch disease" was first used by *The Economist* in 1977 to describe the negative effects on the Dutch manufacturing sector caused by the discovery of natural gas in the 1950s.

negative effect is the strongest when ores and metals account for roughly one third of total exports. Conversely, if ores and metals are the predominant export (e.g. they exceed 50% of the total), the negative effect on the other export variables is minor as they already represent a modest share of total exports.

7.1.5 Small population and island nations

Turning now to the geographical dummy variables, it was found in the regression that countries with small population and island nations tend to have worse current account balances. As already underlined in section 5.9, a very limited size is a sign of particular vulnerability for an economy. In the regression estimation, the dummy for small population takes on a value of 1 if the country has less than 500.000 inhabitants[19]. The island dummy assumes a value of 1 if the developing country is an island or a group of islands[20]. As shown in the main regression output, low population dummy has a stronger and more significant negative effect than the dummy for island.

Interestingly, many of the countries with population below 0.5 million coincide with the island countries. Small island nations are actually one well know category of vulnerable countries, which are normally referred to as "SIDS - Small Island Developing States" by international organizations, such as the United Nations. A paper from the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (2011: 2-3) reports the common challenges faced by SIDS as:

> narrow resource base depriving them of the benefits of economies of scale; small domestic markets and heavy dependence on a few external and remote markets; high costs for energy, infrastructure, transportation, communication and servicing; long distances from export markets and import resources; low and irregular international traffic volumes; little resilience to natural disasters; growing populations; high volatility of economic growth; limited opportunities for the private sector and a proportionately large reliance of their economies on their public sector; and fragile natural environments.

[19] 10 countries in the sample for a total of 23 observations: Antigua and Barbuda, Barbados, Belize, Grenada, Malta, Samoa, Seychelles, St. Lucia, St. Vincent and the Grenadines, Tonga.
[20] 17 countries in the sample for a total of 49 observations: Antigua and Barbuda, Barbados, Cabo Verde, Fiji, Grenada, Jamaica, Madagascar, Malta, Mauritius, Philippines, Samoa, Seychelles, Sri Lanka, St. Lucia, St. Vincent and the Grenadines, Tonga, Trinidad and Tobago.

Island countries with a population of less than 500.000 resulted to be particularly penalized in terms of external performance in the regression, as combining the effects of low population and island, the model yields a cumulative negative effect on the current account balance equivalent to 5.51pp. Clearly, financing such a deficit every year poses significant challenges to these countries, which as a result are more exposed to external crisis than others.

8. Robustness Checks

In this section, different specifications are introduced to test the sensitivity of the results exposed in section 7. In the followings, advanced countries are added to the sample and a Chow test on structural break is performed (section 8.1), export variables are expressed as dummies for the main export category instead of percentage of merchandise exports (8.2), endogeneity is tested (8.3), a fixed effects panel data regression is run (8.4) and finally robustness of the results to the inclusion of dummies for continent is checked (8.5).

8.1 Inclusion of advanced countries

The exclusion of the advanced countries[21] from the sample may seem quite arbitrary. Some reasons to motivate the decision are provided in section 4.2. However, it can be of interest to verify if the results obtained for the developing economies in section 7 are also valid for advanced countries, or at least to see which coefficients are robust to the inclusion of advanced countries and which are not.

[21] Specifically, those countries for which data were found and were among the industrialized in the IMF's October 1989 World Economic Outlook are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Italy, Japan, Luxembourg, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States of America.

A change in regression coefficients across two or more subsamples is referred to as a structural break (Verbeek, 2012). Testing for a structural break is possible by employing the Chow test (Chow, 1960). The Chow test is commonly known as a test on the poolability of data as it considers a null hypothesis of coefficients being equal across different subsamples. Hence, if the null hypothesis is rejected we are in the presence of a structural break, which means that the two subsamples should be treated separately.

A first Chow test (see row "overall" in appendix 11.4, table 9) on the coefficients of every regressor used in section 7 including the intercept yields an outright rejection of the null hypothesis. This means that just adding the advanced countries to the original sample would have been wrong because advanced countries represent a structural break vis-à-vis developing countries.

However, at a second glance it can be noted that the break is only present because of a subset of coefficients. In fact, if 7 of the 17 regressors are excluded and namely per capita GDP growth together with its quadratic term, foreign direct investment inflows, stock of foreign direct investment liabilities, dummy for low population and exports of fuel as well as exports of high tech manufactures, the null hypothesis of the Chow test (appendix 11.4, table 10, row "overall") is no longer rejected. This means that the coefficients of these seven variables are significantly different between the two subsamples. On the other hand, it also means that the results obtained for the other 10 regressors are broadly extendible also to the advanced economies.

8.2 Export Dummies

In order to test whether the results on the typology of exports are robust, data have been re-arranged to create export dummies for food, fuel, manufactures (here expressed as total exports of manufactures, comprising both high technology and the rest) and ores and metals. These dummies assume a value of one if the relative type of exports is the predominant among the 4 categories and zero if it is not. Moreover, also a

dummy for high technology exports has been created, which takes a value of one if exports of high technology represent more than 10% of total merchandise exports[22].

The regression results are reported in table 4. Once again, the variable corresponding to manufactures exports is excluded to avoid multicollinearity issues, or specifically perfect multicollinearity in this case.

Table 4 – Regression output with export dummies

Linear regression — Number of obs = 396; F(15, 124) = 18.61; Prob > F = 0.0000; R-squared = 0.6219; Root MSE = 4.7401

(Std. Err. adjusted for 125 clusters in Country)

CAB	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
FB	.5642736	.1061809	5.31	0.000	.3541119	.7744353
young	-.1779237	.0769488	-2.31	0.022	-.330227	-.0256203
old	-.3971846	.1522535	-2.61	0.010	-.698537	-.0958322
GDPpc	6.098492	2.862783	2.13	0.035	.4322431	11.76474
pcGrowth	-5.146407	1.099753	-4.68	0.000	-7.323127	-2.969687
pcg2	2.186923	.6670779	3.28	0.001	.8665892	3.507257
NFA	.018074	.0068528	2.64	0.009	.0045104	.0316375
FDI	-.4302058	.115759	-3.72	0.000	-.6593252	-.2010863
FDI_stock	.0141296	.0042465	3.33	0.001	.0057247	.0225345
dExp_FoodAgri	-1.912899	.8168599	-2.34	0.021	-3.529693	-.2961042
dExp_Fuel	3.927967	1.151775	3.41	0.001	1.648281	6.207653
dExp_Ores	-1.420218	1.573736	-0.90	0.369	-4.535082	1.694646
dExp_HT_Manu	3.288345	1.073726	3.06	0.003	1.16314	5.41355
LowPop	-3.627507	1.317049	-2.75	0.007	-6.234316	-1.020698
Island	-1.422043	.7722487	-1.84	0.068	-2.95054	.1064531
_cons	8.856207	3.433852	2.58	0.011	2.059653	15.65276

Table 4 shows that the results regarding exports presented in section 7 are robust. Food (dExp_FoodAgri), fuel (dExp_Fuel) and high technology (dExp_HT_Manu) maintain the sign they had earlier and remain strongly significant also under this setting. On the other hand, the dummy for ores and metals (dExp_Ores) assume a negative largely

[22] Such decision was taken given the fact that Exp_HT_Manu is rarely the predominant export variable in the sample. For only 56 of the 396 observations exports of high technology exceed 10% of total exports.

insignificant effect. All in all, the result is satisfactory as it confirms the trends showed in the main regression output, while nevertheless remaining much more imprecise. In fact, by using the dummies for prevalent export instead of each percentages of merchandise exports, part of the information contained in the initial estimation gets lost, and this is witnessed by an R-squared that dropped to 0.6219 from 0.6632 in the original regression exposed in section 7.

8.3 Endogeneity

Endogeneity is the result of correlation between explanatory variables and error terms. As it leads to biased and inconsistent parameter estimates, it is highly undesirable. Endogeneity can stem from three different problems, namely measurement errors, omitted variables and simultaneity.

Measurement errors are relatively frequent in data coming from developing countries. As pointed out in section 6.1, taking 5-year averages is possibly a good counter to it as it mitigates the impact of an incorrect value in the data. Another solution is to increase the size of the sample, so that possible misleading values are as outweighed as possible in the estimation.

In order to check if omitted variables are source of model misspecification, I ran the Ramsey regression equation specification error test for omitted variable and the specification link test for single-equation models. Evidence on the matter is mixed. While the former test rejects the null hypothesis of no omitted variables, the latter fails to reject the null hypothesis of correct specification of the model.

Lastly, simultaneity arises when causality does not run exclusively from independent variables to dependent variable, i.e. the dependent variable has an influence on the explanatory variables. In the sample it is clearly the case for the net foreign asset position, which is basically the result of previous current account balances. As a result, in the estimation process the values for net foreign assets refer to the level of the variable at the beginning of the relative 5-year period. In this way, only the effect going from net foreign asset position to current account balance is captured and the issue of endogeneity is effectively solved.

Another regressor that is potentially endogenous is the fiscal balance. For instance, state owned enterprises exporting commodities would make both government revenues and current account receipts rely on production and price of the goods sold abroad. In this case, potential endogeneity was dealt with the use of instrumental variables. Two instruments were employed and namely the lagged values of the fiscal balance and government effectiveness[23]. While the lagged fiscal balance simply represents the values of the previous 5-year period, government effectiveness captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann et al, 2010: 3). Both variables are positively correlated with the fiscal balance and unlikely to suffer from reverse causality stemming from the current account balance. However, the size of the sample shrunk from 396 to 353 in the two-stage least squares estimation, as for some countries data relative to the previous fiscal balance was not found and additionally government effectiveness is only provided from 1996, thus leaving the first timeframe (1990-1994) without any observations.

The two instruments proved to be valid, as showed by the underidentification, weak identification and overidentification tests (see section 11.5). The rejection of the null hypothesis in the underidentification test shows that both instruments are correlated with the endogenous regressor. Rejection of the weak identification test indicates that the instruments are not weak. Finally, the failure to reject the overidentification test (p-value of 0.1709) is also positive, since its null hypothesis states that the two instruments are exogenous to the dependent variable and rightly excludable from the main regression.

The results from the two-stage least squares (2SLS) estimation are reported in full in the appendix (table 11, section 11.5) together with the 3 tests mentioned above. Instrumental variable estimation points to a strengthening of the coefficient for fiscal balance from 0.502 to 0.633. Nevertheless, standard errors on the instrumented fiscal balance almost double, indicating that the estimate becomes less precise.

[23] Government effectiveness is one of the Worldwide Governance Indicators provided by the World Bank. Although data are available for every country part of the sample used here, it is only provided over the period 1996-2016.

It must be however underlined that the postestimation test on endogeneity for fiscal balance fails to reject the null hypothesis of exogeneity of the fiscal balance (p-value of 0.5295 as also reported in table 12, section 11.5). This means that the test finds no evidence about the presence of endogeneity between fiscal balance and current account balance in the first place.

8.4 Panel data fixed effects

Table 5 displays the regression output obtained by employing the fixed effects (FE) estimator in a panel data analysis. Data still refer to the timeframe 1990-2014 but are no longer grouped in 5-year averages. This was done to provide a less unbalanced panel as many groups (countries) would have had only 1-2 observations and up to 5 in the best case, thus damaging the time series dimension of the panel and weakening the results. As a consequence, under this setting there are up to 25 observations per country and the final sample comprises 130 developing countries for a total of 2329 observations[24].

The decision to use the fixed effects estimator over random effects comes from the fact that each country has its own idiosyncratic characteristics which can hardly be described as a random selection. This is corroborated by the Hausman test, as proposed by Hausman (1978), which strongly rejected the null hypothesis of random effects. An advantage of using fixed effects is that the inherent characteristics of countries, such their geographic variables, are controlled for, but the drawback is that their impact cannot be estimated. Furthermore, estimation of variables which change slowly over time is supposed to be relatively imprecise as the fixed effects estimator focuses on variability within individuals (countries) and not between them.

[24] Only countries with at least 5 observations were taken into account. Observations with FDI inflows higher than the relative GDP and stock of FDI liabilities higher than 600% of GDP were excluded as considered outliers.

Table 5 – Fixed-effects regression output

```
Fixed-effects (within) regression               Number of obs      =      2329
Group variable: idc                             Number of groups   =       130

R-sq:  within  = 0.2256                         Obs per group: min =         5
       between = 0.6968                                        avg =      17.9
       overall = 0.5163                                        max =        25

                                                F(13,2186)         =     49.00
corr(u_i, Xb)  = 0.2817                         Prob > F           =    0.0000
```

CAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
FB	.4687139	.0305675	15.33	0.000	.4087696	.5286582
oldyou	-.2157108	.0554294	-3.89	0.000	-.3244105	-.107011
GDPpc	2.35771	2.038912	1.16	0.248	-1.640698	6.356118
pcGrowth	-.0656159	.0307915	-2.13	0.033	-.1259996	-.0052322
pcg2	.006283	.0022662	2.77	0.006	.0018388	.0107272
NFA	.0096083	.0019464	4.94	0.000	.0057913	.0134253
FDI	-.5120814	.0309989	-16.52	0.000	-.5728719	-.451291
FDI_stock	.0809363	.6227287	0.13	0.897	-1.140266	1.302138
Exp_FoodAgri	-.006362	.0155455	-0.41	0.682	-.0368476	.0241235
Exp_Fuel	.0483355	.0179674	2.69	0.007	.0131005	.0835705
Exp_Ores	-.2211477	.045264	-4.89	0.000	-.3099126	-.1323829
Exp_ores2	.0029122	.0006745	4.32	0.000	.0015895	.0042348
Exp_HT_Manu	.0588611	.0338712	1.74	0.082	-.007562	.1252842
_cons	8.353565	2.427346	3.44	0.001	3.593419	13.11371
sigma_u	5.0132686					
sigma_e	5.2797513					
rho	.47412769	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(129, 2186) =     9.68           Prob > F = 0.0000
```

Overall, the outcomes of the fixed effects estimation point broadly in the same direction of the results obtained earlier with the POLS estimator. This is especially the case for fiscal balance, net foreign direct investment inflows as well as exports of fuel. Same goes for exports of ores and metals, which preserve their quadratic effect on the fiscal balance and for which the trough shifts from the 33.64% of total exports envisaged in the POLS estimation to 37.97%. Also with the fixed effects estimator, per capita GDP growth[25] is found to have a quadratic effect on the current account balance, and namely a negative effect if per capita GDP growth is between 0 and 10.44%. Results of the

[25] For per capita GDP growth, coefficients are not directly comparable since a different scale was used in the two different estimation methods.

demographic variables where in line too[26]. Conversely, the coefficient for per capita GDP is almost halved in the FE regression and it is only significant at a 25% level, weakening the results obtained earlier which were more decisively in favour of the stages of development hypothesis. The effect of net foreign asset position is notably reduced and exports of technologically advanced manufactures see their coefficient more than halved in the FE estimation, although it still remains the type of exports with the highest positive effect on the current account balance. Finally, stock of FDI liabilities as well as food and agricultural exports lose their statistical significance. For the latter it means that under this specification, exports of food have an effect on the current account balance that is no longer significantly different from exports of non high technology manufactures. In section 11.6 of the Appendix, table 13 directly compares the results obtained with the two different methods.

8.5 Robustness to geographic location

The results are robust to the inclusion of dummy variables for continent. Africa (p-value 0.680), Asia (0.430), America (0.273) are far from statistically significant levels. The dummy variable for Europe is the one with the lowest p-value (0.115), remaining close to statistical significance at a 10% level. Interestingly, its coefficient assumes a negative value (-1.7382), meaning that ceteris paribus European developing countries tended to have a lower current account balance. This may be due to the fact that most of these countries have undergone a period of great transformations from a state directed economy to a market based one in the timespan that broadly coincided with that of this analysis. With the rapid opening of their borders to capital flows, investment has poured especially from more developed countries in Europe, making their current account deficits spike.

Moreover, also a specific dummy variable for Sub-Saharan African (SSA) countries is not significant (p-value 0.811). This is relevant because it could have been argued that the

[26] In the fixed effects estimation only one demographic variable was used, which was the sum of young and old population, whereas in the POLS estimation two distinct variables were used (old and young, separately). The fact that the oldyoung variable assumes a significant coefficient between the values of the coefficients of old and young as estimated with POLS, supports the robustness of the main estimation.

significance of the variable for exports of food and agricultural raw materials in the main regression just acted for a pseudo-dummy variable for food-exporting poor countries. As a matter of facts, SSA countries are the least developed in the sample (average GDP per capita accounts for 3.8% of US GDP of the respective timeframe) and are those for which agricultural and food exports cover the highest share of total exports of goods at an average 48.9% against an average of 24.3% in the rest of the sample. Although SSA countries tend to have a lower current account balance (average of -5.64% against an average -2.21% of the other developing countries), the insignificance of the SSA dummy variable means that this difference is fully explained by the regressors included in the model.

9. Conclusion

Rising external imbalances have become a focal point of attention in international macroeconomics after several open economies have been hit by financial crises. In my thesis I investigated the drivers of the current account balance of 125 developing countries through a pooled ordinary least squares estimation with clustered standard errors. In order to smooth business cycle-related variations and to counter measurement errors the dataset, which spans 25 years between 1990 and 2014, has been rearranged into five 5-year periods. Each observation therefore represents a five-year average.

Results show that fiscal balance, GDP per capita, net foreign asset position, stock of FDI liabilities as well as the shares of fuel and high technology manufactures on total exports have a positive impact on the current account balance. Conversely, the shares of young and old population, foreign direct investment inflows together with the shares of food and agricultural raw materials on total exports have a negative effect on the current account balance. In addition, dummies for population below 500.000 and for island nations were found to be statistically significant and to negatively affect the current account balance.

The results presented support the twin deficit hypothesis, which states that fiscal deficits put a negative pressure on the current account balance. In comparison, support to the stages of economic development hypothesis resulted to be weaker, as the variable GDP per capita was only significant at a 5% level in the main regression and largely insignificant in the panel data fixed effects estimation which was run as a robustness check. Regression outcomes also show that countries with low age dependency ratios are expected to run higher current account balances, in line with Modigliani's life-cycle hypothesis.

Previous literature has largely neglected the importance of the main categories of exports. At most, a variable related to the exports of oil or hydrocarbons have been included in past research. However, the inclusion of the share over total of main categories of exports besides fuel, such as agriculture, metals and high technology manufactures, notably improves estimation results and shows how a structural feature of a country which represents the comparative advantage in its exports, has far reaching repercussions on the current account balance and therefore on its position as a net lender or net borrower.

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11. Appendix

11.1 Sample list.

In the followings, each country and the relative time frames are reported. Observations underlined represent outliers (see section 6.3) and have been discarded before the final estimation.

Albania 2000-2004; 2005-2009; 2010-2014. Algeria 1995-1999; 2000-2004; 2005-2009; 2010-2014. Antigua and Barbuda 2010-2014. Argentina 1995-1999; 2000-2004; 2005-2009; 2010-2014. Armenia 2000-2004; 2005-2009; 2010-2014. Azerbaijan 2000-2004; 2005-2009; 2010-2014. Bahrain 2000-2004; 2005-2009; 2010-2014. Bangladesh 1990-1994; 2000-2004; 2005-2009. Barbados 1995-1999; 2000-2004; 2005-2009; 2010-2014. Belarus 2000-2004; 2005-2009; 2010-2014. Belize 1995-1999; 2005-2009. Benin 2000-2004; 2005-2009; 2010-2014. Bhutan 2005-2009. Bolivia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Bosnia and Herzegovina 2005-2009; 2010-2014. Botswana 2000-2004; 2005-2009; 2010-2014. Brazil 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Bulgaria 2000-2004; 2005-2009; 2010-2014. Burkina Faso 1995-1999; 2000-2004; 2010-2014. Burundi 2000-2004; 2005-2009; 2010-2014. Cabo Verde 2010-2014. Cambodia 2000-2004; 2005-2009; 2010-2014. Cameroon 2000-2004; 2005-2009; 2010-2014. Central African Republic 1995-1999; 2000-2004; 2005-2009. Chile 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. China 1995-1999; 2000-2004; 2005-2009; 2010-2014. Colombia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Congo, Rep. 2010-2014. Costa Rica 1995-1999; 2000-2004; 2005-2009; 2010-2014. Cote d'Ivoire 1995-1999; 2000-2004; 2005-2009; 2010-2014. Croatia 2000-2004; 2005-2009; 2010-2014. Cyprus 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Czech Republic 1995-1999; 2000-2004; 2005-2009; 2010-2014. Dominican Republic 2005-2009; 2010-2014. Ecuador 1995-1999; 2000-2004; 2005-2009; 2010-2014. Egypt, Arab Rep. 2005-2009; 2010-2014. El Salvador 1995-1999; 2000-2004; 2005-2009; 2010-2014. Estonia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Ethiopia 2000-2004; 2005-2009; 2010-2014. Fiji 1990-1994; 2000-2004; 2005-2009; 2010-2014. Gabon 2000-2004; 2005-2009. Gambia, The 2000-2004; 2005-2009; 2010-2014. Georgia 2000-2004; 2005-2009; 2010-2014. Ghana 2005-2009. Grenada 1995-1999; 2000-2004. Guatemala 1995-1999; 2000-2004; 2005-2009; 2010-2014. Guinea 1995-1999. Guyana 2000-2004; 2005-2009; 2010-2014. Honduras 1995-1999; 2000-2004. Hungary 1995-1999; 2000-2004; 2005-2009; 2010-2014. India 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Indonesia 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Iran, Islamic Rep. 2000-2004. Israel 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Jamaica 1995-1999; 2000-2004; 2005-2009; 2010-2014. Jordan 1990-1994; 2000-2004; 2005-2009; 2010-2014. Kazakhstan 1995-1999; 2000-2004; 2005-2009; 2010-2014. Kenya 1990-1994; 1995-1999; 2000-2004; 2005-2009. Korea, Rep. 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Kuwait 1995-1999; 2000-2004. Kyrgyz Republic 2000-2004; 2005-2009. Latvia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Lebanon 2000-2004; 2005-2009; 2010-2014. Lesotho 2000-2004. Lithuania 1995-1999; 2000-2004; 2005-2009; 2010-2014. Macao SAR, China 2005-2009. Macedonia, FYR 2000-2004; 2010-2014. Madagascar 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Malawi 2000-2004; 2005-2009; 2010-2014. Malaysia 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Mali 2000-2004. Malta

1990-1994; 2000-2004; 2005-2009; 2010-2014. Mauritius 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Mexico 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Moldova 1995-1999; 2000-2004; 2005-2009; 2010-2014. Mongolia 2000-2004. Morocco 1995-1999; 2000-2004; 2005-2009; 2010-2014. Mozambique 2000-2004; 2005-2009; 2010-2014. Namibia 2000-2004; 2005-2009; 2010-2014. Nepal 2010-2014. Nicaragua 1995-1999; 2000-2004; 2005-2009; 2010-2014. Niger 1995-1999; 2000-2004; 2005-2009; 2010-2014. Nigeria 2010-2014. Oman 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Pakistan 1995-1999; 2000-2004; 2005-2009; 2010-2014. Panama 1995-1999; 2000-2004; 2005-2009; 2010-2014. Papua New Guinea 2000-2004. Paraguay 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Peru 1995-1999; 2000-2004; 2005-2009; 2010-2014. Philippines 1995-1999; 2000-2004; 2005-2009; 2010-2014. Poland 1995-1999; 2000-2004; 2005-2009; 2010-2014. Qatar 2000-2004; 2005-2009. Romania 1995-1999; 2000-2004; 2005-2009; 2010-2014. Russian Federation 2000-2004; 2005-2009; 2010-2014. Rwanda 2005-2009; 2010-2014. Samoa 2005-2009; 2010-2014. Saudi Arabia 2000-2004; 2005-2009; 2010-2014. Senegal 2000-2004; 2005-2009; 2010-2014. Seychelles 1995-1999; 2000-2004; 2010-2014. Singapore 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Slovak Republic 1995-1999; 2000-2004; 2005-2009; 2010-2014. Slovenia 1995-1999; 2000-2004; 2005-2009; 2010-2014. South Africa 1995-1999; 2000-2004; 2005-2009; 2010-2014. Sri Lanka 1990-1994; 2000-2004; 2005-2009; 2010-2014. St. Lucia 1995-1999; 2000-2004. St. Vincent and the Grenadines 1995-1999; 2000-2004; 2005-2009. Suriname 1995-1999; 2000-2004; 2005-2009; 2010-2014. Swaziland 2000-2004. Syrian Arab Republic 2000-2004; 2005-2009. Tanzania 2000-2004; 2005-2009; 2010-2014. Thailand 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Togo 1995-1999; 2000-2004; 2010-2014. Tonga 2010-2014. Trinidad and Tobago 1995-1999; 2000-2004; 2005-2009. Tunisia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Turkey 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Uganda 1995-1999; 2000-2004; 2005-2009; 2010-2014. Ukraine 2000-2004; 2005-2009; 2010-2014. Uruguay 1995-1999; 2000-2004; 2005-2009; 2010-2014. Venezuela, RB 1990-1994; 1995-1999; 2000-2004. Vietnam 2000-2004; 2005-2009; 2010-2014. West Bank and Gaza 2005-2009; 2010-2014. Yemen, Rep. 2005-2009; 2010-2014. Zambia 1995-1999; 2000-2004; 2005-2009; 2010-2014. Zimbabwe 1990-1994; 2005-2009; 2010-2014.

The following observations regarding advanced countries have been added to the original sample to perform the regression of section 8.1:

Australia 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Austria 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Belgium 2000-2004; 2005-2009; 2010-2014. Canada 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Denmark 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Finland 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. France 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Germany 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Greece 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Hong Kong SAR, China 1995-1999; 2000-2004; 2005-2009; 2010-2014. Iceland 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Ireland 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Italy 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Japan 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Luxembourg 2000-2004; 2005-2009; 2010-2014. Netherlands 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. New Zealand 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Norway 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Portugal 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Spain 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Sweden 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. Switzerland 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. United Kingdom 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014. United States 1990-1994; 1995-1999; 2000-2004; 2005-2009; 2010-2014.

11.2 Table 6 - Variable Description and Data Sources

Variable name	**Description**	**Source**
CAB	Current account balance (% of GDP)	World Bank Open Data – World Bank Group International Monetary Fund, World Economic Outlook Database, April 2017
FB	General government budget balance (% of GDP)	International Monetary Fund, World Economic Outlook Database, April 2017 World Bank Open Data – World Bank Group
young	Population ages 0-14 (% of total)	World Bank Open Data – World Bank Group
old	Population ages 65 and above (% of total)	World Bank Open Data – World Bank Group
Oldyoung	Non-working age population (sum of population younger than 15 and older than 64, % of the total). Own elaboration	World Bank Open Data – World Bank Group
GDPpc	GDP per capita in current US dollars expressed as percentage of USA GDP per capita of the same period. Own elaboration	World Bank Open Data – World Bank Group International Monetary Fund, World Economic Outlook Database, April 2017
pcGrowth	Real GDP per capita growth. Own elaboration	World Bank Open Data – World Bank Group International Monetary Fund, World Economic Outlook Database, April 2017 UNdata - a data access system to UN databases

pcg2	Real GDP per capita growth squared. Own elaboration	World Bank Open Data – World Bank Group International Monetary Fund, World Economic Outlook Database, April 2017 UNdata - a data access system to UN databases
NFA	Net foreign assets: difference between total foreign assets and total foreign liabilities expressed as a % of GDP	Philip R. Lane and Gian Maria Milesi-Ferretti, 2017. "International Financial Integration in the Aftermath of the Global Financial Crisis," IMF Working Paper 17/115
FDI	Foreign direct investment, net inflows (% of GDP)	World Bank Open Data – World Bank Group UNCTAD statistics
FDI_stock	Stock of foreign direct investment liabilities expressed as a % of GDP	Philip R. Lane and Gian Maria Milesi-Ferretti, 2017. "International Financial Integration in the Aftermath of the Global Financial Crisis," IMF Working Paper 17/115
Exp_FoodAgri	Sum of Food exports (% of merchandise exports) and Agricultural raw materials exports (% of merchandise exports) – own elaboration • Food exports (% of merchandise exports) Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, food comprises the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and	World Bank Open Data – World Bank Group

	oil kernels). • Agricultural raw materials exports (% of merchandise exports) Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap).	
Exp_Fuel	Fuel exports (% of merchandise exports). Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, Fuels comprise the commodities in SITC section 3 (mineral fuels, lubricants and related materials).	World Bank Open Data – World Bank Group
Exp_Ores	Ores and metals exports (% of merchandise exports). Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, minerals nes); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals).	World Bank Open Data – World Bank Group
Exp_ores2	Ores and metals exports (% of merchandise exports) squared – own elaboration	World Bank Open Data – World Bank Group
Exp_Manu	Manufactures exports (% of	World Bank Open Data –

	merchandise exports) Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals).	World Bank Group
Exp_HT_Manu	Data express high-technology exports as a percentage of merchandise exports. Own elaboration (original data reports high-technology exports as a percentage of manufactures exports) Following the World Bank's methodology based on the Standard International Trade Classification (SITC) revision 3, High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.	World Bank Open Data – World Bank Group
Exp_LowManu	Exports of non-high technology manufactures (% of merchandise exports). The values of the variable represent the difference between Exp_Manu and Exp_HT_Manu. Own elaboration	World Bank Open Data – World Bank Group
dExp_FoodAgri	Dummy variable taking on a value of 1 if exports of food and agricultural raw materials are higher than fuel, ores and metals and total manufactures exports	World Bank Open Data – World Bank Group
dExp_Fuel	Dummy variable taking on a value of 1 if exports of fuel are higher than	World Bank Open Data – World Bank Group

	food and agricultural raw materials, ores and metals and total manufactures exports	
dExp_Ores	Dummy variable taking on a value of 1 if exports of ores and metals are higher than food and agricultural raw materials, fuel, and total manufactures exports	World Bank Open Data – World Bank Group
dExp_Manu	Dummy variable taking on a value of 1 if total exports of manufactures are higher than food and agricultural raw materials, fuel, ores and metals	World Bank Open Data – World Bank Group
dExp_HT_Manu	Dummy variable taking on a value of 1 if high-technology exports represent more than 10% of total merchandise exports	World Bank Open Data – World Bank Group
LowPop	Dummy variable taking on a value of 1 if the country had a population higher than 500.000 in 2014	World Bank Open Data – World Bank Group
Island	Dummy variable taking on a value of 1 if the country has no land borders with other countries	nationsonline.org
ADV	Dummy variable taking on a value of 1 if the country is advanced	IMF's October 1989 World Economic Outlook.
gf	Government effectiveness: estimate. Detailed information available at available at www.govindicators.org	World Bank Open Data – World Bank Group
FB1	General government budget balance as a % of GDP in t-1	International Monetary Fund, World Economic Outlook Database, April 2017 World Bank Open Data – World Bank Group

11.3 Variance Inflation Factors (VIF)

Table 7 –VIF (1)

Variable	VIF	1/VIF
Exp_LowManu	12.64	0.079099
Exp_Ores	10.73	0.093202
Exp_FoodAgri	10.69	0.093517
Exp_Fuel	9.9	0.100973
Exp_ores2	8	0.124994
young	6.3	0.158668
old	4.93	0.202639
pcGrowth	4.36	0.229325
pcg2	3.93	0.254186
GDPpc	2.26	0.442327
FDI	1.99	0.50158
FDI_stock	1.75	0.570024
NFA	1.74	0.573727
LowPop	1.68	0.595514
Island	1.62	0.618273
FB	1.61	0.620373
Exp_HT_Manu	1.52	0.655853

Mean VIF: 5.04

Table 8 – VIF (2)

Variable	VIF	1/VIF
Exp_Ores	8.46	0.118137
Exp_ores2	7.99	0.125094
young	6.3	0.158705
old	4.93	0.20277
pcGrowth	4.36	0.229374
pcg2	3.93	0.254189
GDPpc	2.26	0.442338
Exp_FoodAgri	2.14	0.466375
Exp_Fuel	1.98	0.504724
FDI	1.97	0.50722
FDI_stock	1.75	0.571942
NFA	1.74	0.574042
LowPop	1.63	0.613028
FB	1.61	0.621344
Island	1.61	0.621963
Exp_HT_Manu	1.51	0.663932

Mean VIF: 3.39

11.4 Chow test for structural break

Table 9 – Chow test (1)

Variable	**F**	**P>F**
ADV	0.71	0.402
ADV#c.FB	0.00	0.99
ADV#c.young	0.04	0.8378
ADV#c.old	2.30	0.1312
ADV#c.GDPpc	0.09	0.7703
ADV#c.pcGrowth	2.16	0.1437
ADV#c.pcg2	2.16	0.1439
ADV#c.NFA	0.07	0.7878
ADV#c.FDI	14.08	0.0003

Table 10 – Chow test (2)

Variable	**F**	**P>F**
ADV	0.71	0.4020
ADV#c.FB	0.00	0.9900
ADV#c.young	0.04	0.8378
ADV#c.old	2.30	0.1312
ADV#c.GDPpc	0.09	0.7703
ADV#c.NFA	0.07	0.7878
ADV#c.Exp_FoodAgri	0.36	0.5476
ADV#c.Exp_Ores	1.90	0.1706
ADV#c.Exp_ores2	1.86	0.1750

ADV#c.FDI_stock	12.09	0.0007
ADV#c.Exp_FoodAgri	0.36	0.5476
ADV#c.Exp_Fuel	0.53	0.4687
ADV#c.Exp_Ores	1.90	0.1706
ADV#c.Exp_ores2	1.86	0.175
ADV#c.Exp_HT_Manu	2.95	0.0878
ADV#c.LowPop	3.40	0.0673
ADV#c.Island	1.52	0.2191
Overall	**5.44**	**0.000**

ADV#c.Island	1.52	0.2191
Overall	**1.25**	**0.2665**

11.5 Endogeneity of fiscal balance

Table 11 – IV regression output, underidentification test, weak identification test and overidentification test

```
Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on Country

Number of clusters (Country) =     124                 Number of obs =       353
                                                       F( 16,   123) =     23.81
                                                       Prob > F      =    0.0000
Total (centered) SS     =  21631.86576                 Centered R2   =    0.6844
Total (uncentered) SS   =  24497.57388                 Uncentered R2 =    0.7213
Residual SS             =  6826.739027                 Root MSE      =     4.398
```

CAB	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
FB	.6332079	.1995089	3.17	0.002	.2421777	1.024238
young	-.1504249	.0709337	-2.12	0.034	-.2894524	-.0113974
old	-.3735303	.1454086	-2.57	0.010	-.658526	-.0885346
GDPpc	4.44932	2.58823	1.72	0.086	-.6235172	9.522157
pcGrowth	-5.308562	1.013745	-5.24	0.000	-7.295467	-3.321658
pcg2	2.247783	.5493481	4.09	0.000	1.17108	3.324485
NFA	1.597316	.6511391	2.45	0.014	.3211065	2.873525
FDI	-.4315542	.1058827	-4.08	0.000	-.6390806	-.2240279
FDI_stock	.0135468	.0040074	3.38	0.001	.0056925	.0214011
Exp_FoodAgri	-.0507008	.0159028	-3.19	0.001	-.0818696	-.0195319
Exp_Fuel	.0471987	.0236971	1.99	0.046	.0007531	.0936442
Exp_Ores	-.1867517	.0627444	-2.98	0.003	-.3097284	-.0637749
Exp_ores2	.0027693	.0009913	2.79	0.005	.0008264	.0047123
Exp_HT_Manu	.1429896	.0499583	2.86	0.004	.0450731	.2409062
LowPop	-3.450236	1.144377	-3.01	0.003	-5.693174	-1.207298
Island	-1.936839	.8793857	-2.20	0.028	-3.660404	-.213275
_cons	9.749694	3.420146	2.85	0.004	3.046331	16.45306

```
Underidentification test (Kleibergen-Paap rk LM statistic):              20.703
                                                    Chi-sq(2) P-val =    0.0000
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                27.848
                         (Kleibergen-Paap rk Wald F statistic):           5.034
Stock-Yogo weak ID test critical values: 10% maximal IV size             19.93
                                         15% maximal IV size             11.59
                                         20% maximal IV size              8.75
                                         25% maximal IV size              7.25
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
------------------------------------------------------------------------------
Hansen J statistic (overidentification test of all instruments):         1.875
                                                    Chi-sq(1) P-val =    0.1709
------------------------------------------------------------------------------
Instrumented:         FB
Included instruments: young old GDPpc pcGrowth pcg2 NFA FDI FDI_stock
                      Exp_FoodAgri Exp_Fuel Exp_Ores Exp_ores2 Exp_HT_Manu
                      LowPop Island
Excluded instruments: FB1 gf
------------------------------------------------------------------------------
```

Table 12 – Tests of endogeneity

```
Tests of endogeneity
Ho: variables are exogenous

Robust regression F(1,123)      =  .397649  (p = 0.5295)
  (Adjusted for 124 clusters in Country)
```

11.6 Table 13 - POLS vs FE results comparison

Variable	**POLS: Coef & p-values**	**FE: Coef & p-values**
Fiscal Balance	0.5021648	0.4687139
	(0.000)	(0.000)
Young (share of total population)	-0.1751493	(absent)
	(0.018)	
Old (share of total population)	-0.4071172	(absent)
	(0.005)	
Old & young (share of total population)	(absent)	-0.2157108
		(0.000)

GDP per capita	5.118417	2.35771
	(0.041)	(0.248)
Per capita GDP Growth	-4.844113	-0.0656159
	(0.000)	(0.033)
Per capita GDP Growth squared	2.112385	0.006283
	(0.000)	(0.006)
Net Foreign Asset position (% of GDP)	0.0163951	0.0096083
	(0.013)	(0.000)
FDI inflows (% of GDP)	-0.4272058	-0.5120814
	(0.000)	(0.000)
Stock of FDI liabilities (% of GDP)	0.0134454	0.0809363
	(0.001)	(0.897)
Exports of Food and Agricultural raw materials	-0.037897	-0.006362
	(0.019)	(0.682)
Exports of Fuel	0.0593847	0.0483355
	(0.004)	(0.007)
Exports of Ores and Metals	-0.1801874	-0.2211477
	(0.003)	(0.000)
Exports of Ores and Metals squared	0.0026785	.0029122
	(0.004)	(0.000)
Exports of high technology manufactures	0.143309	0.0588611
	(0.001)	(0.082)
Low population (dummy)	-3.703238	(absent)
	(0.001)	
Island (dummy)	-1.807889	(absent)
	(0.024)	
Constant	9.477416	8.353565
	(0.005)	(0.001)